INTERNATIONAL STANDARD

ISO/HL7 21731

First edition
2006-08-01

Corrected version
2012-10-15

Health informatics — HL7 version 3 — Reference information model — Release 1

Informatique de santé — HL7 version 3 — Modèle d'information de référence — Version 1

Reference number
ISO/HL7 21731:2006(E)

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HEALTH LEVEL SEVEN REFERENCE INFORMATION MODEL, RELEASE 1

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

A pilot project between ISO and Health Level Seven Inc. (HL7) has been formed to develop and maintain a group of ISO/HL7 standards in the field of medical devices as approved by Council resolution 7/2002. Under this pilot project, HL7 is responsible for the development and maintenance of these standards with participation and input from ISO member bodies.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/HL7 21731 was prepared by HL7 and Technical Committee ISO/TC 215, *Health informatics*.

This corrected version incorporates important new copyright and licensing agreement information on the cover page of this document.

0 Introduction

This introduction is confined to discussion of the requirement for a Reference Information Model in standardization. Further information on the development of this model and the rational for advancing it as a standard can be found in Annex A.

0.1 Uses of a Reference Information Model (RIM) in Health Informatics

0.1.1 Use of the RIM in ISO TC215

ISO TC215 – Health Informatics has previously advanced ISO 17113, a specification for a framweork for developing health data interchange standards. This framework specification calls for messaging standards to be based on a single, comprehensive model of health information. The RIM presented in the current specification provides one such model. Further, the RIM may provide a reference document that can facilitate the harmonization of the health informatics standards and relaterd specifications within ISO TC 215.

0.1.2 Use of the RIM by HL7

The HL7 RIM is a critical component of the V3 development process. It is the root of all information models and structures developed as part of the V3 development process.

The HL7 V3 standard development process is a model-driven methodology in which a network of inter-related models are developed that depict the static and behavioral aspects of the requirements and design of HL7 standards, as well as the underlying semantics and business rules that govern them.

0 INTRODUCTION

The RIM provides a static view of the information needs of HL7 V3 standards. It includes class and state-machine diagrams and is accompanied by use case models, interaction models, data type models, terminology models, and other types of models to provide a complete view of the requirements and design of HL7 standards. The classes, attributes, state-machines, and relationships in the RIM are used to derive domain-specific information models that are then transformed through a series of constraining refinement processes to eventually yield a static model of the information content of an HL7 standard.

The HL7 V3 standard development process defines the rules governing the derivation of domain information models from the RIM and the refinement of those models into HL7 standard specifications. The rules require that all information structures in derived models be traceable back to the RIM and that their semantic and related business rules not conflict with those specified in the RIM. The RIM therefore is the ultimate source for all information content in HL7 V3 standards.

The RIM is used by HL7 international affiliates to extend HL7 V3 standards to meet local needs. Through a process known as localization, V3 standard specifications are extended using the RIM as the source for new information content. This new information is derived from the RIM and refined in the same manner used to create the original specification.

0.1.3 Uses of the RIM Outside of HL7

The RIM is primarily for use by HL7 and its international affiliates. However, others outside of HL7 have also found the RIM useful. Although HL7 maintains a copyright on the expression of this standard, HL7 does not seek to license or otherwise control the use of information structures or programs that implement this specification. Early adopters of the V3 standards development process have used the RIM to develop HL7-like message specifications in their own environments. These early adopters include vendors, large integrated delivery networks, and government agencies within the United States and internationally. These same early adopters are extremely active in HL7 and provide practical input to the RIM and other aspects of V3 the development process.

Some HL7 member organizations have reported using the RIM as a source of input to their enterprise information architectures or as a starting place for systems analysis and design. The RIM may indeed be useful for such purposes; however, HL7 provides no assurance that the RIM is useful for anything other than as a reference model for HL7 standards development.

The RIM is only one model of healthcare information needs. The abstract style of the RIM and the ability to extend the RIM through vocabulary specifications make the RIM applicable to any conceivable healthcare system information interchange scenario. In fact, it is conceptually applicable to any information domain involving entities playing roles and participating in acts.

The universal applicability of the RIM makes it particularly useful for an organization like HL7 that has to consider the needs of a large and diverse membership. The style of the RIM makes it extremely stable, which is another important characteristic for HL7. The HL7 standards development process calls for the creation of domain specific models derived from the RIM and the incremental refinement of those models into design models that are specific to the problem area. These problem area specific design models narrow the abstractness of the RIM and include constraints on attribute values and class relationships that are use case specific. External organizations considering using the HL7 RIM are advised to adopt a similar process of deriving design models as a transformation of the RIM.

