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Information technology — Specification and standardization of data elements —

Part 1: Framework for the specification and standardization of data elements

Technologies de l'information — Spécification et normalisation des éléments de données —

Partie 1: Cadre pour la spécification et la normalisation des éléments de données

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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 11179 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 11179-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management services*.

ISO/IEC 11179 consists of the following parts, under the general title *Information technology — Specification and standardization of data elements*:

— *Part 1:Framework for the specification and standardization of data elements*

— *Part 2: Classification for data elements*

— *Part 3: Basic attributes of data elements*

— *Part 4: Rules and guidelines for the formulation of data definitions*

— *Part 5: Naming and identification principles for data elements*

— *Part 6: Registration of data elements*

Annexes A and B of this part of ISO/IEC 11179 are for information only.

Introduction

Background

Humans are aware of anything that exists in the natural world through its properties. Data represents the properties of these things. Specification of data elements, the basic units of data, involves documenting relevant characteristics of each data element to ensure its representation of the natural world item is consistent and accurate. Data that has been carefully specified and standardized greatly enhances its usefulness and shareability across systems and environments. Sharing data involves the ability to locate desired data, retrieve the data, and to exchange the data with others. When data elements are well documented according to ISO/IEC 11179 and the documentation is managed in a Data Element Registry, finding and retrieving them from disparate databases as well as sending and receiving them via electronic communications are made easier.

The recognition and standardization of data elements used in communications through automated information processing systems is an ongoing and essential activity. The success of this activity and its application throughout the world is of vital importance if international communications among governments, businesses, and scientific communities are to be improved.

The primary data sharing and standardization problems addressed by the development of ISO/IEC 11179 include, but are not limited to the following:

- A lack of mechanisms for enabling global data acquisition and interchange, particularly across application areas;
- Unique global identifiers for standard data elements currently do not exist;
- Documentation of data element characteristics is inadequate to support fully automated sharing of data, including locating, retrieving, and exchanging the data;
- There is a lack of uniform guidance for identification, development, and description of data elements;
- Finding and retrieving a specific standard data element among thousands or millions is difficult or impossible;
- No universal means for organizing standard data elements exists;
- While data is sometimes standardized within an organization, there are few common data standards between organizations;
- Exchange of data among organizations results in a proliferation of customized data interchange representations;
- Data definitions and descriptions are not sufficiently precise to support reuse or multiple users of data;
- Current inventory structures for reducing logical data redundancies are inadequate;
- Global implementation of Electronic Data Interchange (EDI) is impeded by a lack of standard data elements; standard data elements are needed for the content of EDI messages.

To facilitate global electronic communications, the International Standards community has been working diligently to define an Open Systems Interconnection Environment (OSIE) within which diverse computer hardware and applications could share information. Standards have been proposed or defined for three (hardware, software, and communications) of the four (hardware, software, communications, and data) basic components required for open information processing systems. ISO/IEC 11179 for data specification, the fourth basic component for open information systems, provides a mechanism for enabling data to be shared in the OSIE.

For systems to be truly open, data must be portable and shareable within and among these various application environments, which span localized and distributed networks. For data to be shareable, both the users and owners of data must have a common understanding of its meaning, representation, and identification. To understand the meaning of any data, the descriptions of the data must be available to the users from, for example, a Data Element Registry. Data must be adequately described and users must have a convenient way to obtain these descriptions. Data Element Registries provide a way to

organize the content and representation of data elements so that data descriptions are consistently specified and can be easily located by data designers and users. Uniform specification of data facilitates data retrieval, data exchange, and consistent use of data throughout the Software Development Life Cycle. The units of information with normalized meanings and formats are known as "standardized data elements."

Purpose of ISO/IEC 11179

ISO/IEC 11179 describes the standardizing and registering of data elements to make data understandable and shareable. Data element standardization and registration as described in ISO/IEC 11179 allow the creation of a shared data environment in much less time and with much less effort than it takes for conventional data management methodologies.

The purpose of ISO/IEC 11179 is to give concrete guidance on the formulation and maintenance of discrete data element descriptions and semantic content (metadata) that shall be used to formulate data elements in a consistent, standard manner. It also provides guidance for establishing a data element registry.

Although motivated by the desire for the open exchange of data throughout the international communities by electronic information interchanges, ISO/IEC 11179:

- facilitates acquisition and registration of data;
- expedites access and use of data;
- simplifies data manipulation by intelligent software by enabling manipulation of data based on characteristics described by metadata;
- enables the development of a data representation metamodel for CASE tools and repositories; and
- facilitates electronic data interchange and data sharing.

ISO/IEC 11179 benefits the communication of data among information systems and people:

- within an organization;
- among different organizations; and
- crossing all levels of software and hardware, and geographic, organizational and political boundaries.

