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Aplikacijski programski vmesnik za sistem upravljanja z energijo (EMS-API) - 456. del: Profili stanja sproščenega elektroenergetskega sistema

Energy management system application program interface (EMS-API) - Part 456: Solved power system state profiles

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Interface de programmation d'application pour système de gestion d'énergie (EMS-API) - Partie 456: Profils d'état de réseaux électriques résolus

Ta slovenski standard je istoveten z: **EN IEC 61970-456:2018**

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Energy management system application program interface (EMS-API) - Part 456: Solved power system state profiles (IEC 61970-456:2018)

Interface de programmation d'application pour système de gestion d'énergie (EMS-API) - Partie 456: Profils d'état de réseaux électriques résolus
(IEC 61970-456:2018)

Schnittstelle für Anwendungsprogramme für Netzführungssysteme (EMS-API) - Teil 456: Globale Stabilitätsbeurteilung
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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 57/1951/FDIS, future edition 2 of IEC 61970-456, prepared by IEC/TC 57 "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61970-456:2018.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2019-01-23
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-04-23

This document supersedes EN 61970-456:2013.

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

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The text of the International Standard IEC 61970-456:2018 was approved by CENELEC as a European Standard without any modification.

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

IEC 61970-1	NOTE	Harmonized as EN 61970-1.
IEC/TS 61790-2	NOTE	Harmonized as CLC/TS 61790-2.
IEC 61790-301	NOTE	Harmonized as EN 61790-301.
IEC 61790-501	NOTE	Harmonized as EN 61790-501.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61970-452	2017	Energy management system application program interface (EMS-API) - Part 452: CIM static transmission network model profiles	EN 61970-452	2017
IEC 61970-453	2014	Energy Management System Application Program Interface (EMS-API) -- Part 453: Diagram Layout Profile	EN 61970-453	2014
IEC 61970-552	2016	Energy management system application program interface (EMS-API) - Part 552: CIMXML Model exchange format	EN 61970-552	2016

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

Part 456: Solved power system state profiles

FOREWORD

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International Standard IEC 61970-456 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 2013 and Amendment 1:2015. This edition constitutes a technical revision. It is based on the IEC 61970 UML CIM16 version 33.

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

a) The Steady State Hypothesis (SSH) profile has been added in new Subclause 8.2.
b) Clause 5 "Overview" has been extended to better describe the relation between different profiles and aligned with the current nomenclature used with profiles, e.g. "data set" and "network part".

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c) The former Clause 6 "Architecture" has been shrunk and merged with Clause 6 "Use cases".

d) The former Clause 7 "Applying the standard to business problems" has been split and merged with Clause 6 "Use cases" and Clause 7 "Data model with CIMXML examples".

e) Clause 6 "Use cases" description of the use cases has been extended.

f) The former Clause 8 "Data model with CIMXML examples" has become section 7 "Data model with CIMXML examples".

g) The CIMXML document examples in Clause 7 "Data model with CIMXML examples" has been updated to match with IEC 61970-552:2016.

h) Clause 8 "Profiles" describe the actual profile data.

i) Subclause 8.1 "Comments and notes" gives additional information on the use some profile data.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
57/1951/FDIS	57/1963/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

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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.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document 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.

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INTRODUCTION

This document is one of several parts of the IEC 61970 series that defines common information model (CIM) datasets exchanged between application programs in energy management systems (EMS).

The IEC 61970-300 series specifies the common information model (CIM). The CIM is an abstract model that represents the objects in an electric utility enterprise typically needed to model the operational aspects of a utility.

This document is one of the IEC 61970-400 series of component interface standards that specify the semantic structure of data exchanged between components (or applications) and/or made publicly available data by a component. This document describes the payload that would be carried if applications are communicating via a messaging system, but the standard does not include the method of exchange, and therefore is applicable to a variety of exchange implementations. This document assumes and recommends that the exchanged data is formatted in XML based on the resource description framework (RDF) schema as specified in IEC 61970-552 CIM XML model exchange standard.

