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**Schnittstelle für Anwendungsprogramme für Netzführungssysteme (EMS-API) –****Teil 402: Allgemeine Dienste (IEC 61970-402:2008);  
Englische Fassung EN 61970-402:2008**

Energy management system application program interface (EMS-API) –  
Part 402: Common services (IEC 61970-402:2008);  
English version EN 61970-402:2008

Interface de programmation d'application pour systèmes de gestion d'énergie  
(EMS-API) –  
Partie 402: Services communs (CEI 61970-402:2008);  
Version anglaise EN 61970-402:2008

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## **Beginn der Gültigkeit**

Die von CENELEC am 2008-07-01 angenommene EN 61970-402 gilt als DIN-Norm ab 2009-01-01.

## **Nationales Vorwort**

*Vorausgegangener Norm-Entwurf: E DIN IEC 61970-402:2006-06.*

Für diese Norm ist das nationale Arbeitsgremium K 952 „Netzleittechnik“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE ([www.dke.de](http://www.dke.de)) zuständig.

Die enthaltene IEC-Publikation wurde vom TC 57 „Power systems management and associated information exchange“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (maintenance result date) unverändert bleiben soll, das auf der IEC-Website unter „<http://webstore.iec.ch>“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

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Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 61970-402 veröffentlicht. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

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Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

## **Einführung**

Die Normen der Reihe 61970 legen Schnittstellen für Anwendungsprogramme (application program interfaces = APIs) für Netzführungssysteme fest. Sie beruhen auf Arbeiten des nordamerikanischen Forschungsinstitutes EPRI (Electric Power Research Institute, Palo Alto/USA).

Die Reihe DIN EN 61970-4xx legt die Schnittstellen fest, die eine Komponente oder Anwendung aufweisen sollte, um in genormter Weise mit anderen Komponenten oder Anwendungen Informationen austauschen oder auf öffentlich zugängliche Daten zugreifen zu können.

Der vorliegende Teil legt die Basisfunktionalität hierfür fest.

**Energy management system application program interface (EMS-API) —  
Part 402: Common services  
(IEC 61970-402:2008)**

Interface de programmation d'application  
pour systèmes de gestion d'énergie  
(EMS-API) —  
Partie 402: Services communs  
(CEI 61970-402:2008)

Schnittstelle für Anwendungsprogramme  
für Netzführungssysteme (EMS-API) —  
Teil 402: Allgemeine Dienste  
(IEC 61970-402:2008)

This European Standard was approved by CENELEC on 2008-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 57/928/FDIS, future edition 1 of IEC 61970-402, prepared by IEC TC 57, Power systems management and associated information exchange, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61970-402 on 2008-07-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2009-04-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2011-07-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 61970-402:2008 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

|               |      |                                                 |
|---------------|------|-------------------------------------------------|
| IEC 61850-7-2 | NOTE | Harmonized as EN 61850-7-2:2003 (not modified). |
| IEC 61968     | NOTE | Harmonized in EN 61968 series (not modified).   |
| IEC 61968-1   | NOTE | Harmonized as EN 61968-1:2004 (not modified).   |
| IEC 61968-3   | NOTE | Harmonized as EN 61968-3:2004 (not modified).   |
| IEC 61970-301 | NOTE | Harmonized as EN 61970-301:2004 (not modified). |

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## INTRODUCTION

This standard is one of the IEC 61970 series parts that define an application program interface (API) 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 IEC 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 IEC 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 61970-402 contains API services that are considered to be foundational. As such, all the other parts in the IEC 61970-4xx series assume their existence. As a result, the services described in IEC 61970-402 are required for any component that complies with the IEC 61970-4xx series.

The component interface specifications refer to entity objects for the power system domain that are defined in the IEC 61970-3xx series: Common Information Model (CIM).

This standard contains normative and informative text. Clauses are marked as normative or informative. A subclause inherits its parent clause's label unless overridden by the lower level subclause label.

