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Information technology — CDIF framework —

Part 1: **Overview**

Technologies de l'information — Cadre de référence CDIF —

Partie 1: Vue d'ensemble

Reference number
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Foreword

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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 15474 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 15474-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and system engineering*.

ISO/IEC 15474 consists of the following parts, under the general title *Information technology — CDIF framework*:

— *Part 1: Overview*

— *Part 2: Modelling and extensibility*

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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.

This document, ISO/IEC 15474-1:2002, *Information technology — CDIF framework — Part 1: Overview*, describes the architecture of the CDIF family of standards and provides an overview to all the current standards that form the CDIF family of standards.

The document ISO/IEC 15474-2:2002, *Information technology — CDIF framework — Part 2: Modelling and extensibility*, explains the scope, and modelling approach in CDIF. It also defines the CDIF meta-metamodel and extensibility mechanism of CDIF.

This document and the Framework for Modelling and Extensibility should be read first when initially exploring CDIF.

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:

— Clause 1 to 5 are prescribed ISO/IEC Clauses

— Clause 6: CDIF Overview and architecture

  This Clause describes the scope, purpose, architecture, and fundamental concepts of CDIF. This Clause also describes the major components of the CDIF architecture: the framework, the transfer format, and the semantic metamodel.

— Clause 7: CDIF Family of standards overview

  This Clause describes the components of the CDIF semantic metamodel. These components are presented as a series of subject areas that serve to address key areas of the System's Development Life Cycle.

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Information technology — CDIF framework —

Part 1: Overview

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 CDIF family of standards includes a semantic metamodel and a transfer format definition. It also includes the specification of a meta-metamodel and associated rules that define a framework for the semantic metamodel and the transfer format. The language that is defined for the transfer format also has applicability as a general language for Import/Export for repositories. The CDIF semantic metamodel also has applicability as the basis of standard definitions for use in repositories.

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.

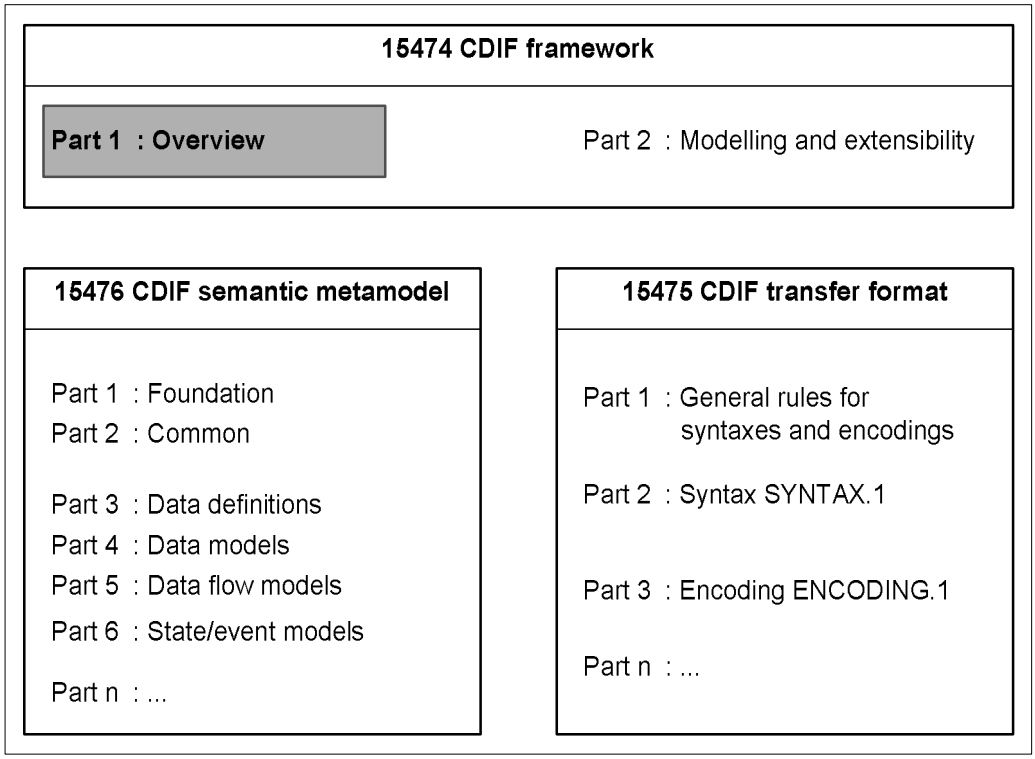


Figure 1 – CDIF family of standards

This document introduces the CDIF family of standards and defines the terms common to the CDIF family of standards.

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This document is intended to be used by anyone wishing to understand and/or use CDIF. This document provides an introduction to the entire CDIF family of standards. 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.

This 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 CDIF architecture conformant if and only if it can, as a property of that product, represent the product's metamodel instances, and/or the product's metamodel using the concepts defined in the ISO/IEC 15474-2:2002*, Information technology — CDIF framework — Part 2: Modelling and extensibility* ("Framework document"), and all the concepts defined in the standard ISO/IEC 15476-1:2002*, Information technology — CDIF semantic metamodel — Part 1: Foundation Subject Area* ("Foundation document"), and obeys all the constraints and rules for metamodels and meta-data defined in the Framework document, and obeys all the rules and constraints defined in the Foundation document. Conformance to the graphical notation as defined in the Framework document is not required.