IEC 61970-456 specifies three profiles:

- The Steady State Hypothesis (SSH) profile that describe power flow application input variables such as voltage set points, switch statuses etc..
- The topology profile that describe a bus-branch model. A topology model may be created by a network model builder from a node-breaker model and SSH inputs or by a tool where a user interactively builds a topology model. A topology model is input to power flow applications.
- State variables solution from a power system case such as is produced by power flow or state estimation applications.

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IEC 61970-456 describes the dynamic value inputs and solutions with reference to a power system model that conforms to IEC 61970-452 in this series of related standards. The separation of information into profiles also enables separation of data into documents corresponding to the profiles. In this way the profiles defined in this document generate small data documents compared with traditional bus-branch or node-breaker formats that include the network, the initial conditions and the result.

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

Part 456: Solved power system state profiles

1 Scope

This part of IEC 61970 belongs to the IEC 61970-450 to IEC 61970-499 series that, taken as a whole, define at an abstract level the content and exchange mechanisms used for data transmitted between power system analyses applications, control centers and/or control center components.

The purpose of this document is to rigorously define the subset of classes, class attributes, and roles from the CIM necessary to describe the result of state estimation, power flow and other similar applications that produce a steady-state solution of a power network, under a set of use cases which are included informatively in this standard.

This document is intended for two distinct audiences, data producers and data recipients, and may be read from those two perspectives. From the standpoint of model export software used by a data producer, the document describes how a producer may describe an instance of a network case in order to make it available to some other program. From the standpoint of a consumer, the document describes what that importing software must be able to interpret in order to consume power flow cases.

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There are many different use cases for which use of this document is expected and they differ in the way that the document will be applied in each case. Implementers are expected to consider what use cases they wish to cover in order to know the extent of different options they must cover. As an example, this document will be used in some cases to exchange starting conditions rather than solved conditions, so if this is an important use case, it means that a consumer application needs to be able to handle an unsolved state as well as one which has met some solution criteria.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61970-452:2017, *Energy management system application program interface (EMS-API) – Part 452: CIM static transmission network model profiles*

IEC 61970-453:2014, *Energy management system application program interface (EMS-API) – Part 453: Diagram layout profile*

IEC 61970-552:2016, *Energy management system application program interface (EMS-API) – Part 552: CIMXML Model exchange format*

3 Terms and definitions

No terms and definitions are listed in this document.

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Profile information

The profiles defined in this document are based on the UML version CIM16v33.

The profiles are listed in Table 1.

Table 1 – Profiles defined in this document

Name	Version	URI
SteadyStateHypothesis (SSH)	1	http://iec.ch/TC57/2013/61970-456/SteadyStateHypothesis/1
Topology (TP)	4	http://iec.ch/TC57/2013/61970-456/Topology/4
StateVariables (SV)	4	http://iec.ch/TC57/2013/61970-456/StateVariables/4

5 Overview

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This document describes an interface standard in which XML payloads are used to transfer initial conditions and results created during typical steady-state network analysis processes (e.g. state estimation or power flow solutions). Major requirements/objectives driving the design of this document include:

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- Power flow solution algorithms and outputs are virtually the same whether run in operations or planning contexts. State estimator output shares a common core with power flow. A single standard is desired so as to minimize software development and enable use cases that cross between environments.
- While some users of this standard might only be interested in the output state, the more general situation is that users continue to perform follow-on analyses (e.g. security analysis, voltage stability) and require both the input on which the solution was based and the output result.
- Real life analytical processes often involve a series of solutions in which most of the input data remains the same from one solution to the next, and the standard must support these processes in a way that does not repeat data unnecessarily.
- Power flow solutions tend to drift if the result from a power flow run is used as input to a subsequent power flow run. By preserving the initial conditions between power flow runs the solutions do not drift.

In order to meet these requirements, this document depends on modularizing the potentially voluminous overall input and output data into subsets that would each be realized as smaller, XML payloads. An instance of one of these subsets is referred to herein as a ‘dataset’. Data set payloads are typically compressed to a zip archive.