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

### Part 402: Common services

#### 1 Scope

This International Standard 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 <sup>1)</sup> generic interface standards. An application is expected to use the Common Services in conjunction with the generic interfaces. These application category independent interfaces include:

- IEC 61970-403: Generic Data Access (GDA)
- IEC 61970-404: High Speed Data Access (HSDA)
- IEC 61970-405: Generic Eventing and Subscription (GES)
- IEC 61970-407: Time Series Data Access (TSDA)

To support these objectives, the Common Services are divided into three categories:

- a) Resource Identifiers – A common way of identifying classes, class attributes, and object instances.
- b) Resource Description – A common way of encoding values associated with classes, class attributes, and object instances.
- c) Views – A common way of presenting classes, class attributes, and object instances via hierarchies.

IEC 61970-402 contains API services that are considered to be foundational. As such, all the other parts in the IEC 61970-4xx series assume their existence. As a result, the services described in IEC 61970-402 are required for any component that complies with the IEC 61970-4xx series of standards.

Though the target of this IEC standard includes the control center technical domain, common services encompass a general set of concepts that can be applied to many types of systems. Examples of these systems include:

- Distribution management systems
- Work or asset management systems
- Geographic information systems
- Outage management systems
- Other types of 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 common service requirements to the extent that they are common to different types of systems while effectively addressing the control center needs.

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<sup>1)</sup> At this time, only parts 402 to 408 exist. Additional generic services beyond are not yet under consideration.

## 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 61970-403, *Energy management system application program interface (EMS-API) – Part 403: Component Interface Specification (CIS) – Generic data access*

IEC 61970-404, *Energy management system application program interface (EMS-API) – Part 404: High Speed Data Access (HSDA)*

IEC 61970-405, *Energy management system application program interface (EMS-API) – Part 405: Generic Eventing and Subscription (GES)*

IEC 61970-407, *Energy management system application program interface (EMS-API) – Part 407: Time Series Data Access (TSDA)*

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 International Standard 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 control center applications and systems. This specification provides a mechanism for applications from independent suppliers to access IEC 61970 Common Information Model (CIM) data using a common Application Program Interface (API) for the purpose of supplementary processing, storage, or display.

IEC 61970-401, 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, defines a set of generic application independent services that a component shall use for exchanging information with another component or for accessing public data. However, as the generic interfaces do not specify what specific data is exchanged, interoperability between products using IEC 61970-402 to IEC 61970-449 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.

The IEC 61970-4xx series of documents describes the specific event types and message contents that shall be used by applications independent of any particular component technology. The implementation of these messages using a particular component technology is described in the IEC 61970-5xx series of documents. As part of the IEC 61970-4xx series, this document contains a Level 1 Platform Independent Model (PIM) that describes in narrative terms (with text and the Unified Modeling Language (UML)) the interface functionality to be standardized. The IEC 61970-5xx series of documents describes a Level 2 or Platform Specific Model (PSM) that apply IEC 61970-4xx series specifications to particular platforms.

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 certain functionalities considered important for the environment in which the IEC 61970 standards will be applied.

IEC 61970-402 contains API services that are considered to be foundational. As such, all the other parts in the IEC 61970-4xx series assume their existence. As a result, the services described in IEC 61970-402 are required for any component that complies with the IEC 61970-4xx series.

## 5 Common services identifiers (normative)

### 5.1 DAF resource identifiers interface

This document normatively includes by reference the modelling contained in the Utility Management System (UMS) Data Access Facility (DAF) resource identifiers module<sup>2)</sup>. This module defines a generic means that shall be used to identify CIM resources (power system related classes, class attributes, and object instances). The DAF resource identifiers module defines several classes and one service as illustrated in Figure 1.

