TECHNICAL REPORT

ISO/IEC TR 19583-1

First edition
2019-07

Information technology — Concepts and usage of metadata —

Part 1: Metadata concepts

Technologies de l'information — Concepts et utilisation des métadonnées —

Partie 1: Concepts liés aux métadonnées

Reference number
ISO/IEC TR 19583-1:2019(E)

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Published in Switzerland

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Foreword

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

A list of all parts in the ISO/IEC 19583 series can be found on the ISO website.

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Introduction

This document describes the concept of metadata, particularly in respect of its use within the data management speciality in information technology.

The ISO/IEC 11179[2] and ISO/IEC 19763[4] series describe the structure for registering information about metadata that is used and/or held elsewhere.

The ISO/IEC 11179 series defines metadata as “data that defines and describes other data”. There are, however, many other definitions of metadata that are used more generally, for example, the US National Information Standards Organization (NISO) defines metadata as "structured information which describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource”.

Metadata is, therefore, just data, but data which has the specific purpose of defining or describing other data. Metadata is normally used within a particular context, which is the set of circumstances, purposes or perspectives within which any particular item of data is used as metadata. Metadata can, therefore, be considered to be data about data within some context.

The definitions above, by themselves, do not say how metadata arises, where it comes from, how it is used, or how it is managed (although the ISO/IEC 11179 series describes the facilities for registering and managing structured metadata). For those reasons, this document has been developed to provide a broader view of metadata and the associated concept of the metamodel.

These concepts of metadata and metamodels are important when trying to understand exactly what is being registered within the registries whose structure is specified in the ISO/IEC 11179 and ISO/IEC 19763 series.

Information technology — Concepts and usage of metadata —

Part 1: Metadata concepts

1 Scope

This document describes the basic concept of metadata, and its relationship to both data and metamodels.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

4 Introduction to metadata

Metadata is defined as “data that defines and describes other data”. This is a very broad definition of metadata leaving room for confusion. It is often said that one person’s metadata is another person’s data. Whether any piece of data is seen as metadata or just data depends on the context. These contexts can be classified into three distinct groups:

— structural metadata: the metadata used by those responsible for the management of data in information systems to describe the ‘containers’ of data, for example, the tables and columns in a database managed using the SQL database language;

— descriptive metadata: the metadata used for the discovery and identification of content, such as by librarians, and the metadata that helps to further describe other data, such as metadata that a scientist has observed about continuous or systematically produced data;

— administrative metadata: the metadata associated with data values, such as metadata describing when and who created the data, who can edit and manage the data, and any other information about the data that is deemed useful, including metadata that describes multimedia data.

The focus of this document is the first of these groups: the structural metadata used within data management. The use of descriptive metadata is explained in Annex A and the use of administrative metadata is explained in Annex B.

For any data to be useful or shareable the meaning of the data (the semantics), the data type and format of the data (the syntax) and the relationship of the data to other data (the structure) must be known. All of this information about data is metadata.

Metadata is independent of the systems that produce the data. Metadata is usually defined before systems are built, either as part of the systems development of an individual system or as part of an

enterprise-wide data management initiative. However, metadata can be recorded after the data has been created in less formal systems as part of a data documentation initiative. The only significant difference between single-system metadata and enterprise-wide metadata is the scope of the metadata, although there might be differences around the degree of formality applied to its creation.

5 The use of structural metadata in data management

The traditional data management view of metadata is that it describes the types of data stored in a database and also describes how that data is to be managed. Examples of such metadata are:

— table and column definitions for a database schema managed by an SQL database management system;

— definitions of any constraints used for validating the data to be placed in the database;

— rules for accessing the data in the database;

— rules for maintaining the quality of the data in the database;

— predicted volumes for the data in the database.

A more comprehensive view of metadata within the data management community is that metadata is defined very early in the systems development lifecycle[6]. Conceptual data models and the data definitions derived from them can, therefore, be considered as metadata. The relationships shown on a conceptual data model can also be considered as metadata.

At the enterprise level, other information about data can be viewed as metadata. Details of the ownership and source of data definitions can be viewed as metadata, as can any other information that helps business users and system developers with understanding what data is recorded in the enterprise's databases, and where it is recorded.

Metadata may be held on paper or electronically, or both. In addition to the diagrams of the data models for the system, paper-based metadata can include glossaries of business terms that support the use of the data, descriptions of the information systems owned by the enterprise, and descriptions of the data held by each system. Metadata that is held electronically may be stored in the information technology systems, for example, in the system tables, where this metadata supports the creation and management of the data held in the individual systems. Metadata may also be held electronically within a data warehouse to describe the schemas of the operational systems that feed the data warehouse to assist with the transformation and loading of that data into the data warehouse.

Metadata may also be held electronically in stand-alone systems to support interoperability by enabling the common understanding of data that is shared between separate systems. These stand-alone systems are often called data dictionaries, repositories or registries. Such stand-alone systems will each have its own database. The structure of that database will be represented in a series of data models that together describe what information about the metadata is to be held and how it is to be held. The relationships between the information may also be described in the models.