3 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 15474. 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 15474 are encouraged to investigate the possibility of applying the most recent edition of the normative document 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.

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

4 Terms and definitions

For the purposes of this part of ISO/IEC 15474 and of all the standards in the CDIF family of standards (ISO/IEC 15474, 15475, 15476) the following definitions apply:

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4.1 From ISO/IEC 13238-1

This part of ISO/IEC 15474 and of all the standards in the CDIF family of standards (ISO/IEC 15474, 15475, 15476) make use of the following terms from ISO/IEC 13238-1 Data management Export/Import Standardization framework:

Transfer file
A file containing data to be interchanged. It is made up of a header, and a number of components. Components contain either data, or data definition data.

CDIF transfer file
A transfer file conforming to ISO/IEC 15475.

Export process
The process of generating a transfer file from a source environment.

Exporter
The agent of the export process.

Import process
The process of incorporating the content of a transfer file into a target environment.

Importer
The agent of the import process.

Clear text file encoding
A class of techniques for representing data based on first defining a human readable representation using some specific character repertoire and then defining an encoding for that repertoire.

4.2 For this standard

For the purpose of this part of ISO/IEC 15474 and of all the standards in the CDIF family of standards (ISO/IEC 15474, 15475, 15476) the following definitions apply:

Arity
The arity (of a relationship) is the number of roles that participate in a relationship. A binary relationship has an arity of two. An n-ary relationship has an arity of n. (n>2) sometimes known as the "degree" of a relationship.

Associative entity
An entity used to represent a relationship between other entities. An associative entity is used when a relationship does not otherwise provide sufficient mechanisms.

Attribute
A single-valued characteristic of an entity or relationship.

Attributed relationship
A relationship that has attributes.

Cardinality
Describes the constraint on the number of entity instances that are related to the subject entity through a relationship. Cardinality is represented for each entity participating in a relationship by indicating the minimum and maximum number of its instances that may be associated with one particular instance of the related entity.

CDIF
See *CDIF family of standards.*

CDIF clear text encoding
A clear text file encoding of a CDIF transfer file.

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CDIF exporter
A tool that creates a CDIF transfer file.

CDIF family of standards
The CDIF family of standards is composed of a set of standards that, when used together, provide a standard definition for the interchange of information between modelling tools.

CDIF graphical notation
The set of rules governing the representation of CDIF modelling concepts in diagrams.

CDIF identifier
An attribute that uniquely identifies an object in the model section of a transfer.

CDIF importer
A tool that reads a CDIF transfer file and uses it to create or modify a model.

CDIF semantic metamodel
The description of the set of concepts and notations used to define a model. The CDIF semantic metamodel defines an Entity-Relationship-Attribute model that is used to construct and define models used in systems development.

CDIF metaIdentifier
A meta-meta-attribute that uniquely identifies a meta-object in the metamodel section of a transfer.

CDIF meta-metamodel
The description of the set of concepts and notations used to define a metamodel. Specifically, the CDIF meta-metamodel defines an Entity-Relationship-Attribute model that is used to construct and define both metamodels and the CDIF meta-metamodel itself.

CDIF transfer
A combination of a particular syntax, a particular encoding of that syntax, and a metamodel. In other words, a complete definition of the format and contents of a transfer.

CDIF transfer format
A combination of a particular syntax and a particular encoding of that syntax which together provides a complete definition of the transfer format.

CDIF transfer syntax and encoding
A standard vehicle format supported by CDIF. The combination of SYNTAX.1 and ENCODING.1 forms the initial CDIF transfer syntax and encoding.

Characteristic entity
A meta-entity that provides additional attribution for another meta-object. Other common names for characteristic entity are: attributive entity and dependent entity. Each instance of a characteristic meta-entity is logically only related to one instance of one other meta-object, therefore an importer could incorporate the meta-attributes of a characteristic meta-entity with those of the 'owning' meta-object, where the owning meta-object is the one to which the characteristic meta-entity is related with a cardinality of 1:1.

Character set
A character set is a collection of characters used in an encoding to represent terminal symbols. The character set used is significant in the encoding of text and string meta-attributes for a CDIF transfer.

Constraint
A constraint is generally a restriction on the value of an attribute or the existence of any object based on the value or existence of one or more others. In CDIF a constraint may be classed as computable (i.e., code may be built to implement the constraint) or non-computable (e.g., a constraint expressed in natural language). An example of a non-computable constraint -- "No two instances of *DFMProcess* may have the same value for the meta-attribute *Name*." An example of a computable *textual constraint "ForAny (DFMProcess,c) Unique (c.Name)."*

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Data model
A model about data by which an interpretation of the data can be obtained. In the modelling tool industry a data model is one that may be encoded and manipulated by a computer.

Encoding
An encoding defines how the elements of a syntax are represented using an identified character set. Details of representation of the various terminal symbols and data types in the syntax's grammar are provided.

ENCODING.1
The CDIF family of standards supports multiple transfer formats, each composed of a syntax and an encoding. ENCODING.1 is the primary encoding defined within the CDIF family of standards.

Entity
An object (i.e., thing, event or concept) that occurs in a model (i.e., transfer).

Information content
The Information Content is the set of metamodel and model instances found in a CDIF transfer.

Instance
An individual occurrence of a type (e.g., the diagram *MyDiagram* is an instance of the *Diagram* type).

