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Health informatics — Service architecture (HISA) —

Part 3: Computational viewpoint

Informatique de santé — Architecture de service —

Partie 3: Point de vue informatique

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 215, *Health informatics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 251, *Health informatics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 12967-3:2009), which has been technically revised. The main changes compared to the previous edition are as follows:

— use of terms, definitions and concepts from ISO 13940:2015 (Contsys);

— reference to further standards, such as HL7® and FHIR®;

— updates to the Bibliography.

A list of all parts in the ISO 12967 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 12967 series specifies fundamental requirements for 'information infrastructure' and provides guidance for the description, planning and development of new systems as well as for the integration of existing information systems, both within one enterprise and across different healthcare organizations through an architecture integrating the common data and business logic into a specific architectural layer (i.e. the healthcare specific service architecture), distinct from individual applications and accessible throughout the whole information system through information services, as shown in Figure 1.

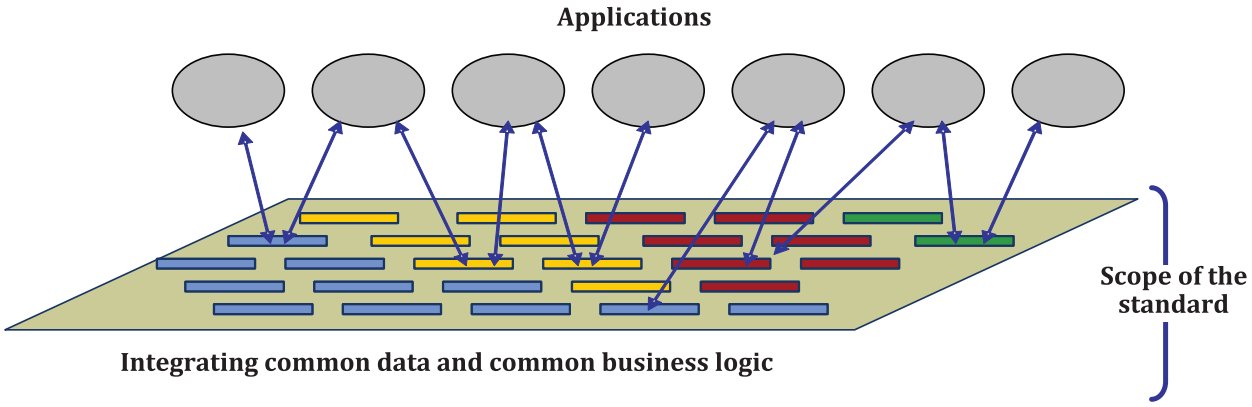

Figure 1 — Scope of the ISO 12967 series

The overall architecture is formalized according to ISO/IEC 10746 (all parts) and is therefore structured through the following three viewpoints.

a) Enterprise viewpoint: specifies a set of fundamental common requirements at enterprise level with respect to the organizational purposes, scopes and policies that should be supported by the information and functionality of the service architecture. It also provides guidance on how one individual enterprise (e.g. a regional healthcare authority, a large hospital or any other organization where this model is applicable) can specify and document additional specific business requirements, with a view to achieving a complete specification, adequate for the characteristics of that enterprise.

   Enterprise viewpoint is specified in ISO 12967-1.

b) Information viewpoint: specifies the fundamental semantics of the information model to be implemented by the service architecture to integrate the enterprise's common data and to support the enterprise requirements formalized in ISO 12967-1. It also provides guidance on how one individual enterprise can extend the ISO 12967 series information model with additional concepts needed to support local requirements in terms of information to be put in common.

   Information viewpoint is specified in ISO 12967-2.

c) Computational viewpoint: specifies the scope and characteristics of the information services that should be provided by the service architecture for allowing access to the common data as well as for the execution of the business logic supporting the enterprise processes identified in the information viewpoint and in ISO 12967-1. It also provides guidance on how one individual enterprise can specify additional information services needed to support local specific requirements in terms of common business logic to be implemented.

   Computational viewpoint is specified in this document.

ISO 12967-1:2020, Annex C includes an explanation of ISO 23903:—[1)] and its relevance in regard to the ISO 12967 series, for integration with other International Standards such as ISO 13940.

