
**Information technology — Metadata
Registries Interoperability and Bindings
(MDR-IB) —**

**Part 1:
Framework, common vocabulary, and
common provisions for conformance**

iTeh STANDARD PREVIEW

*Technologies de l'information — Interopérabilité et liaisons des registres
de métadonnées (MDR-IB) —*

*Partie 1: Cadre d'applications, vocabulaire commun et dispositions
communes de conformité*

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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

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

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

ISO/IEC 20944-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

ISO/IEC 20944 consists of the following parts, under the general title *Information technology — Metadata Registries Interoperability and Bindings (MDR-IB)*:

- *Part 1: Framework, common vocabulary, and common provisions for conformance*
- *Part 2: Coding bindings*
- *Part 3: API bindings*
- *Part 4: Protocol bindings*
- *Part 5: Profiles*

Introduction

ISO/IEC 20944 provides the bindings and their interoperability for metadata registries, such as those specified in ISO/IEC 11179.

This part of ISO/IEC 20944 contains an overview, framework, common vocabulary, and common provisions for conformance for ISO/IEC 20944. In the context of increasing metadata and data interoperability harmonization, four methodologies have been employed to simplify the tasks and to reduce risk.

The first methodology employed is the treating of data (and metadata) interoperability as a series of layered technical specifications (e.g., standards), from application-independent layers to application-specific layer(s).

The second methodology employed is the simplification of interoperability specializations, also known as bindings. Rather than independently developing each separate method of representation and access [codings, application programming interfaces (APIs), protocols], a common, harmonized approach is taken where each binding is derived in a consistent two-step process:

- Step #1 is choosing from the categories of coding, API, protocol (or combination), which themselves are derived from a common data model and navigation method.
- Step #2 is to derive the specific binding from its general binding, e.g., the XML coding binding (ISO/IEC 20944-2:2012, Clause 12) and other (specific) coding bindings are derived from the generic coding binding (ISO/IEC 20944-2:2012, Clauses 1-10); the C API binding (ISO/IEC 20944-3:2012, Clause 11), the Java API binding (ISO/IEC 20944-3:2012, Clause 12), and the other API bindings are derived from the generic API binding (ISO/IEC 20944-3:2012, Clauses 1-10). Because these bindings have a well-defined derivation, the bindings are harmonized, i.e., there is commonality in meaning and interpretation across the bindings. Thus, the complexity of adding and harmonizing a new (coding, API, protocol) binding is greatly simplified.

The third methodology employed is the use of rule-based bindings to simplify the normative wording of the standards. A rule-based binding is a binding that is specified by a general set of rules (in contrast to application-specific normative wording). For example, the XML coding binding is based upon a set of transformation rules (in contrast to specifying a specific DTD or XML schema).

The fourth methodology involves the harmonization of bindings within a category. For example, the XML coding binding is intended to be harmonized with the ASN.1 coding binding; the C API binding is intended to be harmonized with the Java API binding, etc.

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Information technology — Metadata Registries Interoperability and Bindings (MDR-IB) —

Part 1: Framework, common vocabulary, and common provisions for conformance

1 Scope

1.1 General

ISO/IEC 20944 is a series of International Standards that describe codings, APIs, and protocols for interacting with an ISO/IEC 11179 metadata registry (MDR).

This part of ISO/IEC 20944 provides the overview, framework, common vocabulary, and common provisions for conformance for ISO/IEC 20944. It addresses the following data interoperability features¹:

- a common framework for variety control: harmonized concepts for conforming implementations and strictly conforming implementations;
- harmonized provisions, such as mandatory requirements² and optional requirements³, and their consistent application across all bindings of ISO/IEC 20944;
- harmonized and consistent treatment of data elements with varying data obligation attributes (e.g., mandatory, conditional, optional, extended) and varying data longevity attributes (e.g., in-use, obsolete, reserved, etc.).

This part of ISO/IEC 20944 also includes a rationale that guided its development. The rationale also discusses the harmonized use of profiles (e.g., subsets, supersets, changes, etc.) of the data structure and data elements.