Semantic metamodel
See *CDIF semantic metamodel.*

Kernel entity
This classification is used for a meta-entity whose instances can exist without the occurrences of other meta-entities. For example, an instance of the meta-entity called *Attribute*, having a name, full description and brief description, is significant without the knowledge of the *DataObject* it describes.

Meta-
Meta- is used in CDIF generally as a prefix to a concept to imply definition information about the concept. Specifically, used to designate the location of an object in the three model layers.

Meta-attribute
A definition of a characteristic of a meta-entity or meta-relationship. Instances of a meta-attribute occur in a model as data values.

Meta-entity
A definition of a type of data object that occurs in CDIF models. Specifically, a meta-entity represents a set of zero or more meta-attributes, stored together to represent a thing, event or concept that has instances in a model.

Meta-layers
See *Model Layers*.

Meta-meta-attribute
A definition of a characteristic of a meta-meta-entity or meta-meta-relationship. Instances of a meta-meta-attribute occur in a metamodel as meta-data values.

Meta-meta-entity
A definition of the behaviour and structure of meta-entities, meta-relationships, meta-attributes, or subject areas (i.e., a definition of the meta-object definitions used to describe information in models).

Meta-metamodel
See *CDIF meta-metamodel.*

Meta-meta-relationship
A definition of a type of data object that occurs in CDIF metamodels. Specifically, a meta-meta-relationship represents the definition of a relationship between instances of meta-meta-entities.

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Metamodel
A metamodel contains detailed definitions of the meta-entities, meta-relationships and meta-attributes whose instances appear in the model section of a CDIF transfer.

The CDIF semantic metamodel (as defined in the set of standards that comprise the CDIF family of standards) is a definition of all of the types of information that can be transferred in a CDIF transfer without using the CDIF extensibility mechanism.

Meta-object
A meta-object is a generic term for meta-entities, meta-relationships and meta-attributes.

Meta-relationship
A definition of a type of data object that occurs in CDIF models. Specifically, a meta-relationship represents the definition of a relationship between meta-entities that has instances in a model. A meta-relationship may also define a set of zero or more meta-attributes, stored together to represent characteristics of a relationship between meta-entities.

Model
A related collection of instances of meta-objects, representing (describing or prescribing) an information system, or parts thereof, such as a software product.

Model layers
The different layers of definition (or abstraction) used in defining the CDIF family of standards. The four model layers in CDIF are: user data, model, metamodel, meta-metamodel.

Any given model layer provides an accurate and complete definition of all the instances that may occur one layer below the given layer. For example, the meta-metamodel provides a set of definitions that are used to construct and understand the metamodel; the metamodel provides a set of definitions that are used to construct and understand a model.

Modelling tool
A tool that provides support for modelling, i.e. representing, a software product or an information system.

N-ary relationship
A relationship with arity (degree) n > 2. A relationship that has more than two participating entities. (Note that a single entity may participate several times in a single relationship.)

Non-terminal symbol
A part of the hierarchical definition of a syntax that is further decomposed in the hierarchy.

Relationship
A real-world association among one or more entities. Where the association is between an entity and itself, the relationship is said to be recursive.

Role
The participation of an entity in a relationship. Each instance of a role has a minimum and maximum cardinality, and may be attributed. The direction of the role indicates how to read the name of the role.

Subject area
A related collection of meta-object instance definitions. Subject areas are used to define scoped areas of interest. Subject areas overlap to ensure the integration of the overall metamodel, but a tool need only use those subject areas relevant to the data to be exported/imported.

Syntax
A syntax is a definition of the format of information in a CDIF transfer. The definition is in the form of a grammar. It is specified with regard to ordering, repetition, down to the level of terminals, but does not specify the representation of any of the terminal objects in the grammar. Those decisions are defined in the encoding of the syntax.

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SYNTAX.1
The CDIF family of standards supports multiple transfer formats, each composed of a syntax and an encoding. SYNTAX.1 is the primary syntax defined within the CDIF family of standards.

Terminal symbol
A part of the hierarchical definition of a syntax that is **not** further decomposed in the hierarchy.

Tool
A software product that provides support for software and system life cycle processes, as defined in ISO/IEC 12207: 1995. When "tool" is used in this International Standard "tool" it refers particularly, but not exclusively, to a modelling tool.

Transfer
See *CDIF transfer*.

Transfer format
See *CDIF transfer format*.

Virtual reference
References made to concepts, other than specific meta-entities in a metamodel, are known as virtual references and are represented by boxes with diagonal striping.

Working metamodel
The working metamodel is the definition of the specific meta-objects that may be instantiated in the model section of a CDIF transfer. The working metamodel comprises the meta-objects in the CDIF semantic metamodel that are used by the subject areas referenced in the metamodel section of the transfer, and the meta-objects defined as extensions in the metamodel section.

5 Symbols (and abbreviated terms)

5.1 Naming and diagramming notations

All meta-objects and meta-meta-objects in CDIF (in metamodels and meta-metamodels) are named by concatenating all the words that name the meta-object or meta-meta-object; the first letter of each word is upper-case, the rest are lower-case (e.g., *MetaAttribute*, *AttributeDerivation*, *IsDrawnUsing*, *IsOptional*).

Full details of the CDIF graphical notation used in the metamodel and the meta-metamodel can be found in the framework document (ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility*).