0.2 Further information

Questions or comments about the content of the standard may be addressed to HL7 at (www.hl7.org), to one of the HL7 International Affiliate organizations, or to the Secretariat of ISO TC215 – Health Informatics.

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1 Scope

The Health Level Seven (HL7) Reference Information Model (RIM) is a static model of health and health care information as viewed within the scope of HL7 standards development activities. It is the combined consensus view of information from the perspective of the HL7 working group and the HL7 international affiliates. The RIM is the ultimate source from which all HL7 version 3.0 protocol specification standards draw their information-related content. In the context of ISO TC215 – Health Informatics, the RIM provides a reference model that may be used in developing further health informatics specifications.

2 Conformance

An information model such as the RIM specified in this standard may serve as the basis for other information models that are directly derived from it, and may provide a foundation to support the design of data bases and other information structures. Nevertheless, neither ISO TC 215 nor HL7 believe that it is reasonable to define tests of whether a particular implementation may conform to this standard. Therefore users of this standard shall not claim conformance to this standard. Further, ISO TC215 and HL7, as developers of this standard request that users inform them of particular requirements which caused the users to deviate from this stanard or to extend it. This will allow subsequent releases of the standard to meet a broader range of requirements.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 17113, *Health informatics — Exchange of information between healthcare information systems — Method for development of messages*

ISO/IEC 19501, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

ANSI/HL7 V3 DT, R1-2004, HL7 Version 3 Standard: Data Types — Abstract Specification, Release 1

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
ANSI
American National Standards Institute

4.2
association
A reference from one class to another class or to itself, or a connection between two objects (instances of classes).

4.3
association role name
A name for each end of an association. The name is a short verb phrase depicting the role of the class at the opposite end of the association from the perspective of the class adjacent to the role.

4.4
attribute
An abstraction of a particular aspect of a class. Attributes become the data values that are passed in HL7 messages.

4.5
bag
A form of collection whose members are unordered, and need not be unique.

4.6
cardinality
Property of a data element (the number of times a data element may repeat within an individual occurrence of an object view).

4.7
class
An abstraction of a thing or concept in a particular application domain.

4.8
classifier attribute
An attribute used in generalization hierarchies to indicate which of the specializations is the focus of the class .

4.9
coded attribute
An attribute in the Reference Information Model (RIM) with a base data type of CD, CE, CS, or CV.

4.10
coding strength
An extensibility qualifier that specifies whether or not a code set can be expanded to meet local implementation needs.

4.11
coding system
A scheme for representing concepts using (usually) short concept identifiers to denote the concepts that are members of the system; defines a set of unique concept codes. Examples of coding systems are ICD-9, LOINC and SNOMED.

4.12
collection
An aggregation of similar objects. The forms of collection used by HL7 are set , bag, and list. Objects which may be found in collections include data types.

4.13
connection
In an information model, a specified relationship between two classes .

4.14
data type
The structural format of the data carried in an attribute. It may constrain the set of values an attribute may assume.

4.15
distal class
From the perspective of a class in an information model, it is the class at the opposite end of an association between the two.

4.16
domain
1. A particular area of interest. For example, the domain for HL7 is healthcare.

2. The set of possible values of a data type , attribute, or data type component. See also vocabulary domain.

4.17
event

1. A stimulus that causes a noteworthy change in the state of an object, or a signal that invokes the behavior of an object.

2. A vocabulary domain value for Mood.

4.18
extensibility qualifier
A vocabulary domain qualifier used in a domain specification, which indicates whether or not the existing vocabulary domain can be extended with additional values. There are two possible values: CNE (coded, no extension) and CWE (coded with extension).

4.19
generalization
An association between two classes, referred to as superclass and subclass, in which the subclass is derived from the superclass. The subclass inherits all properties from the superclass, including attributes, relationships, and states, but also adds new ones to extend the capabilities of the parent class. Essentially, a specialization from the point-of-view of the subclass.

4.20
generalization hierarchy
All superclasses and subclasses with a common root superclass.

4.21
graphical expression
A visual representation of a model that uses graphic symbols to represent the components of the model and the relationships that exist between those components.

4.22
Health Level Seven
HL7
A standards developing organization based in the United States of America.

4.23
identifier attribute
An attribute used to identify an instance of a class.

4.24
information model
A structured specification, expressed graphically and/or narratively, of the information requirements of a domain. An information model describes the classes of information required and the properties of those classes, including attributes, relationships, and states. Examples in HL7 are the Domain Reference Information Model, Reference Information Model, and Refined Message Information Model.

4.25
inheritance
In a generalization relationship, the subclass inherits all properties from the superclass, including attributes, relationships, and states, unless otherwise specified.

4.26
instance
A case or an occurrence. For example, an instance of a class is an object.

