TECHNICAL SPECIFICATION

ISO/TS 18876-1

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Industrial automation systems and integration — Integration of industrial data for exchange, access and sharing —

Part 1: Architecture overview and description

Systèmes d'automatisation industrielle et intégration — Intégration des données industrielles pour l'échange, l'accès et le partage —

Partie 1: Vue d'ensemble et description de l'architecture

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 18876-1 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This International Standard is organized as a series of parts, each published separately. The structure of this International Standard is described in this part of ISO 18876.

0 Introduction

0.1 Overview of ISO 18876

This International Standard establishes an architecture, a methodology, and other specifications for integrating industrial data for exchange, access, and sharing. It supports:

— data sharing and data integration;

— specification of mappings between models; and

— data transformation.

0.2 Organization of this part of ISO 18876

This part of ISO 18876 is organized as follows:

— Clause 1 specifies the scope and field of application of the International Standard and of this part of ISO 18876;

— Clause 2 identifies additional standards that, through references in this part of ISO 18876, constitute provisions of this part of ISO 18876;

— Clause 3 defines terms and abbreviations used in this part of ISO 18876;

— Clause 4 describes the organization of this International Standard;

— Clause 5 describes the fundamental concepts and assumptions on which this International Standard is based;

— Clause 6 provides an overview of the model integration process;

— Clause 7 identifies some components of the integration architecture;

— Clause 8 provides an overview of the processes of data mapping and consolidation;

— Clause 9 summarizes the relationships with other standards.

0.3 Target audiences

The target audiences for this part of ISO 18876 are as follows:

— technical managers wishing to determine whether ISO 18876 is appropriate for their business needs;

— implementers wishing to obtain an overview of its contents.

Industrial automation systems and integration — Integration of industrial data for exchange, access and sharing — Part 1: Architecture overview and description

1 Scope

This Technical Specification establishes an architecture, a methodology, and other specifications for integrating industrial data for exchange, access, and sharing. The following activities are supported:

— integrating data which may be:

  — from different sources or different contexts,

  — described by different models, or

  — defined in different modelling languages;

— sharing data among applications through systems integration architectures;

— resolving conflict between models developed with different objectives;

— translating data between different encodings;

— translating models between different modelling languages.

The following are within the scope of ISO 18876:

— integration models;

— methods for creating, extending, and updating integration models;

— methods for creating a mapping specification to map data instances between an integration model and an application model that falls within its scope;

— encoding and decoding of data and models with different formats, such as SGML [1], XML [7], EXPRESS [3], UML [6] and ISO 10303-21 [4];

— methods for consolidating data sets from different sources and different models;

— modelling and mapping specification languages.

The following is within the scope of this part of ISO 18876:

— the architecture and an outline of the methodology.

The following are outside the scope of this part of ISO 18876:

— integration models;

— detailed specifications of the methodology;

NOTE Such specifications can be found in other parts of ISO 18876 or in other standards.

— translating data between different encodings;

— encoding and decoding of data and models with different formats;

— modelling and mapping specification languages.

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.

ISO/IEC 8824-1:—[1)], *Information technology — Abstract Syntax Notation One (ASN.1) — Part 1: Specification of basic notation*

ISO 10303-1:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*

3 Terms, definitions, and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms, definitions and abbreviations apply; those taken from ISO 10303-1 are repeated below for convenience.

NOTE 1 Definitions copied verbatim from other standards are followed by a reference to the standard in brackets, such as "[ISO 10303-1]". In these cases the definition in the referenced document is normative; its repetition here is informative and in the case of any discrepancy the definition in the referenced document has precedence. An explanatory note follows definitions that have been adapted from other standards. In these cases, the definition given here is normative for the purposes of this part of ISO 18876.

3.1.1
application model (AM)
model that represents information used for some particular purpose

NOTE Some application models are also integration models (see 3.1.12).

3.1.2
class
category or division of things

[1)] To be published. (Revision of ISO/IEC 8824-1:1998)

NOTE There are a number of ways that class can be defined. This definition is intended to be as broad as possible, and is broader than that used in ISO 15926-2.

EXAMPLE Pump, power station, engineer, and fictional space vehicle are examples of classes.