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5.2 Abbreviations

The following abbreviations are used in this international standard:

CDIF CASE Data Interchange Format (originally)

ERA Entity-Relationship-Attribute modelling

6 CDIF concepts and facilities

6.1 Introduction

CDIF has been developed to define the structure and content of a transfer that may be used to exchange data between two modelling tools. The fundamental objectives of the CDIF family of standards are:

— To provide a precise, unambiguous definition of information to be transferred

— To define a transfer that may be read and understood directly (i.e., without interpretation by a computer)

— To provide the importer with sufficient information to enable the importer to reproduce the transferred data consistent with the original sense.

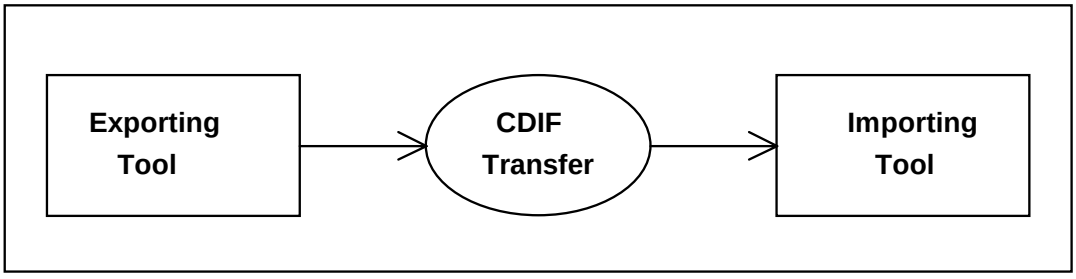


Figure 2 – Use of the CDIF family of standards

The CDIF family of standards defines the content and format of the transfer of information between tools, especially modelling tools. Figure 2 shows the use of the CDIF family of standards. The transfer is usually from one tool to another and is usually via a file. Additional types of transfer include inter-process communication, inter-machine (i.e., network) transfer, repository-to-tool transfer, etc.

While the CDIF family of standards makes no statements about the exact mechanism used to get conformant transfers accomplished, CDIF is designed to support all of the above types of transfers.

6.2 Fundamental goals

6.2.1 Extensibility

The scope of the CDIF semantic metamodel is all concepts used in models of a software product or system. Some concepts are unique to any given modelling tool and may not be included in the CDIF semantic metamodel.

Because CDIF cannot anticipate all of the information needs of the tools that utilize it, an extensibility mechanism exists. This mechanism, an integral part of the standards, allows tools to extend the capabilities of CDIF easily and cleanly to support the transfer of information that the standard CDIF semantic metamodel does not cover. This mechanism is described fully in ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility.*

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6.2.2 Principle of maximum information transfer

Exporters shall be built without knowledge of any prospective importer. Since the capabilities of the importer are unknown (for example, the support of n-ary relationships, or the techniques supported), it is a fundamental principle of CDIF that an exporter shall transfer all available information within the intended scope of the transfer. Each importer may then discard any information for which it has no use.

6.3 Architecture of CDIF

6.3.1 Framework

6.3.1.1 Layers of information

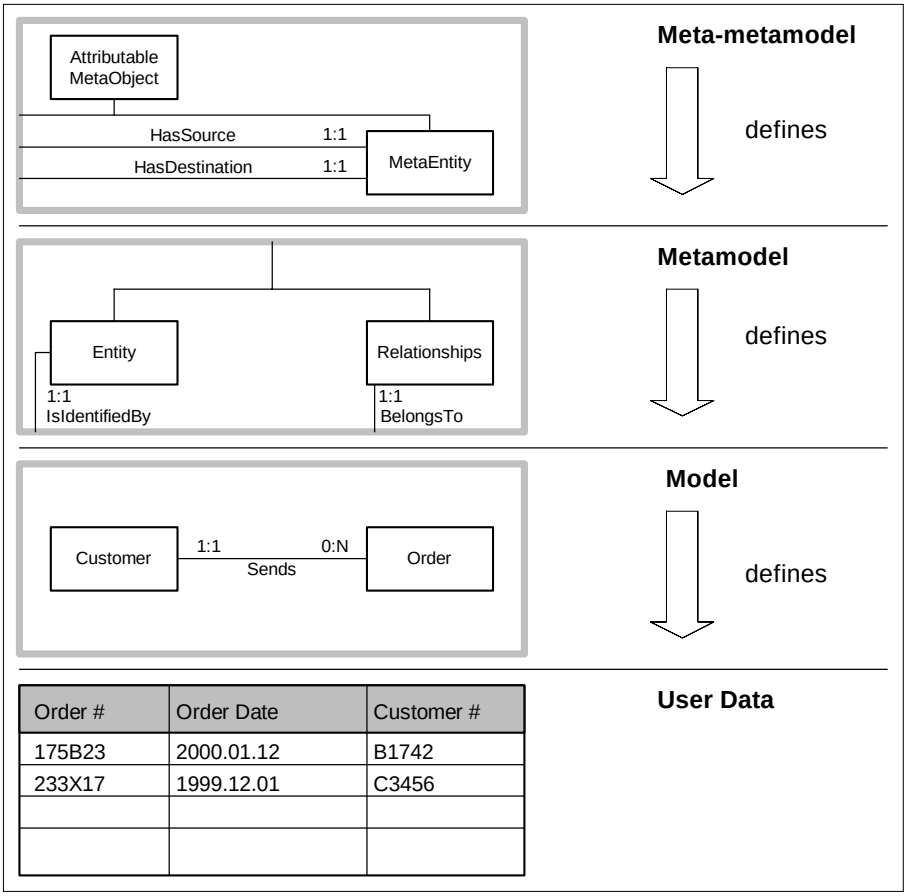


Figure 3 – Multiple layers

CDIF itself uses models to define the information content of a CDIF transfer file. Several layers of model are used: the second being an abstraction of the first, the third of the second, and so on. Each abstraction, or meta-layer as it is called, defines the rules for the level from which it is abstracted. Figure 3 and the following text describe the meta-layers used in CDIF.