4.27
list
A form of collection whose members are ordered, and need not be unique.

4.28
literary expression
A representation of a model in text. The literary expression seeks to balance the need for a rigorous, unambiguous description of the model with the need for a rendition that can be easily read and interpreted by individuals who understand the general concepts underlying object-oriented models, but who may not be schooled in formal model definition languages.

4.29
mandatory
If an attribute is designated as mandatory, all message elements which make use of this attribute must contain a non-null value or they must have a default that is not null.

4.30
mandatory association
An association with a multiplicity minimum greater than zero on one end. A fully mandatory association is one with a multiplicity minimum greater than zero on both ends.

4.31
methodology
Methods or rules followed in a particular discipline.

4.32
model
A representation of a domain that uses abstraction to express the relevant concepts.

4.33
multiplicity
In the information model, multiplicity is a specification of the minimum and maximum number of objects from each class that can participate in an association. Multiplicity is specified for each end of the association.

4.34
namespace
A namespace is a part of the model in which names are defined and used, where each name has a unique meaning.

4.35
object
An instance of a class. A part of an information system containing a collection of related data (in the form of attributes) and procedures (methods) for operating on that data.

4.36
object identity
The feature that the existence of an object is independent of any values associated with the object.

4.37
object-based
Any method, language, or system that supports object identity, classification, and encapsulation. An object-based system does not support specialization. Ada is an example of an object-based implementation language.

4.38
property
Any attribute, association, method, or state model defined for a class or object.

4.39
Reference Information Model
RIM
The HL7 information model from which all other information models (e.g., R-MIMs) and messages are derived.

4.40
role
1. A function or position.

2. A Reference Information Model class that defines the competency of an Entity class. Each role is played by one Entity (the Entity that is in the role) and is usually scoped by another.

3. In UML, each end of an association is designated as a role to reflect the function that class plays in the association.

4.41
role name
See association role name.

4.42
set
A form of collection which contains an unordered list of unique elements of a single type.

4.43
specialization
An association between two classes (designated superclass and subclass), in which the subclass is derived from the superclass. The subclass inherits all properties from the superclass, including attributes, relationships, and states, but also adds new ones to extend the capabilities of the superclass.

4.44
state
A named condition of a class instance (object) that can be tested by examination of the instance's attributes and associations.

4.45
state attribute
An attribute describing the current state of an object.

4.46
state diagram
A graphical representation of a state transition model showing states as vertices (nodes) and state transitions as directed arcs (arrows) between the nodes.

4.47
state machine
A description of the life cycle for instances of a class, defined by a state transition model.

4.48
state transition
A change in the state of an object, as a result of a change in its attributes or associations.

4.49
state transition model
A graphical representation of the life cycle of a class. The model depicts all of the relevant states of a class, and the valid transitions from state to state.

4.50
subclass
A class that is the specialization of another class (superclass).

4.51
subject area
A convenient aggregation of model classes used to partition large models into manageable subsets.

4.52
sub-state
An identifiable state of a class that has a more specific definition than, and is entirely encompassed within the scope of, its super-state.

4.53
superclass
A class that is the generalization of one or more other classes (subclasses).

4.54
super-state
A state of a class that encompasses two or more independent sub-states.

4.55
Unified Modeling Language (UML)
A language for the creation of domain models. UML was created in order to unify several well-known object-oriented modeling methodologies, including those of Booch, Rumbaugh, Jacobson, and others.

4.56
vocabulary
The set of valid values for a coded attribute or field.

4.57
vocabulary domain
The set of all concepts that can be taken as valid values in an instance of a coded attribute or field; a constraint applicable to code values.

4.58
vocabulary domain qualifier
Part of a vocabulary domain specification. The two existing qualifiers are extensibility and realm.

4.59
W3C
The World Wide Web Consortium, an international industry consortium

5 Interpretation of the Specification

5.1 Specification contents

The RIM consists of classes assigned to one or more subject area packages. Attributes, Relationships, and State Machines are associated with classes.

Each class within the RIM represents information about a concept that must be documented and communicated within the health care environment. The names that are assigned to these classes are drawn from normal language, but the use of these names is necessarily constrained to the "namespace" of the RIM. The meaning of these classes is entirely embodied in the definition of the class, and the definitions of the properties (attributes and associations) assigned to that class. Thus, for example, the meaning of the "Role" class can only be understood by studying the definition provided and the properties assigned. Definitions from another context or dictionary definitions for the name are not relevant within the context of the RIM namespace.

The RIM is expressed using the Unified Modeling Language (UML) with HL7 specific tags as extensions to the UML model element metadata. All standard UML model element metadata values are normative but only the following HL7 extensions are also normative:

- Class.stateAttribute
- Class.classCode

