

1  
2  
3  
4  
  
5  
  
6  
7  
  
8  
  
9  
10  
11  
12  
13  
14  
15  
16  
17

ISO/IEC FDIS 11179-34:~~20XX(E)~~

ISO/IEC/~~JTC 1/SC 32/~~AWG-2

Secretariat: ANSI

Date: 2024-~~01-15~~02-06

**Information technology — Metadata registries (MDR) —**

**Part 34:  
Metamodel for computable data registration**

iTeh Standards  
(<https://standards.itih.ai>)  
Document Preview

ISO/IEC FDIS 11179-34

<https://standards.itih.ai/catalog/standards/iso/d5bf4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34>

**FDIS stage**

**Warning for WDs and CDs**

~~This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.~~

~~Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.~~

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/IEC FDIS 11179-34](#)

<https://standards.iteh.ai/catalog/standards/iso/d5bf4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34>

**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/IEC FDIS 11179-34](https://standards.iteh.ai/catalog/standards/iso/d5bf4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34)

<https://standards.iteh.ai/catalog/standards/iso/d5bf4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34>

© ISO/IEC 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
~~Email~~E-mail: [copyright@iso.org](mailto:copyright@iso.org)  
Website: ~~www.iso.org~~[www.iso.org](http://www.iso.org)

Published in Switzerland

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

ISO/IEC FDIS 11179-34

<https://standards.iteh.ai/catalog/standards/iso/d5b4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34>

## Contents

<b>Foreword</b> .....	<b>viii</b>
<b>Introduction</b> .....	<b>ix</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Abbreviated terms</b> .....	<b>2</b>
<b>5 Conformance</b> .....	<b>2</b>
<b>5.1 Overview of conformance</b> .....	<b>2</b>
<b>5.2 Degree of conformance</b> .....	<b>2</b>
<b>5.2.1 General</b> .....	<b>2</b>
<b>5.2.2 Strictly conforming implementations</b> .....	<b>2</b>
<b>5.2.3 Conforming implementations</b> .....	<b>3</b>
<b>5.3 Conformance by feature</b> .....	<b>3</b>
<b>5.4 Registry conformance</b> .....	<b>3</b>
<b>5.4.1 Standard registry profiles</b> .....	<b>3</b>
<b>5.4.2 Conformance labels</b> .....	<b>3</b>
<b>5.5 Implementation conformance statement (ICS)</b> .....	<b>3</b>
<b>5.6 Obligation</b> .....	<b>4</b>
<b>6 Relationship to ISO/IEC 11179-3</b> .....	<b>4</b>
<b>6.1 Metamodel for a metadata registry</b> .....	<b>4</b>
<b>6.2 Specification of the metamodel</b> .....	<b>4</b>
<b>6.3 Use of UML class diagrams and textual description</b> .....	<b>4</b>
<b>6.4 Package dependencies</b> .....	<b>5</b>
<b>7 Computable Data package</b> .....	<b>6</b>
<b>7.1 Overview of the Computable Data package</b> .....	<b>6</b>
<b>7.2 Computable Data metamodel region</b> .....	<b>6</b>
<b>7.2.1 Overview of the Computable Data metamodel region</b> .....	<b>6</b>
<b>7.2.2 Classes in the Computable Data metamodel region</b> .....	<b>12</b>
<b>7.2.3 Associations in the Computable Data metamodel region</b> .....	<b>26</b>
<b>7.2.4 Datatypes in the Computable Data metamodel region</b> .....	<b>29</b>
<b>Annex A (informative) Mapping between IEEE 2791-2020 and this document</b> .....	<b>1</b>
<b>Annex B (normative) Consolidated Class Hierarchy</b> .....	<b>10</b>
<b>Annex C (informative) Examples of computable data registration</b> .....	<b>12</b>
<b>Bibliography</b> .....	<b>30</b>

