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Information technology — Metamodel framework for interoperability (MFI) —

Part 1: Framework

Technologies de l'information — Cadre du métamodèle pour l'interopérabilité (MFI) —

Partie 1: Structure

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

This third edition cancels and replaces the second edition (ISO/IEC 19763-1:2015), which has been technically revised.

The main changes are as follows:

— The document has been revised to take account of the changes caused by the modularization and technical revision of ISO/IEC 11179-3. The fourth edition of ISO/IEC 11179-3, published in 2023, is now *Information technology — Metadata registries (MDR) — Part 3: Metamodel for registry common facilities*;

— Annex B has been removed.

A list of all parts in the ISO/IEC 19763 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Due to the proliferation of internet-enabled communication aided by mobile devices, social network systems and cloud computing, both the efficient and effective sharing of information and the handling of business transactions across countries and cultures has become easier.

In the private sector, the handling of these business transactions using Electronic Data Interchange (EDI) has been common for a long time. Companies hold large quantities of structured, semi-structured and unstructured data – the “Big Data” explosion. It is in their interest to make effective use of this data to extract business intelligence and knowledge.

In the public sector, governments in many countries and territories are working on the establishment of new schemes that enable interoperation and collaboration among different departments or agencies, materialising the semantic interoperability of data and surmounting border or language differences. At the same time, many governments and agencies are attempting to make their data available to their citizens over the internet, the “Open Data” initiatives. These “Open Data” initiatives can be the driver for similar innovations in the private sector. One of the issues for users is to access the various sets of open data easily and integrate them for analysis to create new value through added information or knowledge.

These trends have produced new needs for standards that enable effective information sharing in both private and public sectors.

One of the key enablers of this sharing of the information that is used by different communities through the interoperability of systems is a registry, or a network of inter-connected registries, that provides for the discovery and sharing of meta-information, such as metadata or models. The metamodel framework for interoperability (MFI) provides the specifications for such registries.

The metamodels specified in the ISO/IEC 19763 series each provides an extension for a metadata registry (MDR) as defined in the ISO/IEC 11179 series. ISO/IEC 11179-3[2] specifies the common facilities for a registry. These common facilities allow for items in the registry to be identified (assigned a unique identifier), designated (or named), defined and classified along with the recording of information about the provenance of the registered items. ISO/IEC 11179-6[3] specifies the registration procedures to be used with a registry.

This revised document provides a clear overview of the ISO/IEC 19763 series and illustrates the overall architecture of the metamodel framework for interoperability.

Each part of the ISO/IEC 19763 series is described in more detail in Annex A.

Information technology — Metamodel framework for interoperability (MFI) —

Part 1: Framework

1 Scope

This document provides an overview of the whole ISO/IEC 19763 series. This overview includes the purpose, the underlying concepts, the overall architecture and the requirements for the development of other standards within the 19763 series.

Collectively, the other parts of the ISO/IEC 19763 series provide a set of normative metamodels to enable the registration of many different types of model. Each of these metamodels is expressed both as a UML class diagram and, more formally, in text. The metamodels, along with the specification in ISO/IEC 11179-3, define the information about the models that is to be registered. The models themselves can be stored in a model repository or can just exist as paper documents.

The ISO/IEC 19763 series does not specify any physical structure of a registry where model information is to be recorded.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
model
representation of some aspect of a domain of interest using a normative *modelling language* (3.3) and *model constructs* (3.4)

Note 1 to entry: Models can be used to express a set of information requirements, processes, services, roles, goals or some other aspect of a domain of interest

3.2
model element
element or component in a *model* (3.1)

Note 1 to entry: Examples of model elements are a representation of an entity type in an *information model* (3.17), a representation of an event in a *process model* (3.21), a representation of a service operation in a *service model* (3.23), or a representation of an actor in a *role and goal model* (3.26).

3.3
modelling language
modelling facility
language or notation and associated rules that is used to model some aspect of a domain of interest

Note 1 to entry: UML is a typical example of a modelling language

3.4
model construct
unit of notation to represent a *model* (3.1)

Note 1 to entry: This is a more generic term for *model element* (3.2). Sometimes the term is used to include metadata, code and object patterns rather than the notations of a particular *modelling language* (3.3) such as UML.

3.5
metamodel
model (3.1) that explains a set of related models by defining the language for expressing such models

Note 1 to entry: In MFI, the metamodels are expressed using UML class diagrams and text.

3.6
metadata
data that defines and describes other data

[SOURCE: ISO/IEC 11179-1:2023, 3.2.30]

3.7
metadata item
instance of a *metadata object* (3.8) in a *metadata registry* (3.9)

[SOURCE: ISO/IEC 11179-3:2023, 3.2.58, modified — notes have been removed.]

3.8
metadata object
object type defined by a *metamodel* (3.5)

[SOURCE: ISO/IEC 11179-3:2023, 3.2.31, modified — notes have been removed.]

3.9
metadata registry
MDR
information system for registering *metadata* (3.6).

Note 1 to entry: The associated information store or database is known as a metadata register

[SOURCE: ISO/IEC 11179-3:2023, 3.2.55]

3.10
model registry
information system for registering *models* (3.1)

3.11
model repository
repository (3.13) where *models* (3.1) are stored

3.12
registry
information system for registration

Note 1 to entry: In ISO/IEC 19763, the registry is a model registry since the metadata items that are registered are models. This model registry uses facilities provided by a metadata registry as specified in ISO/IEC 11179-3.

[SOURCE: ISO/IEC 11179-1:2023, 3.2.34, modified — note to entry has been added.]

3.13
repository
place where, or receptacle in which, things are or can be stored

Note 1 to entry: In MFI, a repository is recognized as an information system that stores actual instances that conform to a particular metamodel or a particular set of metadata.

