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Information technology — CDIF semantic metamodel —

Part 1: **Foundation**

Technologies de l'information — Métamodèle sémantique CDIF —

Partie 1: Fondation

Reference number
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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 3.

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 part of ISO/IEC 15476 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 15476-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and system engineering*.

ISO/IEC 15476 consists of the following parts, under the general title *Information technology — CDIF semantic metamodel*:

— *Part 1: Foundation*

— *Part 2: Common*

— *Part 3: Data definition*

— *Part 4: Data models*

— *Part 5: Data flow models*

— *Part 6: State/event models*

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Introduction

This standard will assist the vendors and users of modelling tools and meta-data repositories in developing mechanisms for interchanging information. This standard specifies an element of a family of related standards. When used together, these standards specify a mechanism for transferring information between tools.

ISO/IEC 15474-1:2002, *Information technology — CDIF framework — Part 1: Overview*, and ISO/IEC 15474-2:2002, *Information technology — CDIF framework — Part 2: Modelling and extensibility*, should be read first when initially exploring CDIF. The first explains the overall CDIF architecture and how the family of standards fits together. The second explains the scope, and modelling approach in CDIF. The CDIF meta-metamodel and extensibility mechanism are also defined in that document.

This standard explains the Foundation subject area of the CDIF semantic metamodel, which is used to ensure that the information held by tools communicating using CDIF express the information they pass with an agreed meaning. This subject area contains the basic objects on which all others, including extensions, must be based.

This standard has been developed with the wide support and participation of vendors, users, academia and government involved in or familiar with the CASE industry, its products and the general requirements associated with interchanging information between these products.

This document is organized into the following Clauses:

— Clauses 1 to 5 are prescribed ISO/IEC Clauses

— Clause 6: Subject area overview

  This Clause gives an overview of the coverage of this subject area.

— Clause 7: Subject area summary

  This Clause gives an overview of the content of this subject area.

— Clause 8: Subject area definition

  This Clause gives the formal specification of all the objects defined in the subject area, and the formal reference to those used, but not defined in the subject area.

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Information technology — CDIF semantic metamodel —

Part 1: Foundation

1 Scope

The CDIF family of standards is primarily designed to be used as a description of a mechanism for transferring information between modelling tools. It facilitates a successful transfer when the authors of the importing and exporting tools have nothing in common except an agreement to conform to CDIF. The language that is defined for the transfer format also has applicability as a general language for import/export from repositories. The CDIF semantic metamodel defined for CASE also has applicability as the basis of standard definitions for use in repositories.

The standards which form the complete family of CDIF standards are documented in ISO/IEC 15474-1:2002, *Information technology — CDIF framework — Part 1: Overview.* These standards cover the overall framework, the transfer format and the CDIF semantic metamodel.