Foreword — iv

Introduction — v

1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Abbreviated terms	2
5	Conformance	2
5.1	Overview of conformance	2
5.2	Degree of conformance	2
5.2.1	General	2
5.2.2	Strictly conforming implementations	2
5.2.3	Conforming implementations	2
5.3	Conformance by feature	3
5.4	Registry conformance	3
5.4.1	Standard registry profiles	3
5.4.2	Conformance labels	3
5.5	Implementation conformance statement (ICS)	3
5.6	Obligation	4
6	Relationship to ISO/IEC 11179-3	4
6.1	Metamodel for a metadata registry	4
6.2	Specification of the metamodel	4
6.3	Use of UML class diagrams and textual description	4
6.4	Package dependencies	5
7	Computable_Data package	5
7.1	Overview of the Computable_Data package	5
7.2	Computable_Data metamodel region	6
7.2.1	Overview of the Computable_Data metamodel region	6
7.2.2	Classes in the Computable_Data metamodel region	8
7.2.3	Associations in the Computable_Data metamodel region	22
7.2.4	Datatypes in the Computable_Data metamodel region	24
	Annex A (informative) Mapping between IEEE 2791-2020 and this document	26
	Annex B (normative) Consolidated Class Hierarchy	33
	Annex C (informative) Examples of computable data registration	34
C.1	Overview	34
C.2	The computable data example in bioinformatics	34
C.2.1	Overview of the example	34
C.2.2	Registration of the example computable data	38
C.3	The computable data example in earth science	40
C.3.1	Overview of the example	40
C.3.2	Registration of the example computable data	41
	Bibliography	43

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

ISO/IEC FDIS 11179-34

<https://standards.iteh.ai/catalog/standards/iso/d5bf4608-16c9-4f32-a89f-24775bb2649b/iso-iec-fdis-11179-34>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents) and <https://patents.iec.ch>. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

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

This document is part of the ~~4th Edition~~fourth modularization of ISO/IEC 11179. This document brings into ISO/IEC 11179 the ability to register information about computable data.

A list of all parts in the ISO/IEC 11179 series can be found on the ISO and IEC websites.

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](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).



## Introduction

Significant scientific discoveries are increasingly achieved through complex and distributed computations and data analyses. These computations and analyses always involve processing files through a series of steps and transformations, usually called a pipeline or a workflow.

Data pipelines typically use multiple pieces of software, each of which typically has multiple versions available, multiple input parameters, multiple outputs, and possibly platform-specific configurations. As with experimental parameters in a laboratory protocol, small changes in computational parameters can have a large impact on the scientific validity of the results.

To reproduce and verify scientific discoveries, details of pipelines need to be documented and shared, including the protocol, procedures, or metadata associated with them. The more analysis steps and the more complicated a pipeline, the greater the need for a standardized mechanism of communication. A detailed communication helps ensure responsibility, reproducibility, and the ability to verify protocol, track provenance information, and promote interoperability.

This document is inspired by the IEEE 2791-2020<sup>[4],[1]</sup>, which aims to improve communication of bioinformatics protocols and data to facilitate bioinformatics workflow related exchange and communication between regulatory agencies, pharmaceutical companies, bioinformatics platform providers and researchers. Although IEEE 2791-2020 has a bioinformatics background and application areas, the concepts and methods it expressed are applicable to a broader field of scientific research. A mapping table is included in [Annex A, Annex A](#), showing the relationship between domains and fields in IEEE 2791-2020 and classes and attributes in this document.

ISO/IEC 11179-3:2023 specifies the structure of a Metadata Registry (MDR) and provides a metamodel for registry common facilities. That metamodel is intended to be extended by other parts of ISO/IEC -11179 for specific purposes.

This document provides a specification of the extensions to the registry metamodel specified in ISO/IEC 11179-3:2023 to enable the registration of metadata about computable data. Registration of metadata about computable data are like a manifest describing all details related to input files, output files, and the pipeline used to process these files. The intent is to facilitate efficient communication and interoperability among different platforms, industries, scientists, and regulators and to improve reproducibility and replicability. 34

In Clauses 6 and 7, this document uses **bold** font to highlight terms which represent metadata objects specified by the metamodel.

EXAMPLE **Computable Data** (see 7.2.2.1) is a class each instance of which models computable data.



# 1 Information technology — Metadata registries (MDR) —

## 2 Part — 34: 3 Metamodel for computable data registration

### 4 1 Scope

5 This document provides a specification for an extension to a metadata registry (MDR), as specified in  
6 ISO/IEC 11179-3, in which metadata that describe computable data can be registered.

7 The specification in this document, together with the relevant clauses of the specification in ISO/IEC  
8 11179-3, provides the ability to record metadata about computable data.

### 9 2 Normative references

10 The following documents are referred to in the text in such a way that some or all of their content  
11 constitutes requirements of this document. For dated references, only the edition cited applies. For  
12 undated references, the latest edition of the referenced document (including any amendments) applies.