¹ The concept of data interoperability applies to metadata when metadata is treated as data, e.g., metadata item attributes (as specified by ISO/IEC 11179-3) that are transferred or exchanged. The concept of data interoperability is different from metadata interoperability (agreement upon the meaning of descriptive data), which is outside the scope of ISO/IEC 20944.

² In the context of this part of ISO/IEC 20944, the term mandatory requirement is defined as in ISO/IEC Guide 2:2004, subclause 7.5.1: *a requirement of a normative document that must necessarily be fulfilled in order to comply with that document*. There is no implication that the aforementioned requirement is compulsory by law or regulation. This kind of mandatory requirement is also known as an exclusive requirement.

³ ISO/IEC Guide 2:2004, subclause 7.5.2 defines the term optional requirement, which includes the following note: *An optional requirement may be either: a) one of two or more alternative requirements; or b) an additional requirement that must be fulfilled only if applicable and that may otherwise be disregarded.*

1.2 Overview of concepts

1.2.1 Metadata vs. data

Metadata is descriptive data about objects⁴. The *essential characteristics* of metadata include: it is *descriptive data*, and that it is *descriptive about something*. For example, if *P* is data and *P*→*Q* represents the descriptive relationship such that *P* describes *Q*, then *P* is metadata about *Q*. If there is no relationship from *P* to *Q*, then *P* is no longer metadata (i.e., *P* is merely data) because metadata is always relative to the object of description. Or stated differently, *P* only becomes metadata once its descriptive relationship to *Q* is established. Thus, it is *impossible to determine, independent of context and relationships*, that any piece of data is actually also metadata. The implications are: (1) because metadata is data, it can be exchanged like other data, but (2) to remain metadata, the exchange must include the associated context and relationships. ISO/IEC 20944 simply treats everything as data — whether it is *used as metadata* is outside the scope of ISO/IEC 20944. Although metadata is just data, ISO/IEC 20944 also provides reification⁵ and navigation of these contexts and relationships that are particular to metadata (and atypical for common data sets).

NOTE ISO/IEC 20944-5 provides a mapping and a profile such that ISO/IEC 20944 bindings may be used to interchange metadata contained in ISO/IEC 11179 metadata registries, e.g., an application may connect to, access, read, and use metadata from an ISO/IEC 11179 metadata registry.

1.2.2 Metadata and data interoperability

The successful interchange of data is dependent upon mutual agreement of interchange participants. Some key requirements for successful data interchange include (from lower implementation details to higher level abstractions):

- The *syntax* determines how data is coded (structured) and encoded (represented). Codings include specifications for organizing data structures (e.g., *How are records represented? Is tagging embedded or implied?*). Encodings include specifications for representation of datatypes (e.g., are numbers represented as a string of characters or a string of bits?). [ISO/IEC 20944-1:2013](https://standards.iteh.ai/catalog/standards/sist/43c6302-63ee-41a1-8344-312c5210150e/iso-20944-1-2013)

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EXAMPLE 1 In XML, "*the temperature is 17°*" might be *coded* as a tagged element "<temp>17</temp>" that is *encoded* as 15 UTF-8 characters, the encoding would be the ordering of the bits within the octet, e.g., little endian vs. big endian.

EXAMPLE 2 In the programming language C, "*the temperature is 17°*" might be *coded* as a single binary octet { uint8_t temp = 17; }, and *encoded* as a two's complement big-endian 16-bit integer.

- The *semantics* define the meaning of the data. Several kinds of descriptive techniques are possible, such as using ISO/IEC 11179-3 for describing data. Additional technical specifications, such as standards, may be used in conjunction with the ISO/IEC 11179-3 description of data.

EXAMPLE 3 The statement "*the temperature is 17°*" might not be descriptive enough because (1) it does not convey units of measure, e.g., Celsius or Fahrenheit; and (2) it does not convey what is being measured, e.g., temperature sensor #289. Both these features are part of the semantic description that comprises an ISO/IEC 11179-3 Data Element.

- Application-specific behavior is determined by the context of the data.