When an end-user information system is operating, it is manipulating information (e.g., order number 175B23 is for customer B1742, etc.). This information is known as "user data." User data is not relevant to the CDIF family of standards beyond the fact that CDIF deals with the tools that are used to create these information systems.

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The information that is exchanged between two modelling tools through CDIF is known as a "model." The model is a description of the user information system; for example, a model of the data that supports a sales order processing information system (e.g., a system where 'Orders' are placed 'For' 'Customers', etc.). A model is exchanged in a CDIF transfer file.

Standard structures of the data used in software engineering methods and techniques have been defined to store the models in transfers. The abstract representation of such data structures is defined using Entity-Relationship-Attribute models. This representation contains data items, which are the type definitions for data items found in models; for example, entities, data types, and processes. It is known as the "metamodel" because it contains data about data (in models).

To document the metamodel, an agreed set of meta-data structures (diagram types, definitions, notations, techniques and syntax) has been defined. Together, this set is known as the "meta-metamodel" because it contains data about data (in metamodels) about data (in models). The CDIF meta-metamodel is defined in the framework document (ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility)*.

6.3.1.2 Separation of the what from the how

The basic concepts of the CDIF architecture are embodied in the separation of the definition of what information is transferred from the definition of how that information is transferred. The information content of a CDIF transfer is defined by a metamodel. CDIF provides a standardized metamodel that is called the CDIF semantic metamodel. The transfer format provides the definition of how that information is to be put into a standardized form for transfer.

Figure 4 depicts the separation of the transfer format and information content of a CDIF transfer. The common element that unites these is the CDIF meta-metamodel. It establishes the rules and building blocks from which the CDIF semantic metamodel and the CDIF transfer format are defined.

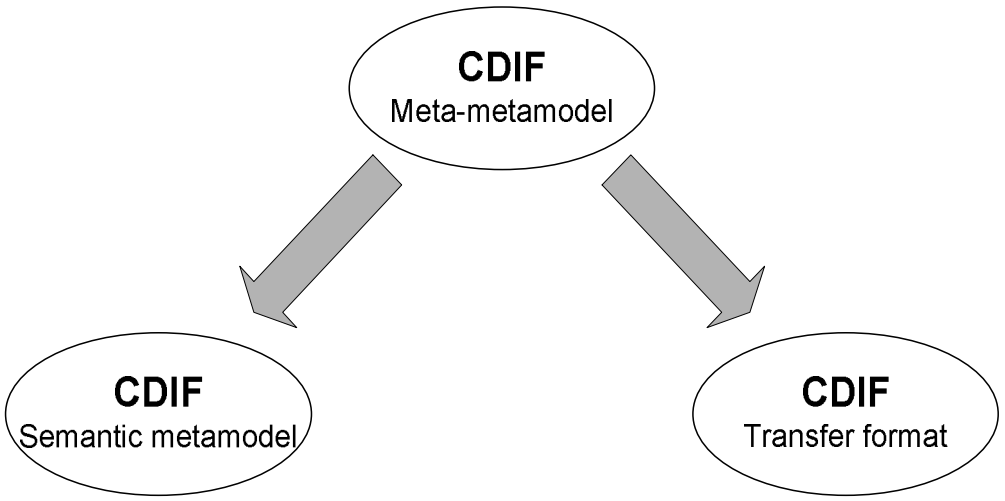


Figure 4 – Architecture of CDIF

6.3.1.3 Modelling approach

Because of the clear separation in CDIF between the definition of the information that is transferred during a transfer and the actual transfer format (i.e., syntax and encoding), as well as CDIF's support for multiple transfer formats, a concrete definition vehicle for the semantic (as opposed to representational) contents of a transfer is required; the definition can not be done at the syntax level. This semantic content, which is contained in the CDIF semantic metamodel, is defined using a variant of Entity-Relationship-Attribute (ERA) modelling.

This modelling approach was developed by extracting the necessary elements from industry-standard ERA modelling techniques. Although a few extensions have been made to meet the specific requirements of CDIF,

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anyone familiar with basic ERA modelling techniques should be able to interpret the CDIF semantic metamodel with little effort.

The detailed definition of this technique is contained in ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility*.

The goal of the CDIF semantic metamodel is to provide definitions of all information of interest to modelling tools. However, this is a major task that cannot be undertaken in one standard due to its size and complexity.

The approach that has been taken in the CDIF semantic metamodel is to provide definitions specific to a modelling technique in a manner that relates those areas while enabling each area to be used without the need of knowledge or understanding of all the other areas covered by the CDIF family of standards. These are called "subject areas". Each subject area is defined in a separate standard that forms part of the set of Standards which define the overall CDIF semantic metamodel.