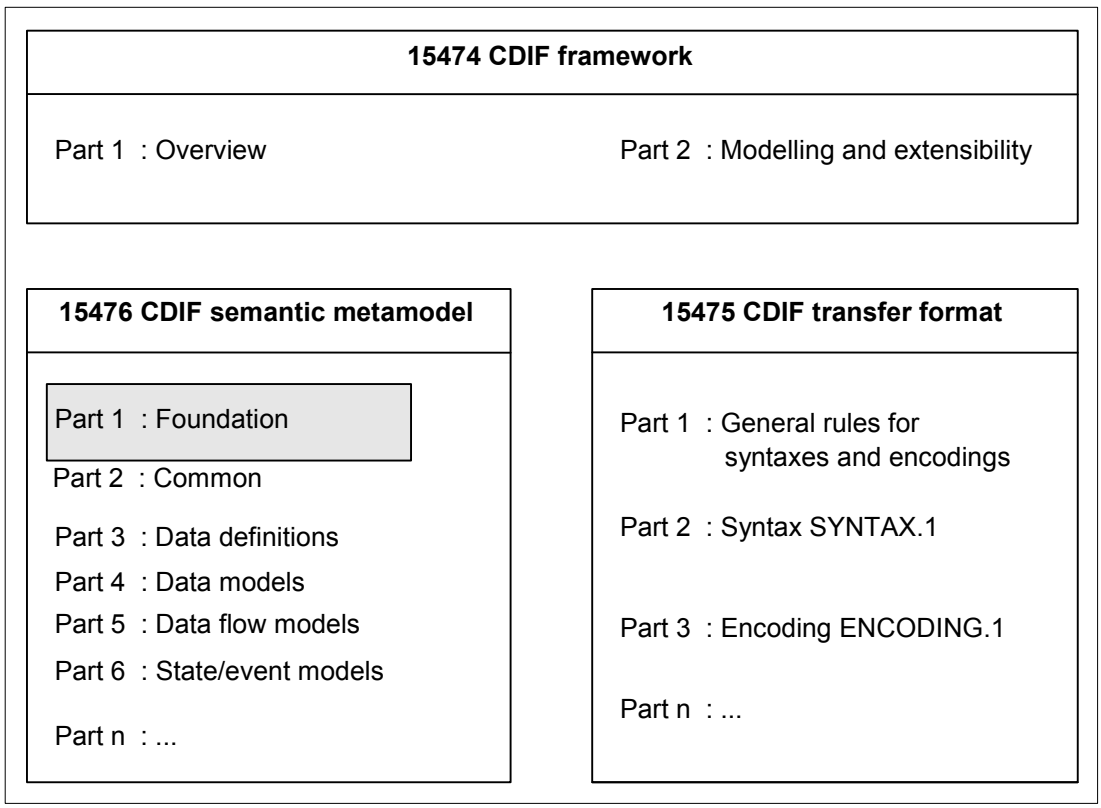


Figure 1 – CDIF family of standards

The diagram in Figure 1 depicts the various standards that comprise the CDIF family of standards. The shaded box depicts this Standard and its position in the CDIF family of standards.

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This standard defines the Foundation subject area of the CDIF semantic metamodel. This subject area contains the basic objects on which all other objects, including those defined using extensibility, must be based.

This document is intended to be used by anyone wishing to understand and/or use CDIF. This document provides a definition of a single subject area of the CDIF semantic metamodel. It is suitable for:

— Those evaluating CDIF,

— Those who wish to understand the principles and concepts of a CDIF transfer, and

— Those developing importers and exporters.

The document, ISO/IEC 15474-1:2002*, Information technology — CDIF framework — Part 1: Overview*, and the framework document ISO/IEC 15474-2:2002*, Information technology — CDIF framework — Part 2: Modelling and extensibility*, should be read first when initially exploring CDIF and before attempting to read other documents in the CDIF family of standards.

While there are no specific prerequisites for reading this document, it will be helpful for the reader to have familiarity with the following:

— Entity-Relationship-Attribute modelling;

— Modelling (CASE) tools;

— Information repositories;

— Data dictionaries;

— Multiple meta-layer modelling.

2 Conformance

A product is fully standards conformant to a CDIF subject area standard if and only if it is input-conformant, output-conformant and round-trip conformant to each and every *MetaEntity*, *MetaRelationship*, *MetaAttribute*, and *AttributableMetaObject* which is defined and/or used in that standard, and it is also CDIF architecture conformant. A product may be partially input-conformant, and/or partially output-conformant, and/or partially round-trip conformant to a CDIF subject area standard.

2.1 Input conformance

Input conformance for a specific *MetaEntity*, *MetaRelationship*, *MetaAttribute*, or *AttributableMetaObject* (short: *CollectableMetaObject*) is determined by applying the following test:

A set of meta-data containing all meanings and structures standardized by a CDIF subject area is imported by the product under test. Then the meta-data which has arrived in the product is examined. The following options exist for the relation between the input (CDIF) meta-data and the imported (product) meta-data:

For a specific *CollectableMetaObject*:

1 The product is input conformant if each instance of the specific *CollectableMetaObject* has arrived in the product without change of meaning or structure. If the *CollectableMetaObject* is a meta-entity or meta-relationship, its structural relationships to other *CollectableMetaObjects* have been preserved. If the *CollectableMetaObjec*t is a meta-attribute, the value of the meta-attribute has been preserved.

2 The product is input morphing conformant if each instance of the specific *CollectableMetaObject* has arrived in the product, but with some changes in meaning or structure. If the *CollectableMetaObject* is a meta-attribute, the value(s) for some instances of the meta-attribute have changed.