EXAMPLE 4 The statement "*temperature is 17°C at sensor #289*" may have different meanings depending upon the application. In a telemetry application, the statement "*temperature is 17°C at sensor #289*" might represent data to be recorded and analyzed, such as updating low, average, and high values in a set of time-series data. In contrast, in a heating, ventilation, and air conditioning (HVAC) application, the statement "*temperature is 17°C at sensor #289*" might represent a signal that causes heating units to turn on automatically.

⁴ For example, metadata may be descriptive data about other data.

⁵ Reification is to transform into data, e.g., a relationship between datums is transformed into data itself.

Of the three issues above, ISO/IEC 20944 concerns itself with the syntax, i.e., the bindings (codings, APIs, and protocols) for data interchange.

Regarding the semantics, the ISO/IEC 11179 series is a primary tool for specifying semantics, via descriptive data, for data interchange.⁶ This descriptive data is known as metadata. The descriptive data (metadata) may also be interchanged via the ISO/IEC 20944 series. However, in this case the ISO/IEC 20944 series is being used for a different purpose: descriptive data interchange (i.e., metadata interchange) rather than data interchange. It is possible to have separate data and metadata interchanges, and to use the ISO/IEC 20944 series independently for each interchange.

Neither ISO/IEC 20944 nor ISO/IEC 11179 specify application-specific requirements and functionality.

1.2.3 Achieving metadata and data interoperability and harmonization

Interoperability with a metadata registry can be achieved in various ways. ISO/IEC 20944 provides a framework within which several approaches can be standardized. All interoperability requires some kind of interface, and associated bindings, between two or more participating functional units. A binding provides a concrete mapping of a functional unit to an interface. Three categories of bindings are supported by ISO/IEC 20944:

- codings, which deal with the formalized representation of information;
- APIs, which specify a binding in programming terms;
- protocols, which specify formalized communications.

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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 Guide 2, *Standardization and related activities — General vocabulary*

ISO/IEC JTC1 Directives, 5th edition

ISO/IEC 704:2000, *Terminology work — Principles and methods*

ISO/IEC 1087-1:2000, *Terminology work — Vocabulary — Part 1: Theory and application*

ISO/IEC 2382 (all parts), *Information technology — Vocabulary*

ISO/IEC TR 10000-1, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework*

ISO/IEC 10241:1992, *International terminology standards — Preparation and layout*

ISO/IEC 11179 (all parts), *Information technology — Metadata registries (MDR)*

ISO/IEC 11404:2007, *Information technology — General-Purpose Datatypes (GPD)*

ISO/IEC 13886:1996, *Information technology — Language-Independent Procedure Calling (LIPC)*

ISO/IEC 14977:1996, *Information technology — Syntactic metalanguage — Extended BNF*

ISO/IEC 19501:2005, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

⁶ Additional semantics may be described by or supplanted with unstructured descriptive text and/or layering of additional standards and specifications.

3 Terms and definitions

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

3.1 Terms and definitions from ISO/IEC Guide 2

Definitions are taken verbatim from ISO/IEC Guide 2 unless otherwise stated in a following note.

3.1.1 Standardization

3.1.1.1

standardization

activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context

NOTE 1 In particular, the activity consists of the processes of formulating, issuing and implementing standards.

NOTE 2 Important benefits of standardization are improvement of the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation.

3.1.1.2

level of standardization

geographical, political or economic extent of involvement in standardization

3.1.1.3

consensus

general agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments

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3.1.2 Aims of standardization

3.1.2.1

fitness for purpose

ability of a product, process or service to serve a defined purpose under specific conditions

3.1.2.2

compatibility

suitability of products, processes or services for use together under specific conditions to fulfil relevant requirements without causing unacceptable interactions

3.1.2.3

interchangeability

ability of one product, process or service to be used in place of another to fulfil the same requirements

NOTE The functional aspect of interchangeability is called "functional interchangeability", and the dimensional aspect "dimensional interchangeability".

3.1.2.4

variety control

selection of the optimum number of sizes or types of products, processes or services to meet prevailing needs

NOTE Variety control is usually concerned with variety reduction.

3.1.3 Normative documents

3.1.3.1

normative document

document that provides rules, guidelines or characteristics for activities or their results

NOTE 1 The term "normative document" is a generic term that covers such documents as standards, technical specifications, codes of practice and regulations.