Two types of partitioning into datasets are utilized. In the first, the data is modularized according to what kind of data is produced (which generally corresponds with what kind of application produces the data). CIM ‘profiles’ (subsets of the complete CIM) define the classes and attributes that make up of each kind of modularization. The second type of partitioning is by network parts, which divides data into sets of instances according to which utility or entity in an interconnection is responsible for the data. The party responsible for data is called the Model Authority of the data and the network parts are defined by Model Authority Sets (MAS). This partitioning occurs at the instance level and produces multiple datasets

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governed by a profile and network part. Datasets from different MAS combine to form the complete set of data for that profile, Figure 1 illustrates this.

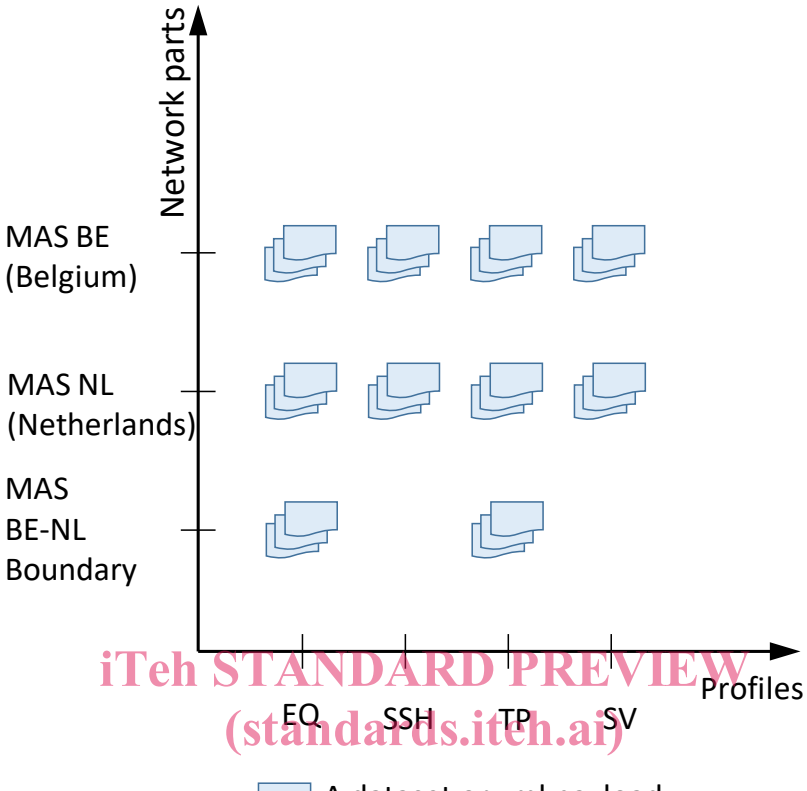

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Figure 1 – Relations between MAS, profile and dataset

Different IEC 61970 profiles are listed along the horizontal axis:

- EQ for equipment as described in IEC 61970-452.
- SSH for power flow initial data as described in this document.
- TP for topology data as described in this document.
- SV for state variables data as described in this document.

A few example Model Authority Sets are listed along the vertical axis:

- MAS BE represent a regional Model Authority Set for Belgium that is a network part defined by a Model Authority BE, e.g. the Belgian TSO.
- MAS NL represent a regional Model Authority Set for Netherlands that is a network part defined by another Model Authority NL, e.g. the Netherlands TSO.
- MAS BE-NL Boundary represent a Model Authority Set that is a network part for the boundary between MAS BE and MAS NL. The boundary network part is typically agreed mutually between Model Authority BE and NL.

The document symbol in Figure 1 describe a dataset packaged as a payload, e.g. a CIMXML document as described in IEC 61970-552.

The Model Authority Sets along the vertical axis in Figure 1 define parts of a network. Datasets belong to a Model Authority Set and this is indicated in Figure 1 by the horizontally aligned datasets at each MAS.