Metadata about data elements is stored in a data element registry. A data element registry supports data sharing with descriptions of data. Registration is the process of documenting metadata to support data shareability. Registration should be carried out at the data element level to promote and maximize semantic value. ISO/IEC 11179 enables the end user to interpret the intended meaning confidently, correctly, and unambiguously.

Users of ISO/IEC 11179

For users and managers of data, ISO/IEC 11179 specifies a basic set of data element characteristics necessary to share data. It places special emphasis on important data element characteristics such as identifiers, definitions, and classification categories. ISO/IEC 11179 describes a data element registry to assist users of shared data to have a common understanding of a data elements meaning, representation, and identification. If data values are received, the user can discover the exact meaning of the data received. If users wish to retrieve data values from a database, they can identify the type of data desired.

For systems analysts and data stewards, ISO/IEC 11179 provides a way to reuse a data element that meets a need, or to design a new data element if one does not already exist. Even before the user accesses data elements in a database, data stewards and systems analysts must have a way to identify and describe data logically so that they do not inadvertently introduce inconsistent values of data. If systems analysts are to create products that share data, they must first be aware whether or not a data element with the required characteristics already exists. If it does, they should use it. If the systems analysts choose to replicate the data element, they must represent data elements containing the same information in the same manner. If a data element with exactly the same characteristics does not already exist, a data steward needs to design the data element and make its description available to software developers. ISO/IEC 11179 aids in the development of precise descriptions of data

elements. Data elements that have been formulated according to the principles in this multi-part International Standard enable interchangeability and retrieval regardless of the information processing system or telecommunication protocols employed.

For software developers, ISO/IEC 11179 provides means to assure data coherence. A registry can serve software developers by enabling the consistent use of data throughout the Software Development Life Cycle (SDLC). A registry will provide the mechanisms for managing data elements and for ensuring their traceability between SDLC phases.

For developers of a data dictionary, data element registry, CASE tool, and other data management software, ISO/IEC 11179 provides the basis for designing a metamodel necessary to enable the capture, storage, management, and exchange of the data element metadata.

Information technology — Specification and standardization of data elements —
Part 1:
Framework for the specification and standardization of data elements

1. Scope

ISO/IEC 11179 specifies basic aspects of data element composition, including metadata. It applies to formulation of data element representations and meaning as shared among people and machines; it does not apply to the physical representation of data as bits and bytes at the machine level.

This part of ISO/IEC 11179 provides the context for associating the individual parts and is the foundation for a conceptual understanding of data elements.

2. Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 11179. 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 11179 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.

ISO Standards Handbook 10, Data Processing - Vocabulary, 1982.

ISO 704:1987, *Principles and methods of terminology*.

ISO 1087, *Terminology - Vocabulary*.

ISO 2382-4:1987, *Information processing systems - Vocabulary - Part 4: Organization of data*.

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

ISO/IEC 11179-2, *Information technology - Specification and standardization of data elements - Part 2: Classification for data elements.*

ISO/IEC 11179-3:1994, *Information technology - Specification and standardization of data elements - Part 3: Basic attributes of data elements.*

ISO/IEC 11179-4:1995, *Information technology - Specification and standardization of data elements - Part 4: Rules and guidelines for the formulation of data definitions*.

ISO/IEC 11179-5:1995, *Information technology - Specification and standardization of data elements - Part 5: Naming and identification principles for data elements.*

ISO/IEC 11179-6:1997, *Information technology - Specification and standardization of data elements - Part 6: Registration of data elements.*

3. Definitions

For the purposes of ISO/IEC 11179, the following terms are defined in the table below. An X under the column heading for a Part indicates that the term is defined in that Part and used in other clauses there. Each word that appears in **bold** in the definition of a term is a term defined elsewhere in this clause. Words that appear in regular type assume their commonly understood definitions. Some words (e.g. representation) are used both ways. There are instances where two or more terms appear next to each other in a definition, giving the appearance that a new term is undefined. There is no ambiguity in determining the actual terms in these cases.

Number	Term	Definition	Part Number 1	2	3	4	5	6
3.1	administered component:	A component for which administrative **attributes** are collected.		X				
3.2	administrative status:	A designation of the position in the processing life-cycle of a **registration authority** for handling **registration** requests.	X					X
3.3	attribute:	A characteristic of an **object** or **entity**.	X	X	X	X	X	X
3.4	attribute value:	A representation of an instance of an **attribute**.			X			
3.5	certified data element:	A **recorded data element** that has met the quality requirements specified in ISO/IEC 11179.	X					X
3.6	classification scheme:	An arrangement or division of **objects** into groups based on characteristics that the **objects** have in common, e.g., origin, composition, structure, application, function, etc.		X	X			X
3.7	classification scheme item:	A component of content in a **classification scheme**. This may be a node in a **taxonomy** or ontology, a term in a **thesaurus**, etc.		X				
3.8	classified component:	Any component of a **data element** that may be classified in one or more **classification schemes**. These components include the **object class**, **property**, **representation** class, **data element concept**, **value domain**, and **data element**.		X				
3.9	comments:	Remarks on the **data element**.			X			X
3.10	concept:	A unit of thought constituted through abstraction on the basis of characteristics common to a set of **objects**. [ISO 1087]	X	X		X		