13 ISO/IEC 11179-3, *Information technology — Metadata registries (MDR) — Part 3: Metamodel for*  
14 *registry common facilities*

15 ~~ISO/IEC 11179-6, *Information technology — Metadata registries (MDR) — Part 6: Registration*~~

16 ~~ISO/IEC 11179-33, *Information technology — Metadata registries (MDR) — Part 33: Metamodel for data*~~  
17 ~~*set registration*~~

### 18 3 Terms and definitions

19 For the purposes of this document, the terms and definitions given in ISO/IEC 11179-3 and the following  
20 apply.

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

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

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

#### 24 3.1

#### 25 **computable data**

26 data that are computed for the purpose of making the data reproducible

#### 27 3.2

#### 28 **pipeline**

29 full set of logically connected steps needed to transform input data into a result, for which one or more  
30 outputs of one data transformation step can be the input of one or more subsequent steps

#### 31 3.3

#### 32 **computation step**

33 individual tool (or a well defined and reusable script) used in a *pipeline* (3.2)(3.2) that can be executed  
34 sequentially or in parallel with other computation steps

35 **3.4**  
 36 **computation execution environment**  
 37 information of the environment needed to execute a *computation step* ~~(3.3)~~(3.3) to the extent to which  
 38 consistent results are obtained when produced repeatedly, including platform, deployment, software  
 39 configuration and running applications, etc.

## 40 **4 Abbreviated terms**

<b>JSON</b>	JavaScript Object Notation
<b>ORCID</b>	Open Researcher and Contributor ID(see Reference <del>[2]</del> [2])
<b>PAV</b>	Provenance, Authoring and Versioning (see Reference <del>[3]</del> [3])
<b>UML</b>	Unified Modeling Language (see References <del>[4]</del> [4] and <del>[5]</del> [5])
<b>URI</b>	Uniform Resource Identifier
<b>URL</b>	Uniform Resource Locator
<b>URN</b>	Uniform Resource Name

## 41 **5 Conformance**

### 42 **5.1 Overview of conformance**

43 Conformance rules for a Metadata Registry are specified in ISO/IEC 11179-3:2023, Clause 4. The clause  
 44 “Degree of Conformance” is repeated here for convenience. The subsequent subclauses extend the rules  
 45 from ISO/IEC 11179-3:2023.

### 46 **5.2 Degree of conformance**

#### 47 **5.2.1 General**

48 The distinction between “strictly conforming” and “conforming” implementations is necessary to address  
 49 the simultaneous needs for interoperability and extensions. This document describes specifications that  
 50 promote interoperability. Extensions are motivated by needs of users, vendors, institutions, and  
 51 industries, and:

- 52 ~~a) a)~~ are not directly specified by this document;
- 53 ~~b) b)~~ are specified and agreed to outside this document;
- 54 ~~c) c)~~ may serve as trial usage for future editions of this document.

55 A strictly conforming implementation can be limited in usefulness but is maximally interoperable with  
 56 respect to this document. A conforming implementation can be more useful but can be less interoperable  
 57 with respect to this document.

#### 58 **5.2.2 Strictly conforming implementations**

59 A strictly conforming implementation:

- 60 ~~a) a)~~ shall support all mandatory, optional and conditional classes, attributes, datatypes and  
 61 associations;
- 62 ~~b) b)~~ shall not use, test, access or probe for any extension features nor extensions to classes, attributes,  
 63 datatypes, associations or any combination thereof;

64 ~~c) e)~~ shall not recognize, nor act on, nor allow the production of classes, attributes, datatypes,  
 65 associations or any combination thereof that are dependent on any unspecified, undefined or  
 66 implementation-defined behaviour.

67 NOTE— The use of extensions to the metamodel can cause undefined behaviour.

### 68 5.2.3 Conforming implementations

69 A conforming implementation:

70 ~~a) a)~~ shall support all mandatory, optional and conditional classes, attributes, datatypes and  
 71 associations;

72 ~~b) b)~~ as permitted by the implementation, may use, test, access or probe for extension features or  
 73 extensions to classes, attributes, datatypes, associations or any combination thereof;

74 ~~c) e)~~ may recognize, act on or allow the production of classes, attributes, datatypes, associations or any  
 75 combination thereof that are dependent on implementation-defined behaviour.