3 The product is not input conformant for that *CollectableMetaObject* if neither of the previous tests is satisfied.

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2.2 Output conformance

Output conformance for a specific *CollectableMetaObject* is determined by applying the following test:

For the product being tested, a set of meta-data that includes all possible meanings and structures representable in that product is exported. Then the meta-data that has been exported is examined. The following options exist for the relation between the product's meta-data and the exported (CDIF) meta-data:

For a specific *CollectableMetaObject*:

1 The product is output conformant if all of the meaning and structure for the specific *CollectableMetaObject* has been represented as meta-data in the product and has been exported as one or more instances of that *CollectableMetaObject*. If the *CollectableMetaObject* is a meta-attribute, the correct value of the meta-attribute has been exported.

2 The product is output morphing conformant if each instance of meta-data in the product that has the same meaning and structure as the *CollectableMetaObject* has been exported, but some instances have been exported as a different *CollectableMetaObject* or some of the meaning and structure has been changed.

3 If the product does not represent the meaning and structure associated with the *CollectableMetaObject*, output conformance for that *CollectableMetaObject* is not applicable to the product.

4 In all other cases, the product is not output conformant for that *CollectableMetaObject*.

2.3 Round-trip conformance

Round-trip conformance for a specific *CollectableMetaObject* is determined by applying the following test:

A set of meta-data containing all meanings and structures standardized by a CDIF subject area is imported by the product under test. Then the meta-data is exported again. The following options exist for the relation between the input meta-data and the output meta-data:

For a specific *CollectableMetaObject*:

1 The product is round-trip conformant if the meaning and structure of each instance of the *CollectableMetaObject* is preserved without changes during the round-trip. For a vendor to claim round-trip conformance, it is also necessary for the tool to be able to perform create, read, update, and delete operations on the imported (product) meta-data corresponding to the instances of the *CollectableMetaObject*.

2 The product is round-trip morphing conformant if each instance of the input *CollectableMetaObject* is preserved, but with some changes in meaning and/or structure. If the *CollectableMetaObject* is a meta-entity or meta-relationship, some of its instances' structural relationships to other *CollectableMetaObjects* have changed, or some instances have been transformed into other *CollectableMetaObjects*, or instances of other *CollectableMetaObjects* have been transformed into instances of the *CollectableMetaObject.* If the *CollectableMetaObject* is a meta-attribute, the values of some instances of the meta-attribute have changed or the domain of the meta-attribute has changed.

3 In all other cases, the product is not round-trip conformant for that CollectableMetaObject.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 15476. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 15476 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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ISO/IEC 13238-1:—[1)], *Information technology — Data management export/import — Part 1: Standardization framework*

ISO/IEC 15474-1:2002, *Information technology — CDIF framework — Part 1: Overview*

ISO/IEC 15474-2:2002, *Information technology — CDIF framework — Part 2: Modelling and extensibility*

4 Terms and definitions

For the purposes of this part of ISO/IEC 15476, the following definitions apply. Unless otherwise noted, the definitions are specific to this part of ISO/IEC 15476.

4.1 From other standards

4.1.1 ISO/IEC 15474-1

This part of ISO/IEC 15476 makes use of the following terms defined in ISO/IEC 15474-1:

CDIF
CDIF family of standards
CDIF semantic metamodel
CDIF meta-metamodel
CDIF transfer
Instance
Meta-attribute
Meta-entity
Metamodel
Meta-object
Meta-relationship
Model
Subject area
Transfer
Transfer format

4.1.2 ISO/IEC 13238-1

This part of ISO/IEC 15476 makes use of the following terms from ISO/IEC 13238-1:

Exporter
Importer

4.2 For this standard

For the purposes of this part of ISO/IEC 15475 new terms are defined when introduced. Double quotes are used to introduce new terms (e.g., “model layer”)

1) To be published.

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5 Symbols (and abbreviated terms)

5.1 Naming, diagramming and definition conventions

Conventions for naming, diagramming, describing and defining meta-objects can be found in Clause 7 of the framework document (ISO/IEC 15474-2:2002*, Information technology — CDIF framework — Part 2: Modelling and extensibility*).

5.2 Abbreviations

The following abbreviation is used in this part of ISO/IEC 15476:

CDIF CASE Data Interchange Format (originally)

6 Foundation subject area overview

The Foundation subject area, shown in Figure 2, provides the basic definitions which underpin the remainder of the CDIF semantic metamodel. It consists of an *AttributableMetaObject* called *RootObject*, which is purely abstract, and acts as the root of the *AttributableMetaObject* hierarchy. It has a mandatory meta-attribute called *CDIFIdentifier* that is used as the sole identifier of an object within the CDIF transfer.