In each subject area, the meta-entities, meta-attributes and meta-relationships included support the common concepts required by methods or techniques using the area covered. The extensibility mechanism provides a way for tool builders to extend the information definition when additional information is required either between similar or different tools.

For the CDIF metamodel itself to be understood, the notation and technique used to describe it must be well defined. This definition of the CDIF semantic metamodel is described by the CDIF meta-metamodel. A detailed description of the CDIF meta-metamodel can be found in ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility*. The CDIF meta-metamodel provides a consistent way of defining meta-entities, their meta-attributes, and the meta-relationships between them.

6.3.2 Information content

6.3.2.1 Separation of semantic information and presentation information

The CDIF semantic metamodel Standards each define a subject area. Subject areas are views on the underlying metamodel. Objects in the metamodel can appear in more than one subject area. The subject areas of the CDIF metamodel can be grouped into two distinct categories: semantic information subject areas and presentation information subject areas.

The semantic information subject areas are those that define the underlying information held by a modelling tool. This is the information entered by the tool's users, which represents the systems those users are analysing, designing and implementing. It does not cover how the information is presented to the user of the tool.

The subject areas within the presentation information category define how a tool displays the information to the user of the tool.

6.3.2.2 Scope

The current CDIF semantic metamodel standards provide a set of definitions for some of the objects that occur within software and system models. When transferring information that is described by this metamodel, the builders of tools can rely on conformance to this standard metamodel by others to guarantee that the information that they transfer will be compatible.

When, however, the information that must be transferred during a CDIF transfer falls outside the scope of the CDIF semantic metamodel, the CDIF extensibility mechanism must be utilized. The two tool builders must explicitly agree upon a CDIF-compatible metamodel definition for the information that they wish to transfer.

While the first approach, above, is preferable, the task of defining a single, unified, complete (and industry-agreed) metamodel for all the information used in software and system models is so large that it must be done incrementally. The CDIF semantic metamodel does not now, nor, perhaps, will it ever, define all such information. It is expected that the CDIF semantic metamodel component of the CDIF family of standards will be amended and expanded in the future as additional subject area standards are defined.

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For an exact description of the subject areas that are currently published, see Clause 7, CDIF family of standards overview.

6.3.3 Transfer format

In order to transfer a model from one tool to another, one must have not only a complete meta-metamodel (i.e., a complete definition of how one builds metamodels) and a complete metamodel (i.e., a complete definition of the semantics of the models that one might want to transfer), but also a complete definition of the transfer format itself.

CDIF supports the idea of multiple transfer formats. The semantics (i.e., the metamodel) are completely separated from the definition of the transfer format, and the metamodel has been defined only by using the meta-data structures defined in the meta-metamodel. It follows, therefore, that any transfer format, which can (in the general case) represent all of the meta-data structures defined by the meta-metamodel, can be used to transfer all the information defined in the metamodel (and, thus, transfer any model which conforms to the metamodel).

Because CDIF transfers are often handled by different transport mechanisms (e.g., a file, an inter-process link, etc.), it is necessary to separate the definitions of the grammar of a transfer format from the definition of that grammar's encoding. CDIF defines a transfer format as the combination of a "syntax" and an "encoding." A syntax is a definition of the grammar and structure of a transfer format. An encoding is a description of how a syntax is physically represented. This allows a common syntax to be used, while permitting selection of an optimal encoding for the transport mechanism being used.

As an example, a syntax might declare that a meta-entity (e.g., a Process Bubble on a Data Flow Diagram), as it occurs in a transfer, shall be represented as follows:

```
<MetaEntity-Definition> ::=
                                    METAENTITY <MetaEntity-Type> <MetaEntity-MetaAttributes>
```

For example:

```
METAENTITY PROCESS
                                    Name = MyProcess
                                    Id = 1.0.3
                                    Other = SomeValue
                                    etc...
```

This says that when a meta-entity (e.g., the *PROCESS* called *MyProcess*) occurs in a transfer, the METAENTITY marker comes first, followed by the identification of the type of the meta-entity (e.g., *PROCESS*), followed by the values of the meta-attributes of the meta-entity (e.g., *Name*, *Id*, etc.).

The encoding, however, would describe such things as how markers are encoded. For example, is the METAENTITY marker represented by?

— The character string 'METAENTITY'; or,

— The number 2 (when 0 is a 'METAATTRIBUTE' and 1 is a 'METARELATIONSHIP'); or,

— The letters 'ME'; etc.

CDIF provides a description of the rules to which any transfer format (used in a CDIF transfer) must adhere.

The architecture of CDIF allows for multiple transfer formats. CDIF provides a base syntax and an encoding for that syntax which together form the base transfer format.

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6.4 CDIF family of standards

6.4.1 Introduction

The organization of the information necessary to define the information content and the transfer format representation is shown in Figure 5. This figure provides a road map to the contents of the CDIF family of standards. The figure also shows the role that this document plays in the overall CDIF family of standards.

6.4.2 Framework

ISO/IEC 15474-2:2002*, Information technology - CDIF framework - Part 2: Modelling and extensibility* includes the definition of the CDIF meta-metamodel and describes the rules and graphical notations used throughout the CDIF family of standards. The Framework also defines the rules for extending the CDIF semantic metamodel.

6.4.3 Information content

The CDIF semantic metamodel is defined by a series of individual standards, each identifying those elements that comprise a separate subject area. This CDIF semantic metamodel defines the information content for a CDIF transfer. Any particular transfer may utilize the definitions found in more than one subject area to define the content of the transfer.