76 NOTE 1 All strictly conforming implementations are also conforming implementations.

77 NOTE 2 The use of extensions to the metamodel can cause undefined behaviour.

### 78 5.3 Conformance by feature

79 Conformance claims may be made to ~~Clause 7~~ Clause 7 of this document, or to specific features within that  
 80 clause. ~~Clause 7~~ Clause 7 is also dependent upon one or more clauses of ISO/IEC 11179-3, so conformance  
 81 to all or part of ~~Clause 7~~ Clause 7 shall be understood to imply conformance also to relevant provisions  
 82 specified in one or more of the clauses in ISO/IEC 11179-3.

83 A conformance statement shall specify exactly the features supported and not supported.

### 84 5.4 Registry conformance

#### 85 5.4.1 Standard registry profiles

86 This document specifies the following standard profiles in addition to those specified in ISO/IEC 11179-  
 87 3:2023, 4.4.2.

88 — **Computable data Registry:** Implements ~~clause 7~~ Clause 7 of this document, in addition to all  
 89 provisions of the Basic registry profile of ISO/IEC 11179-3:2023, 4.4.2;

90 — **Computable data Registry with mapping:** Implements ~~clause 7~~ clause 7 of this document, in  
 91 addition to all provisions of the Basic registry with mapping profile of ISO/IEC 11179-3:2023, 4.4.2.

#### 92 5.4.2 Conformance labels

93 Conformance to the profiles specified in ~~5.4.15.4.1~~ may be claimed using the following labels,  
 94 respectively:

95 — ISO/IEC 11179-34:2024 Computable data Registry;

96 — ISO/IEC 11179-34:2024 Computable data Registry with Mapping.

### 97 5.5 Implementation conformance statement (ICS)

98 An implementation claiming conformance to this document shall include an **Implementation**  
 99 ~~Conformance Statement~~ **implementation conformance statement** stating:

100 ~~a) a)~~ whether it conforms or strictly conforms;

101 ~~b) b)~~ which clauses are or are not supported;

102 ~~c) e)~~ what extensions, if any, are supported or used.

103 A standard profile may be referenced, if applicable.

104 EXAMPLE:- Product Z strictly conforms to ISO/IEC 11179-34:2024 Computable data Registry.

## 105 5.6 Obligation

106 Properties and relationships specified in this document are one of: Mandatory, Conditional or Optional.  
107 The obligation is not explicitly stated but is to be inferred from the multiplicity of the property or  
108 relationship, and the presence or absence of a condition.

109 For the purpose of conformance:

110 ~~a) a) Mandatory~~ mandatory properties and relationships shall exist and shall conform to the provisions  
111 of this document;

112 ~~b) b) Anything~~ anything specified as Conditional within this document shall be treated as Mandatory if  
113 the associated condition is satisfied and shall otherwise be not present;

114 ~~c) c) Optional~~ optional properties and relationships are not required to exist, but if they do exist, they  
115 shall conform to the provisions of this document.

116 Such obligation is enforced if and only if the Registration Status of the associated registry items is  
117 Recorded or higher (see ISO/IEC 11179-3:2023, 9.4.6.3 and ISO/IEC 11179-6:2023, 4.4).

## 118 6 Relationship to ISO/IEC 11179-3

### 119 6.1 Metamodel for a metadata registry

120 A metamodel is a model that describes other models. A metamodel provides a mechanism for  
121 understanding the precise structure and components of the specified models, which are needed for the  
122 successful sharing of the models by users, software facilities or both.

123 ISO/IEC 11179-3 uses a metamodel to describe the information model of a metadata registry. The  
124 registry in turn will be used to describe and model other data, for example about enterprise, public  
125 administration or business applications. The registry metamodel is specified as a conceptual data model,  
126 i.e. one that describes how relevant information is structured in the natural world. In other words, it is  
127 how the human mind is accustomed to thinking of the information.

### 128 6.2 Specification of the metamodel

129 The conventions used in specifying the metamodel are described in ISO/IEC 11179-3:2023, 5.3. Many of  
130 the classes specified in this document inherit from *Item*, which is specified in ISO/IEC 11179-3:2023,  
131 6.4.2.1. As *Items*, instances of these classes may be identified, registered, administered, named, defined  
132 and classified.

### 133 6.3 Use of UML class diagrams and textual description

134 This document uses both text and UML class diagrams to describe the metamodel. Both are normative  
135 and are intended to be complementary. However, if a conflict exists between what is specified in the UML  
136 class diagrams and what is specified in text, the text takes precedence until a correction is made to make  
137 them consistent. Further, if a conflict exists between a formal definition and other normative text, the  
138 formal definition takes precedence until a correction is made to make them consistent.

139 A consolidated UML class hierarchy is included as Annex B-Annex B.