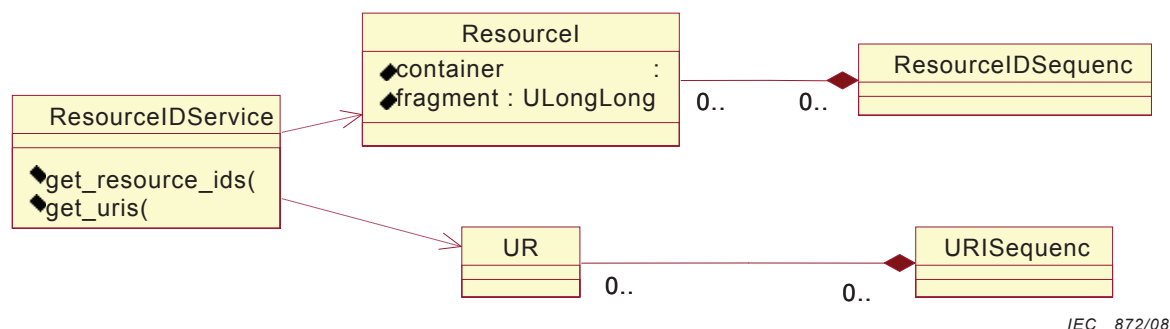


Figure 1 – DAF resource identifiers model

<sup>2)</sup> See OMG, Utility Management System Data Access Facility, document formal/2002-11-08.

**Table 1 – DAF resource identifiers operations**

| Operation        | Example signature                                         | Throws      |
|------------------|-----------------------------------------------------------|-------------|
| get_resource_ids | ResourceIDSequence get_resource_ids<br>(URISequence uris) | LookupError |
| get_uris         | URISequence get_uris<br>(ResourceIDSequence ids)          | LookupError |

The DAF resource identifiers module employs Universal Resource Identifiers (URI's)<sup>3)</sup> and Resource ID's to identify utility resources. A URI is a string used as a name that conforms to the Universal Resource Identifier standard (see reference 5). For example, a URI for the class of transformers might be "http://utility.com/Planning/Production/CIM-schema-cimu09a# Transformer". A resource ID on the other hand consists of a more compact 128 bit (16 octets) ID number. The DAF specification defines arrays of Resource ID's and URI's in ResourceIDSequence and URISequence respectively.

The DAF resource identifiers module requires that Universal Resource Identifiers (URI's) be unique and that within a DAF Server Resource ID's be unique. Furthermore, for any resource exposed by a DAF server there is only one associated resource ID and one associated URI. The DAF ResourceID Service includes two methods called get\_resource\_ids and get\_uris to translate URI's to Resources and visa versa. The get\_resource\_ids method takes a set of URI's as input and returns an equal and corresponding set of Resource ID's as output. The get\_uris method takes a set of Resource ID's as input and returns an equal and corresponding set of URI's as output.