3.14
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[SOURCE: ISO/IEC 2382:2015, 2121317]

3.15
concept
unit of knowledge created by a unique combination of characteristics

Note 1 to entry: Concepts are not necessarily bound to particular natural languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.

Note 2 to entry: A concept is independent of its representation.

[SOURCE: ISO/IEC 11179-3:2023, 3.2.7]

3.16
ontology
specification of concrete or abstract things, and the relationships among them, in a prescribed domain of knowledge

Note 1 to entry: The specification should be computer processable.

[SOURCE: ISO/IEC 19763-3:2020, 3.1.1.1]

3.17
information model
graphical and textual representation of entities and the relationships between them

Note 1 to entry: Can also be known as a data model, a conceptual data model, a logical data model, an entity relationship model**,** an object class diagram or a database definition.

[SOURCE: ISO/IEC 19763-12:2015, 4.2.24]

3.18
document
unit of data that is well-formed according to some agreed specification

Note 1 to entry: In the 19763 series, examples of a unit of data that is referred to as a document include, but are not restricted to, XML documents and JSON documents.

[SOURCE: ISO/IEC 19763-16:2021, 3.1.1, modified — Note 1 has been modified to make it relevant to this document.]

3.19
document model
document schema
formal specification of the structure of a *document* (3.18)

Note 1 to entry: The same model can be used for multiple documents

[SOURCE: ISO/IEC 19763-16:2021, 3.1.2, modified — ‘schema’ replaced by ‘model’.]

3.20
process
collection of related, structured activities or tasks that achieve a particular goal

[SOURCE: ISO/IEC 19763-5:2015, 3.1.12, modified — note has been deleted]

3.21
process model
representation of a *process* (3.20) using a specific *modelling language* (3.3) that represents *processes*

[SOURCE: ISO/IEC 19763-5:2015, 3.1.13, modified – "process modelling language" amended to read "modelling language that represents processes"]

3.22
service
application which encapsulates one or more computing modules and can be accessed through a specified interface

[SOURCE: ISO/IEC 19763-7:2015, 3.1.17]

3.23
service model
representation of a *service* (3.22) using a specific *modelling language* (3.3) that represents services

3.24
role
named specific behaviour of an entity participating in a particular context

[SOURCE: ISO/IEC 19763-8:2015, 3.1.7]

3.25
goal
intended outcome of user interaction with a *process* (3.20) or *service* (3.22)

[SOURCE: ISO/IEC 19763-8:2015, 3.1.1]

3.26
role and goal model
representation of a set of *roles* (3.24) and *goals* (3.25) using a specific *modelling language* (3.3) that represents *roles* and *goals*, the interactions between them and their interactions with specified *processes* (3.20) or *services* (3.22)

4 Abbreviated terms

BPMN	Business Process Model and Notation
IDEF1X	Integration DEFinition for Information Modeling
LOD	Linked Open Data
MDR	Meta Data Registry
MFI	Metamodel framework for interoperability (this series of standards (ISO/IEC 19763))
OMG	Object Management Group
RGPS	Role, Goal, Process and Service
ROR	Registry of Registries
RS	Registry Summary
SDO	Standards Developing Organization
UML	Unified Modeling Language
W3C	World Wide Web Consortium

XML	eXtensible Markup Language

5 Conformance

This document specifies no conformance requirements. Other parts of the ISO/IEC 19763 series specify their own conformance requirements as appropriate.

6 Purpose and objectives of metamodel framework for interoperability (MFI)

6.1 Purpose of MFI

The MFI provides a set of specifications that allow the registration of models to facilitate interoperability among systems or persons. In this context interoperability is interpreted in its broadest sense: the capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units. The models that are registered can be ontologies, information models, document models (for example, XML schemas), form designs, process models, service models, models of roles and goals or any other type of model specified within the ISO/IEC 19763 series.

Models are used widely within the information technology community to represent system requirements and system specifications. These models can be expressed using a variety of notations or languages. An information model can be expressed in any one of a number of entity-relationship notations (from the simplicity of the original entity-relationship notation proposed by Dr Peter Chen[18] through to the complexity of Express-G[1]), as a UML[5][6] class diagram, or even as a set of SQL CREATE TABLE statements. Similarly, process models can be expressed as BPMN models or as UML activity diagrams.

The sharing of these models is essential if interoperability is to be achieved. If two systems are to exchange information then not only should the formats in which the information is represented as data in those systems be known but the semantics underpinning that data and the processes that the systems are designed to support should also be unambiguously understood. If services are to be shared between interoperating systems then the processes that these services execute, with their goals and the roles of the people or organisations associated with these processes and services, also should be unambiguously understood.

The underlying purpose of MFI is to allow the sharing of these models. Each of the main parts of the ISO/IEC 19763 series provides a specification, in the form of a metamodel, for a model registry where information about the models, and the things, processes, etc that they are describing, can be registered. Once models have been registered it is possible for the mappings between models, or parts of models, to also be registered. In addition, because models are registered in a registry they can be discovered.

A metamodel within the MFI is an information model that provides a conceptual view of the information that is to be recorded when a model is registered. Each of these metamodels is expressed both as a UML class diagram and, more formally, in text.

It is not sufficient to register a model in a registry. The registry should also be discoverable, and enabling this discoverability of registries is also an important element of the MFI.

6.2 Strengthening interoperability and integration capability

6.2.1 Overview

High-level information sharing is necessary to achieve the required integration of data or services. This relies upon the strengthening of the capabilities to discover models. This is underpinned by two types of interoperability, as follows:

— system interoperability (see 6.2.2);