It has two subtypes, a meta-entity called *RootEntity*, and a meta-relationship called *RootEntity.IsRelatedTo.RootEntity*. These act as the supertypes for all other meta-entities and meta-relationships.

The meta-entity *RootEntity* has no additional local meta-attributes.

Additional meta-attributes can be added to **every** meta-entity by extending the meta-attributes of *RootEntity*. Similarly, additional meta-relationships can be defined for **every** meta-entity by using *RootEntity* as either the Source or Destination of a new meta-relationship.

Additional meta-attributes can be added to **every** meta-relationship by extending the meta-attributes of *RootEntity.IsRelatedTo.RootEntity*.

Use of this subject area is required, even when none of the other subject areas of the CDIF semantic metamodel are being used, and all other objects are defined through the use of extensibility.

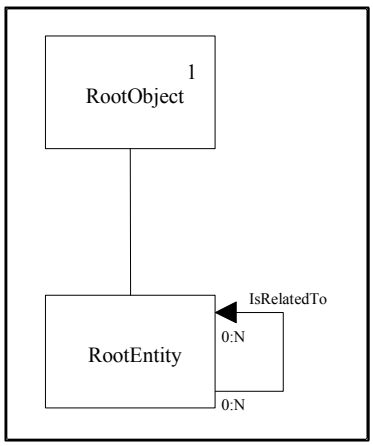


Figure 2 – Foundation subject area[2)]

2) *RootObject* is of *type AttributableMetaObject*.

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7 Foundation subject area summary

7.1 AttributableMetaObject classification hierarchy

MetaObject Name	SubjectArea Name
RootObject	Foundation
RootEntity	Foundation
RootEntity.IsRelatedTo.RootEntity	Foundation

7.2 MetaEntity summary

RootObject	
CDIFIdentifier	Mandatory
DateCreated	Optional
DateUpdated	Optional
TimeCreated	Optional
TimeUpdated	Optional

RootEntity	
CDIFIdentifier	*Mandatory*
DateCreated	*Optional*
DateUpdated	*Optional*
TimeCreated	*Optional*
TimeUpdated	*Optional*

7.3 MetaRelationship summary

RootEntity.IsRelatedTo.RootEntity	
CDIFIdentifier	*Mandatory*
DateCreated	*Optional*
DateUpdated	*Optional*
TimeCreated	*Optional*
TimeUpdated	*Optional*

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8 Foundation subject area specification

8.1 Introduction

This clause provides the full definition of each object used in the Foundation subject area of the CDIF semantic metamodel.

8.2 Subject area definition

SUBJECT AREA DEFINITION	
NAME	**Foundation**
VERSIONNUMBER	15476-1:2002
CDIFMETAIDENTIFIER	10
DESCRIPTION	This subject area forms the foundation of the CDIF semantic metamodel.
USAGE	The use of this subject area is required in all CDIF Transfers, even where no other standard subject area is being used. All meta-entities and meta-relationships must be subtypes of *RootObject* or *RootEntity.IsRelatedTo.RootEntity*, which are defined in this subject area.
ALIASES	
CONSTRAINTS	

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8.3 Meta-entity definitions

8.3.1 RootObject

META-ENTITY DEFINITION	
NAME	**RootObject**
CDIFMETAIDENTIFIER	1
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This object is the root object of the CDIF AttributableMetaObject hierarchy. It can be extended by the addition of new meta-attributes, which will have the effect of adding the new meta-attribute to every meta-entity and meta-relationship.
USAGE	
ALIASES	
CONSTRAINTS	No supertypes can be added to *RootObject* through extensibility.
TYPE	Kernel
ISABSTRACT	True
LOCAL SUBTYPES	RootEntity RootEntity.IsRelatedTo.RootEntity
LOCAL METARELATIONSHIPS	
LOCAL METAATTRIBUTES	CDIFIdentifier DateCreated DateUpdated TimeCreated TimeUpdated