6.4.4 Transfer format

The CDIF transfer format standard is defined in three component standards, a set of general rules for syntaxes and encodings, a transfer syntax definition (SYNTAX.1), and a transfer format encoding using SYNTAX.1 (ENCODING.1).

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7 CDIF family of standards

7.1 Introduction

This Clause describes, at the time of publication, the CDIF family of standards, that is, the Framework for Modelling and Extensibility, the standards which define the CDIF metamodels, the transfer format standards and the mapping standards.

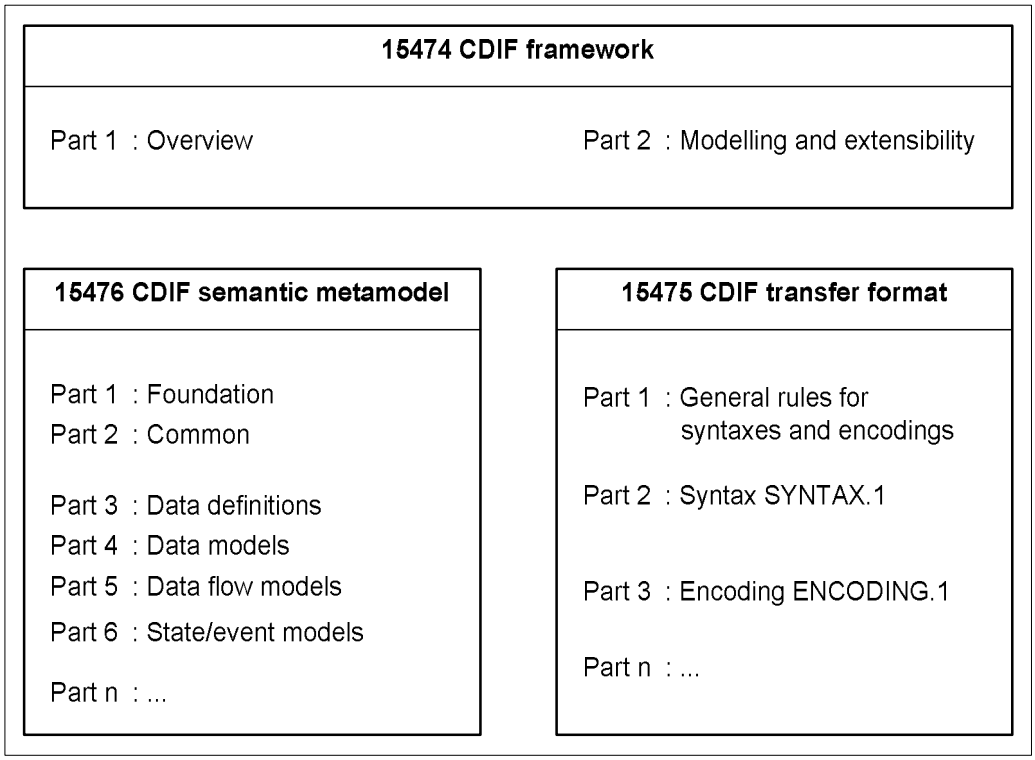


Figure 5 – Architecture of the CDIF family of standards

7.2 Standards documents

The standards, which form the complete CDIF family of standards, are as follows:

— ISO/IEC 15474:2002, *CDIF 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*

— ISO/IEC 15475:2002, *CDIF transfer format*

ISO/IEC 15475-1:2002, *Information technology — CDIF transfer format — Part 1: General rules for syntaxes and encodings*

ISO/IEC 15475-2:2002*, Information technology — CDIF transfer format — Part 2: Syntax SYNTAX.1*

ISO/IEC 15475-3:2002, *Information technology — CDIF transfer format — Part 3: Encoding ENCODING.1*

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NOTE: There may be a requirement for documents describing other syntaxes and encodings.

— ISO/IEC 15476, *CDIF Semantic Metamodel*

ISO/IEC 15476-1:2002*, Information technology — CDIF semantic metamodel — Part 1: Foundation*

ISO/IEC 15476-2:2002*, Information technology — CDIF semantic metamodel — Part 2: Common*

ISO/IEC 15476-3*, Information technology — CDIF semantic metamodel — Part 3: Data definition*

ISO/IEC 15476-4*, Information technology — CDIF semantic metamodel — Part 4: Data models*

ISO/IEC 15476-5, *Information technology — CDIF semantic metamodel — Part 5: Data flow models*

ISO/IEC 15476-6*, Information technology — CDIF semantic metamodel — Part 6: State/event models*

7.3 Frameworks

7.3.1 Overview

This standard (this document) describes the architecture of the CDIF family of standards and provides an overview to all the current standards that form the CDIF family of standards.

7.3.2 Modelling and extensibility

This standard provides detailed information on the CDIF meta-metamodel. The CDIF meta-metamodel defines the meta-objects that may be included in the CDIF semantic metamodel and any extensions, and the way in which they relate with one another. The concept of subject areas as views of the underlying CDIF semantic metamodel is an important part of the CDIF family of standards. The meta-objects that may be used in subject areas are covered by the meta-metamodel, as are the rules for defining the scope of subject areas.

The CDIF meta-metamodel also provides the basis for the transfer format, which is based on the same meta-objects.