These data models can be produced at three levels:

— The conceptual model, or computation independent model, is a model that specifies ***what*** information is to be held by the system (i.e., the data dictionary, repository or registry). Note that with a conceptual model there is no assumption that the final system will be using any information technology; its implementation could be paper-based.

— The logical model, or platform independent model, is the model that begins to consider ***how*** the information is to be held in an information technology-based system. For example, a logical model can be developed on the assumption that the system will have a database managed using the SQL database language.

— The physical model, or platform specific model, is the model that specifies ***how*** the information is to be held in the particular implementation selected for the system. For example, at this level consideration should be given to such details as the naming and allocation of tables to tablespaces.

Each of these models (conceptual, logical and physical) for a data dictionary, repository or registry is known as a metamodel – a model of a model.

Metamodels need not only be used to describe the requirements to hold information about metadata. It is often useful for repositories and registries to hold information about other resources that are important to an enterprise, such as the processes supported by an enterprise's systems, information about the roles and goals of the user of those systems, and information about the forms used to collect the data to be entered into those systems. This required information (including any rules and constraints for describing these resources) will also be represented in one or more metamodels.

6 The relationship between data, metadata and metamodels

A convenient explanation of the relationship between data, metadata and metamodels is provided in ISO/IEC 10027:1990, Clause 6[1], where four data levels are described. The purpose of these four data levels is to make it possible to extend the types of data that can be held in the Information Resource Dictionary (IRD), the name given in ISO/IEC 10027 to a data dictionary, a repository or a registry.

The four data levels described are:

— IRD Definition Schema Level;

— IRD Definition Level;

— IRD Level;

— Application Level.

These levels are illustrated in Figure 1.

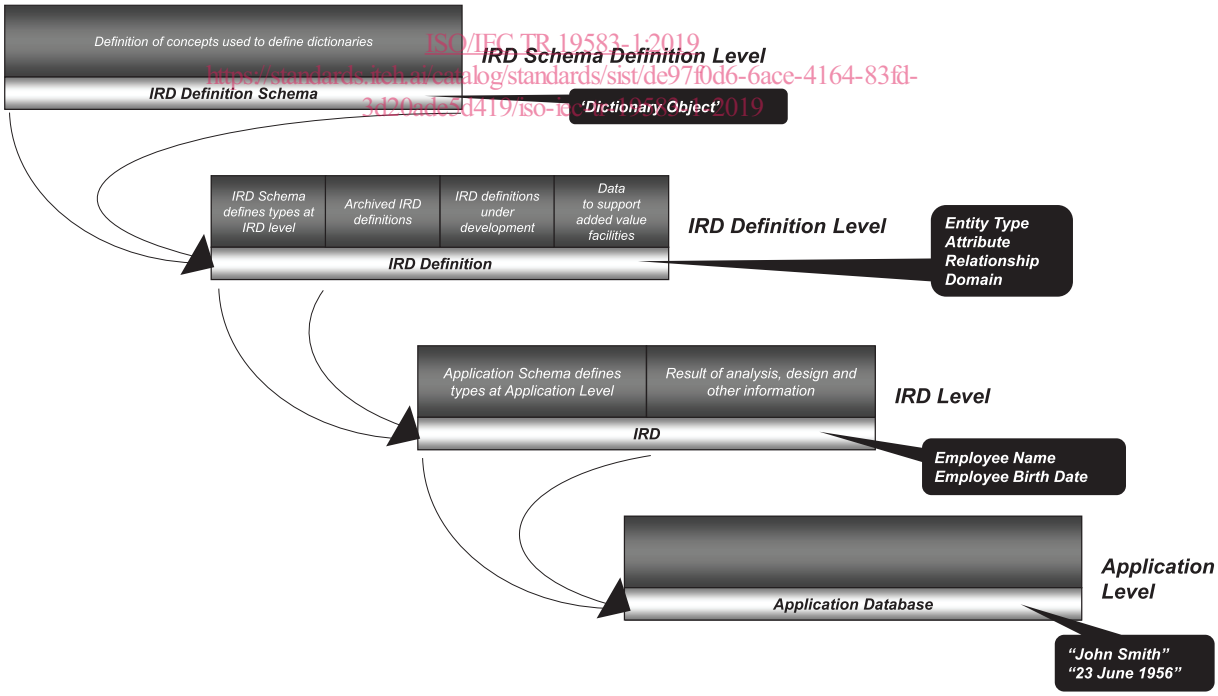

Figure 1 — Four data levels

The Application Level is the level on which instances of business data are recorded in the Application Database. For example, the data about specific instances of employee will be recorded at the Application Level, such as the data about an employee with the name "John Smith" and with a date of birth of "23 June 1956". The Application Level exists, therefore, in the operational information system and not in the Information Resource Dictionary.