META-ATTRIBUTE DEFINITION	META-ATTRIBUTE OF RootObject
NAME	**CDIFIdentifier**
CDIFMETAIDENTIFIER	5
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	*CDIFIdentifier* is a unique identifier. A unique value shall be provided for this meta-attribute for all instances of meta-entities and meta-relationships in a transfer. No semantic meaning is conveyed by the *CDIFIdentifier*. Uniqueness is within the scope of a single transfer.
USAGE	*CDIFIdentifier* is used to identify referenced instances in the Model Section of a transfer.
ALIASES	
CONSTRAINTS	
DATA TYPE	Identifier
DOMAIN	
LENGTH	
ISOPTIONAL	False

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META-ATTRIBUTE DEFINITION	**META-ATTRIBUTE OF** RootObject
NAME	**DateCreated**
CDIFMETAIDENTIFIER	6
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This contains the date of creation of the object.
USAGE	
ALIASES	
CONSTRAINTS	
DATA TYPE	Date
DOMAIN	Any valid date value
LENGTH	
ISOPTIONAL	True

META-ATTRIBUTE DEFINITION	**META-ATTRIBUTE OF** RootObject
NAME	**DateUpdated**
CDIFMETAIDENTIFIER	7
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This contains the date of most recent update of the object.
USAGE	
ALIASES	
CONSTRAINTS	The absolute timestamp indicated by this value together with the *TimeUpdated* should be later than that of *DateCreated* and *TimeCreated,* if this is supplied.
DATA TYPE	Date
DOMAIN	Any valid date value
LENGTH	
ISOPTIONAL	True

META-ATTRIBUTE DEFINITION	**META-ATTRIBUTE OF** RootObject
NAME	**TimeCreated**
CDIFMETAIDENTIFIER	8
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This contains the time of creation of the object, and shall be specified in UTC (Universal Co-ordinated Time)
USAGE	
ALIASES	
CONSTRAINTS	If a *TimeCreated* value is specified, there must be a value provided for *DateCreated*.
DATA TYPE	Date
DOMAIN	Any valid time value
LENGTH	
ISOPTIONAL	True

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META-ATTRIBUTE DEFINITION	**META-ATTRIBUTE OF** RootObject
NAME	**TimeUpdated**
CDIFMETAIDENTIFIER	9
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This contains the time of most recent update of the object, and shall be specified in UTC (Universal Co-ordinated Time).
USAGE	
ALIASES	
CONSTRAINTS	1 If a *TimeUpdated* value is specified, there must be a value provided for *DateUpdated*. 2 The absolute timestamp indicated by this value together with the *DateUpdated* should be later than that of *DateCreated* and *TimeCreated,* if this is supplied
DATA TYPE	Time
DOMAIN	Any valid time value
LENGTH	
ISOPTIONAL	True

8.3.2 RootEntity

META-ENTITY DEFINITION	
NAME	**RootEntity**
CDIFMETAIDENTIFIER	2
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This is the supertype of all meta-entities in the CDIF semantic metamodel and all extensions to it. This exists to define the meta-attributes and meta-relationships that can be given to any meta-entity instance in a CDIF transfer.
USAGE	
ALIASES	
CONSTRAINTS	1 *RootEntity* should not be used directly, since all instances should be more precisely classified. 2 The addition of new supertypes to *RootEntity* through extensibility is not permitted.
TYPE	Kernel
ISABSTRACT	True
LOCAL SUBTYPES	
LOCAL METARELATIONSHIPS	RootEntity.IsRelatedTo.RootEntity
LOCAL METAATTRIBUTES	

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8.4 Meta-relationship definitions

8.4.1 RootEntity.IsRelatedTo.RootEntity

META-RELATIONSHIP DEFINITION	
NAME	**RootEntity.IsRelatedTo.RootEntity**
CDIFMETAIDENTIFIER	3
SUBJECTAREANAME	Foundation
SUBJECTAREAVERSION	15476-1:2002
DESCRIPTION	This is the supertype of all meta-relationships in the CDIF semantic metamodel and all extensions to it. This exists to define the meta-attributes that can be given to any meta-relationship instance in a CDIF transfer.
USAGE	
ALIASES	
CONSTRAINTS	1 It should not be used directly, since all instances should be more precisely classified. 2 The addition of new supertypes to *RootEntity.IsRelatedTo.RootEntity* through extensibility is not permitted.
ISABSTRACT	True
MINSOURCECARD	0
MAXSOURCECARD	N
MINDESTCARD	0
MAXDESTCARD	N
LOCAL SUBTYPES	
LOCAL METAATTRIBUTES	

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