3.1.3
concept
general notion or idea of something

3.1.4
data
representation of information in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[ISO 10303-1]

3.1.5
data model
set of constructs that provides the definition, structure, and format of data, whether physical or abstract in the sense of being bound to some recording medium

3.1.6
derived concept
concept in an integration model that is wholly defined in terms of primitive concepts

3.1.7
encoding transformation
transformation of the way data elements are represented for computer processing

EXAMPLE Conversion of data governed by an EXPRESS schema from an ISO 10303-21 file to an XML document is an example of an encoding transformation.

3.1.8
foundation concept
primitive concept that determines the underlying world viewpoint of an integration model

NOTE There can be a number of integration models. Each will have its own modelling paradigm which is characterised by the foundation concepts that it contains.

EXAMPLE The concepts of class and individual are foundation concepts for a general integration model.

3.1.9
general concept
primitive concept that has very wide applicability, but is a specialization of some foundation concept

NOTE A concept may be considered to be a foundation concept by one community, while it is considered to be a general concept by another.

3.1.10
individual
thing that exists in space and time

NOTE This includes things that actually exist, or have existed, and things that possibly exist (past, present, and future) in space and time.

EXAMPLE The pump with serial number ABC123, Battersea Power Station, Sir Joseph Whitworth, and the Starship "Enterprise" are examples of individuals.

3.1.11
information
facts, concepts, or instructions

[ISO 10303-1]

3.1.12
integration
activity that creates, modifies, or extends an integration model

3.1.13
integration model (IM)
application model that can represent the information that is represented by two or more application models

NOTE Being an integration model is about the role one model plays with respect to one or more application models.

3.1.14
mapping
correspondence between instances of one model and instances of another model that represent the same meaning

NOTE A mapping can be uni-directional or bi-directional.

3.1.15 mapping specification
definition of the transformations necessary to take information according to one data model and represent the same information according to another data model

NOTE 1 A mapping specification can include data structure transformations, data value transformations, data encoding transformations, and terminology transformations.

NOTE 2 Mapping specifications can be procedural, or declarative, or a combination of these.

3.1.16
model
limited information representation of something suitable for some purpose

3.1.17
model context
sum of implicit concepts and constraints that limit the possible extension of a model without changing any existing declarations

NOTE 1 The model context is therefore the class of all possible extensions to a model.

NOTE 2 This term is more general than application context as defined in ISO 10303-1.

3.1.18
model scope
range of information that an application model can describe

3.1.19
primitive concept
concept in an integration model that is not wholly defined in terms of other concepts

3.1.20
specific concept
primitive concept that is a specialization of some general concept and has a limited range of applicability

EXAMPLE Car, process plant, quark, purchase order, and XML document are examples of specific concepts.

NOTE The boundary between a general concept and a specific concept may be arbitrary; some concepts may be thought of as both general concepts and specific concepts.

3.1.21
structural transformation
type of mapping specification that is a transformation to the structure of data

NOTE The change in structure could be due to the rearranging of attributes, the splitting of attributes across entity types, or the creation of new attributes.

3.1.22
terminology transformation
transformation of the term used to refer to a thing

NOTE This could be between synonyms in one language, or between different languages.

3.1.23
transformation
change of form

3.1.24
view
constrained representation of a data model

3.2 Abbreviations

For the purposes of this part of ISO 18876, the following abbreviations apply:

AM application model

NOTE In ISO 10303 the abbreviation AM is used for Application Module. An Application Module is not the same as an Application Model.

IM integration model

4 Organization of ISO 18876

ISO 18876 is divided into a number of parts.

ISO/TS 18876-1, this part, provides an overview and specifies an architecture for the integration of industrial data.

ISO/TS 18876-2 specifies methods for integrating application models and for developing and extending integration models.

NOTE Other specifications may be developed to extend the capability of ISO 18876, such as:

— models designed to integrate two or more other models;

— models designed to meet the needs of a particular application;

— mapping specifications designed to specify how a data population of one model may be migrated to another model;

— mapping specifications designed to specify how a model in one language may be migrated to another language;

— methods and languages to support the definition of models and mapping specificatios between different modelling languages;

— methods and specifications for the encoding of models and transformation between encodings;