## 5.2 Extended resource ID service

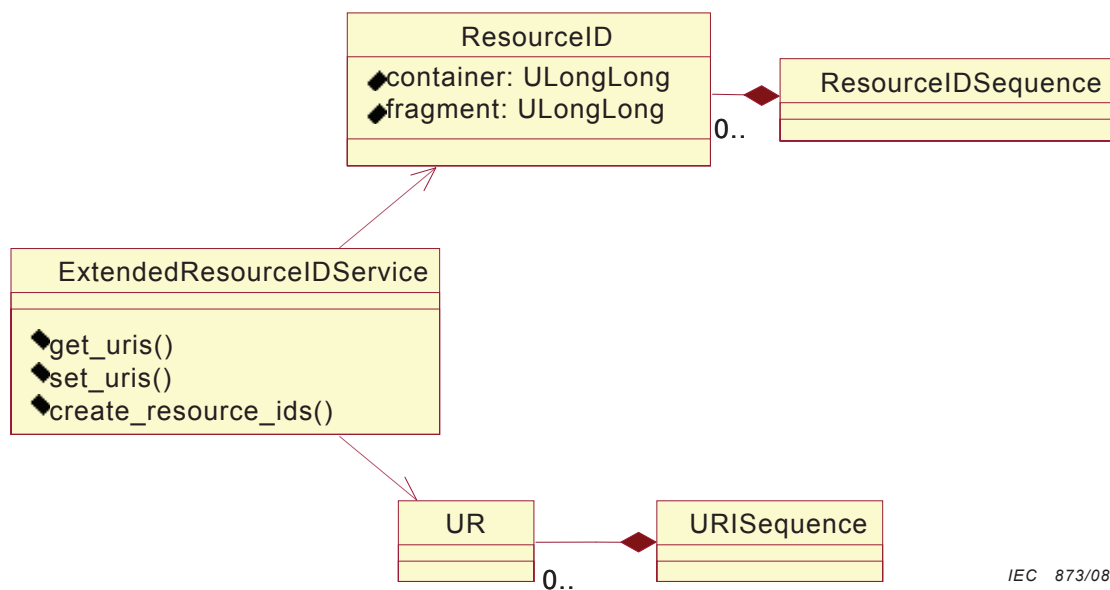
### 5.2.1 General

However, in practice it is possible that a single unique resource ID may be associated with many URI's<sup>4)</sup>. For example, consider a resource ID service provider deployed for planning and operations applications. In this case, a resource such as a substation bus may be associated with two URI's (names) where each URI is associated with a different legacy application for example "utility.com/Planning/Production#Bus123" and "utility.com/EMS/Production#BusAB7". In order to deal with this more complicated use case, the Extended Resource ID Service adds a view name parameter to the DAF Resource ID get\_uris method. The view name parameter is used to determine the scope of the URI.

The extended resource ID service also adds the ability to set URI's given a view name and to allocate resource ID's in a server as shown in Figure 2. Thus, the common services identifiers interface as described in Table 2, can be seen as a complementary extension of the DAF identifiers interface.

<sup>3)</sup> IETF RFC 2396 for more information on URI's.

<sup>4)</sup> For example, consider a IEC 61970-404: High Speed Data Access (HSDA) Server presenting nodes within an IECTC 57PhysicalView hierarchy. Because the HSDA interface does not support a client query to retrieve the Resource ID's of all breakers in a substation for example, a performance bottleneck can occur during HSDA subscription configuration when a client assembles a list of pathnames to subscribe to. However, the Resource ID's for all breakers in a substation can be retrieved using a IEC 61970-403: Generic Data Access query. The Extended Resource Identification Service provider can then be used to translate the retrieved Resource ID's to HSDA server pathnames since the combination of a HSDA Server name and a IECTC 57PhysicalView pathname provides a unique URI. Therefore, the Extended Resource Identifiers Service supplies required functionality to eliminate the subscription configuration bottleneck by allowing a client to pass in a view name to the Resource Identification Service provider when querying for HSDA pathnames.



IEC 873/08

Figure 2 – GDA extended resource identifiers model

Table 2 – GDA extended resource identifiers operations

| Operation           | Example signature                                                              | Throws          |
|---------------------|--------------------------------------------------------------------------------|-----------------|
| get_uris            | URISequence get_uris<br>(char view_name, ResourceIDSequence ids)               | LookupError     |
| set_uris            | void set_uris<br>(char view_name, ResourceIDSequence ids,<br>URISequence uris) | UpdateError     |
| create_resource_ids | ResourceIDSequence create_resource_ids<br>(ResourceID prototype, int how_many) | UnknownResource |

### 5.2.2 get\_uris()

This operation accepts a sequence of resource identifiers as well as a view name and returns the corresponding URI-references. The returned sequence is the same length as the input sequence and in the same order. If the server does not recognize a particular resource identifier or is not responsible for its translation, the operation will raise a LookupError exception.

### 5.2.3 set\_uris()

This operation accepts a sequence of resourceID's and URI's as well as a view name<sup>5)</sup>. Each URI is associated with each ResourceID within the scope of the view name. The ResourceID and URI sequences must be the same length. If the server does not recognize a particular resource identifier or is not responsible for its translation, an UpdateError is thrown.

5) It is recommended but not mandatory that ExtendedResourceID clients that also act as IEC 61970-404:High Speed Data Access (HSDA), IEC 61970-407:Time Series Data Access (TSDA), or IEC 61970-505:Generic Eventing and Subscription (GES) servers use IECTC 57View derived pathnames as URI's and that these pathnames are derived from the one of the standard views such as IECTC 57PhysicalView. When the IECTC 57PhysicalView is used to create the pathname, the URI's used shall correspond to the IECTC 57PhysicalView pathname preceded by the name of the server. For more information on the format of path names, see IEC 61970-404: High Speed Data Access.