NOTE 2 A "document" is to be understood as any medium with information recorded on or in it.

NOTE 3 The terms for different kinds of normative documents are defined considering the document and its content as a single entity.

3.1.3.2

standard

document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context

NOTE Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits.

3.1.3.3

international standard

standard that is adopted by an international standardizing/standards organization and made available to the public

3.1.3.4

regional standard

standard that is adopted by a regional standardizing/standards organization and made available to the public

3.1.3.5

national standard

standard that is adopted by a national standards body and made available to the public

3.1.3.6

provincial standard

standard that is adopted at the level of a territorial division of a country and made available to the public

3.1.3.7

prestandard

document that is adopted provisionally by a standardizing body and made available to the public in order that the necessary experience may be gained from its application on which to base a standard

3.1.3.8

technical specification

document that prescribes technical requirements to be fulfilled by a product, process or service

NOTE 1 A technical specification should indicate, whenever appropriate, the procedure(s) by means of which it may be determined whether the requirements given are fulfilled.

NOTE 2 A technical specification may be a standard, a part of a standard or independent of a standard.

3.1.3.9

regulation

document providing binding legislative rules, that is adopted by an authority

3.1.3.10

technical regulation

regulation that provides technical requirements, either directly or by referring to or incorporating the content of a standard, technical specification or code of practice

NOTE A technical regulation may be supplemented by technical guidance that outlines some means of compliance with the requirements of the regulation, i.e. deemed-to-satisfy provision.

3.1.4 Harmonization of standards

3.1.4.1

harmonized standards

equivalent standards

standards on the same subject approved by different standardizing bodies, that establish interchangeability of products, processes and services, or mutual understanding of test results or information provided according to these standards

NOTE Within this definition, harmonized standards might have differences in presentation and even in substance, e.g. in explanatory notes, guidance on how to fulfil the requirements of the standard, preferences for alternatives and varieties.

3.1.4.2

unified standards

harmonized standards that are identical in substance but not in presentation

3.1.4.3

identical standards

harmonized standards that are identical in both substance and presentation

NOTE 1 Identification of the standards may be different.

NOTE 2 If in different languages, the standards are accurate translations.

3.1.4.4

comparable standards

standards on the same products, processes or services, approved by different standardizing bodies, in which different requirements are based on the same characteristics and assessed by the same methods, thus permitting unambiguous comparison of differences in the requirements

NOTE Comparable standards are not harmonized (or equivalent) standards.

3.1.5 Content of normative documents

3.1.5.1

provision

expression of normative wording that takes the form of a statement, an instruction, a recommendation or a requirement

NOTE These types of provision are distinguished by the form of wording they employ; e.g. instructions are expressed in the imperative mood, recommendations by the use of the auxiliary "should" and requirements by the use of the auxiliary "shall".

3.1.5.2

statement

provision that conveys information

3.1.5.3

instruction

provision that conveys an action to be performed

3.1.5.4

recommendation

provision that conveys advice or guidance

3.1.5.5**requirement**

provision that conveys criteria to be fulfilled

3.1.5.6**exclusive requirement**

mandatory requirement (deprecated)

requirement of a normative document that must necessarily be fulfilled in order to comply with that document

NOTE The term "mandatory requirement" should be used to mean only a requirement made compulsory by law or regulation.

3.1.5.7**optional requirement**

requirement of a normative document that must be fulfilled in order to comply with a particular option permitted by that document

NOTE An optional requirement may be either: (1) one of two or more alternative requirements; or (2) an additional requirement that must be fulfilled only if applicable and that may otherwise be disregarded.

3.1.5.8**deemed-to-satisfy provision**

provision that indicates one or more means of compliance with a requirement of a normative document

3.1.5.9**descriptive provision**

provision for fitness for purpose that concerns the characteristics of a product, process or service

NOTE A descriptive provision usually conveys design, constructional details, etc. with dimensions and material composition.