This standard also defines:

— The modelling rules that apply throughout the standards including the naming conventions, subtyping, and multiple inheritance rules;

— The various symbols and notations used for graphically representing CDIF models with examples of their use;

— The full set of data types that may be encountered in the CDIF meta-metamodel and metamodel;

— An extensibility mechanism whereby the standard CDIF semantic metamodel may be extended within a transfer to allow for all necessary elements to be transferred using the same transfer format. (This includes the allowed types of extensibility);

— Responsibilities for exporters and importers in order to remove ambiguity between tools. These cover, for example, the exporter's responsibility to output any information that may be useful to any importer, since nothing should be assumed about the capability of the importing tool.

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7.4 Semantic metamodel standards

7.4.1 Foundation subject area

The Foundation subject area standard is used as the basis for defining all other subject areas. The meta-objects within it form the root of the CDIF AttributableMetaObject hierarchy. All meta-entities and meta-relationships defined in either the CDIF semantic metamodel or through extensibility must be subtypes of the meta-objects in the Foundation subject area. This subject area must be used in any valid CDIF transfer even when the rest of the CDIF semantic metamodel is not used and the metamodel for the transfer is defined entirely using extensibility.

7.4.2 Common subject area

The Common subject area standard covers aspects that are common to all systems engineering objects. These include the details of the user who created or updated an object, and synonyms for an object. It also provides supertypes to aid the classification of the meta-objects in other subject areas. This subject area shall be used in a CDIF transfer where any of the subject areas of the CDIF semantic metamodel are used (other than Foundation) since it provides the common structures.

7.4.3 Data definitions subject area

The Data definitions subject area standard provides the means to define data elements and data structures; these are referenced by other subject areas when defining the data content of any meta-object. It supports simple and complex structures, array and pointer qualification, single and multiple inheritance. It also provides mechanisms for defining the underlying type of a data element and for specifying the valid domain of a type.

7.4.4 Data models subject area

The Data models subject area standard provides support for all the major forms of Entity-Relationship and Entity-Relationship-Attribute modelling as well as data modelling to support logical design of relational databases.

The concept of a Role in a Relationship is used to allow support for many different forms of relationship modelling, from simple one-to-many unattributed relationships through to complex n-ary attributed relationships. The cardinalities of the relationships can be expressed.

In addition, this subject area provides support such as:

— Keys may be defined for Entities and Tables;

— Single and multiple inheritance are supported for both Entities and Relationships;

— Volumetric information can be captured;

— Data models may be abstracted via Clusters and Subsets;

— Multiple views of a data model may be defined.

Data content may be defined for Entities, Relationships and Roles by use of the Data definition subject area.

7.4.5 Data flow models subject area

The Data flow models subject area standard provides support for modelling the input-process-output view of a system. It provides all the concepts needed for data flows into and out of processes, with associated data stores and external entities.

The concept of process decomposition is supported, together with the decomposition of flows, stores and external entities. The data content of the data flow is described by reference to the Data definition subject area.

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7.4.6 State/event models subject area

The State/event subject area standard addresses the semantic information of event-driven finite state machine modelling. State/event modelling covers component states, actions, transitions between states, and their enabling events and conditions.

State/event models may be decomposed into sub-models. These sub-models can execute concurrently, sequentially, or as mutually exclusive alternates. These semantics apply to Entity-Life-History models for data objects as well as State Machines for process objects.

Actions may be invoked on entry to or exit from a state, during a transition, or by an event. Parallel decomposition of structured states supports concurrent asynchronous State/event models with event triggers for explicit synchronization.

7.5 Transfer format

7.5.1 General rules for syntaxes and encodings

This standard describes the way a working metamodel and models are represented in a transfer. It also describes the way CDIF supports multiple syntaxes and encodings.

A CDIF transfer consists of a transfer Envelope and the transfer Contents. The transfer Envelope identifies the syntax and encoding that is used in the rest of the transfer. The format of the transfer Envelope is the same for all syntaxes and encodings, and is defined in this standard.

The transfer Contents consists of a header section, a metamodel section and a model section. The header section contains general information about the creation of the transfer file. The metamodel section defines the working metamodel used in the transfer by referencing the relevant CDIF subject areas and defining any extensions. The model section contains the model data to be transferred structured according to the working metamodel.

The format of the transfer Contents depends on the syntax and encoding being used. This standard defines rules that apply to all syntaxes and encodings. Currently, only one syntax and one encoding are defined; these are known as SYNTAX.1 and ENCODING.1.

7.5.2 Syntax SYNTAX.1

This standard describes the CDIF transfer format syntax known as SYNTAX.1. It defines the grammar and structure of the transfer format. The syntax of a transfer is defined as a hierarchy of lower level syntactic elements down to the level of syntax terminals.

The detailed representation of the syntax terminals is specified in the relevant encoding; currently ENCODING.1 is the only standard encoding for SYNTAX.1.

7.5.3 Encoding ENCODING.1

This standard defines the CDIF transfer format encoding, ENCODING.1, which is an encoding of SYNTAX.1. ENCODING.1 is a clear text encoding. It provides a transfer format that is capable of being read and understood by a human, as well as being parsable by a computer.

The document defines the detailed representation of each of the syntax terminals defined in SYNTAX.1. An appendix gives two examples of a complete transfer; one example uses only standard CDIF subject areas, while the other uses an extended metamodel.

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