Number	Term	Definition	Part Number 1	2	3	4	5	6
3.11	context:	A designation or description of the application environment or discipline in which a **name** is applied or from which it originates.			X		X	X
3.12	data:	A representation of facts, concepts, or instructions in a formalized manner, suitable for communication, interpretation, or processing by humans or by automatic means. [ISO 2382-4]	X	X		X		X
3.13	data dictionary:	A database used for **data** that refers to the use and structure of other **data**; that is, a database for the storage of **metadata** [ANSI X3.172-1990]. See also **data element dictionary**.	X	X		X		
3.14	data element:	A unit of **data** for which the **definition**, identification, **representation**, and permissible values are specified by means of a set of **attributes**.	X	X	X	X	X	X
3.15	data element concept:	A **concept** that can be represented in the form of a **data element**, described independently of any particular **representation**.	X	X	X		X	X
3.16	data element dictionary:	An information resource that lists and defines all relevant **data elements**. See also **register**.		X	X	X		
3.17	data element facet:	Any aspect of a **data element** that is subject to classification. This includes **object class**, **property**, **representation**, and **data element concept**.		X				
3.18	data element name:	A single or multi-word designation used as the primary means of identification of **data elements** for humans.	X					
3.19	data element registry:	An information resource kept by a **registration authority** that describes the meaning and representational form of **data elements**, including registration **identifiers**, **definitions**, **names**, **value domains**, **metadata** and administrative **attributes**, etc. See also **register**.	X					

Number	Term	Definition	1	2	3	4	5	6
						Part Number		
3.20	data element value:	A value out of a set of permissible values pertaining to a **data element**. See also **data value**.			X			X
3.21	data identifier (DI):	An **identifier** of a **data element** (a string of characters or other graphic symbols) assigned by a **registration authority**.					X	X
3.22	data item:	One occurrence of a **data element**.						X
3.23	data model:	A description of the organization of **data** in a manner that reflects an information structure.	X					
3.24	data steward:	A person or organization delegated the responsibility for managing a specific set of **data** resources.	X					
3.25	datatype:	The format used for the collection of letters, digits, and/or symbols, to depict values of a **data element**, determined by the operations that may be performed on the **data element**.	X					
3.26	datatype of data element values:	A set of distinct values for representing the **data element value**.			X			X
3.27	data value:	An element of a **value domain**.	X					
3.28	definition:	A word or phrase expressing the essential nature of a person or thing or class of persons or things: an answer to the question "what is x?" or "what is an x?"; a statement of the meaning of a word or word group [Webster's Third New International Dictionary of the English Language Unabridged, 1986]. Statement that expresses the essential nature of a **data element** and permits its differentiation from all other **data elements**.	X		X	X	X	
3.29	domain:	The set of possible **data values** of an **attribute**. [ISO/IEC 2382]. See also **value domain**.	X	X		X		

Number	Term	Definition	Part Number 1	2	3	4	5	6
3.30	entity:	Any concrete or abstract thing of interest, including associations among things. [ISO/IEC 2382]. Also see **object class**.	X	X				
3.31	enumerated domain:	A **value domain** that is specified by a list of all permissible values.	X					
3.32	form of representation:	Name or description of the form of **representation** for the **data element**. e.g. 'quantitative value, 'code', 'text', 'icon'. See also **representation term**.			X			X
3.33	identifier:	A language independent unique **identifier** of a **data element** within a **registration authority**. See also **data identifier**. An unambiguous name for an **object** within a given context.	X	X	X	X	X	X
3.34	information:	(In information processing): Knowledge concerning **objects**, such as facts, events, things, processes, or ideas, including **concepts**, that within a certain **context** has a particular meaning. [ISO/IEC 2382]	X					
3.35	information interchange:	The process of sending and receiving **data** in such a manner that the **information** content or meaning assigned to the **data** is not altered during the transmission.	X					X
3.36	international registration data identifier (IRDI):	An internationally unique **identifier** for a **data element**.						X
3.37	keyword:	One or more significant words used for retrieval of **data elements**.		X	X			X
3.38	layout of representation:	The layout of characters in **data element values** expressed by a character string representation.			X			X
3.39	lexical:	Pertaining to words or the vocabulary of a language as distinguished from its grammar and construction.	X				X	