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3.1.5.10**performance provision**

provision for fitness for purpose that concerns the behavior of a product, process or service in or related to use

3.1.6 Implementation of normative documents**3.1.6.1****adoption of an international standard (in a national normative document)**

publication of a national normative document based on a relevant international standard, or endorsement of the international standard as having the same status as a national normative document, with any deviations from the international standard identified

NOTE ISO/IEC Guide 2 uses the term "taking over of an international standard (in a national normative document)". ISO/IEC Guide 2 explains that "taking over of ..." is equivalent to "adoption of ...".

3.1.6.2**application of a normative document**

use of a normative document in production, trade, etc.

3.1.6.3**direct application of a normative document**

application of an international standard irrespective of the taking over of that international standard in any other normative document

3.1.6.4**indirect application of a normative document**

application of an international standard through the medium of another normative document in which it has been taken over

3.1.7 References to standards

3.1.7.1

reference to standards (in regulations)

reference to one or more standards in place of detailed provisions within a regulation

NOTE 1 A reference to standards is either dated, undated or general, and at the same time either exclusive or indicative.

NOTE 2 A reference to standards may be linked to a more general legal provision referring to the state of the art or acknowledged rules of technology. Such a provision may also stand alone.

3.1.7.2

dated reference (to standards)

reference to standards that identifies one or more specific standards in such a way that later revisions of the standard or standards are not to be applied unless the reference is modified

NOTE The standard is usually identified by its number and either date or edition. The title may also be given.

3.1.7.3

undated reference (to standards)

reference to standards that identifies one or more specific standards in such a way that later revisions of the standard or standards are to be applied without the need to modify the reference

NOTE The standard is usually identified only by its number. The title may also be given.

3.1.7.4

general reference (to standards)

reference to standards that designates all standards of a specified body and/or in a particular field without identifying them individually

3.1.7.5

mandatory standard

standard the application of which is made compulsory by virtue of a general law or exclusive reference in a regulation

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3.1.8 Conformity in general

3.1.8.1

conformity

fulfillment by a product, process, or service of specified requirements

3.1.8.2

conformity assessment

any activity concerned with determining directly or indirectly that relevant requirements are fulfilled

NOTE Typical examples of conformity assessment activities are sampling, testing and inspection; evaluation, verification and assurance of conformity (supplier's declaration, certification); registration, accreditation and approval as well as their combinations.

3.2 Terms and definitions from ISO/IEC Directives, Part 2

Definitions are taken verbatim from ISO/IEC Directives, Part 2 unless otherwise stated in a following note.

3.2.1 Fundamental terms

3.2.1.1

International Standard

international standard where the international standards organization is ISO or IEC

3.3 Terms and definitions from ISO/IEC JTC 1 Directives

Definitions are taken verbatim from the ISO/IEC JTC 1 Directives unless otherwise stated in a following note.

3.3.1 Fundamental terms

3.3.1.1

API

application programming interface

boundary across which application software uses facilities of programming languages to invoke services

[JTC 1 Directives, 5th edition, Annex J; and ISO/IEC 13886]

3.4 Terms and definitions from ISO 704

Definitions are taken verbatim from ISO 704 unless otherwise stated in a following note.

3.4.1 Basic concepts

3.4.1.1

object

<terminology> anything that may be perceived or conceived

3.4.1.2

symbol

designation that is non-linguistic

[adapted⁷ from ISO 704]

3.4.1.3

sign

term, appellation, or symbol

[adapted⁸ from ISO 704 and ISO 1087-1]

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3.5 Terms and definitions from ISO 1087-1

Definitions are taken verbatim from ISO 1087-1 unless otherwise stated in a following note.

3.5.1 Basic concepts

3.5.1.1

definition

representation of a concept by a descriptive statement which serves to differentiate it from related concepts

3.5.1.2

designation

representation of a concept by a sign which denotes it

EXAMPLES Budget Amount (a term, according to ISO 704), New York City (an appellation, according to ISO 704), AHRS1 (a symbol, according to ISO 704).

NOTE A designation may be human readable (e.g., Budget Amount, grand_total) or not (e.g., AHRS1, 1.3.60.1234).

⁷ The definition is adapted from the text in ISO 704:2000, subclause 7.5.

⁸ The definition of *sign* is adapted from ISO 704:2000, subclause 7.5 on the definition of *symbol*, and from the definitions of *designation*, *term*, and *appellation* in ISO 1087-1.