1) Under preparation. Stage at the time of publication: ISO/DIS 23903:2020.

Health informatics — Service architecture (HISA) —

Part 3: Computational viewpoint

1 Scope

This document specifies the fundamental characteristics of the computational model implemented by a specific architectural layer of the information system (i.e. the service architecture) to provide a comprehensive and integrated interface to the common enterprise information and to support the fundamental business processes of the healthcare organization, as defined in ISO 12967-1. The computational model is specified without any explicit or implicit assumption about the physical technologies, tools or solutions to adopt for its physical implementation in the various target scenarios. The specification is nevertheless formal, complete and non-ambiguous enough to allow implementers to derive an efficient design of the system in the specific technological environment which will be selected for the physical implementation.

The computational model specified in this document provides the basis for ensuring consistency between different engineering and technology specifications (including programming languages and communication mechanisms) since they are intended to be consistent with the same computational object model. This consistency allows open inter-working and portability of components in the resulting implementation.

This document does not aim at representing a fixed, complete, specification of all possible interfaces that might be necessary for any requirement of any healthcare enterprise. It specifies only a set of characteristics — in terms of overall organization and individual computational objects, identified as fundamental and common to all healthcare organizations, and that are satisfied by the computational model implemented by the service architecture.

Preserving consistency with the provisions of this document, physical implementations of the computational model specified in this document can allow extensions in order to support additional and local requirements. Extensions can include both the definition of additional properties of the objects of the computational model specified in this document and the implementation of entirely new objects.

Also, the computational model specified in this document can be extendable over time according to the evolution of the applicable standardization initiatives, in accordance to the methodology defined in ISO 12967-1:2020, Clause 7, which identifies a set of healthcare common information services, describing the requirements behind them and the methodology through which they will be used.

The information services specified in this document are only the minimal set identifiable according to the identified requirements of the healthcare enterprise, and constituting the service architecture (i.e. the integration platform) to serve as the basis for healthcare applications, e.g. EHR or patient administration.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12967-1:2020, *Health informatics — Service architecture — Part 1: Enterprise viewpoint*

ISO 12967-2:2020, *Health informatics — Service architecture — Part 2: Information viewpoint*

3 Terms and definitions

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

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/

3.1
interface
abstraction of the behaviour of an object which consists of a subset of the possible interaction mechanisms of that object, together with the set of constraints when that interaction occurs

3.2
computational object
object as seen in a computational viewpoint representing the functional decomposition of a system showing a state and behaviour as well as interactions through interfaces with other computational objects

3.3
subject of care
patient
subject of healthcare
healthcare actor with a person role; who seeks to receive, is receiving, or has received healthcare

[SOURCE: ISO 13940:2015, 5.2.1, modified — Note and examples omitted.]

4 Abbreviated terms

EHR Electronic Health Record

HISA Health Informatics — Service Architecture

ODP Open Distributed Processing

UML Unified Modeling Language

5 Methodological principles

5.1 General

This document encompasses the computational viewpoint, which is concerned in answering HISA design aspects through the functional decomposition of the system into a set of computational objects that interact at interfaces, also enabling distribution. HISA will thus be further specified in terms of computational objects, which manage information and provide services, and their interfaces, starting from the clusters of objects identified in ISO 12967-1 and further detailed in ISO 12967-2.

5.2 Clusters of objects

ISO 12967-1 has identified the scope, need for, and use of the ISO 12967 series by both developers and end users. It has described the scope of the business objects from the organization's viewpoint, by summarizing the related user activities and requirements through natural language. During this process the main healthcare common clusters of objects have been identified in ISO 12967-1:

a) Subject of care objects

These objects handle the information necessary for supporting the users' activities that are identified in the "Subject of care workflow".

b) Activity management objects

These objects handle the information necessary for supporting the users' activities that are identified in the "Activity Management workflow".

c) Healthcare information objects

These objects handle the information necessary for supporting the users' activities that are identified in the "Healthcare Information workflow".

d) Users and authorization objects

These objects handle the information necessary for supporting the users' activities related to the management of users and authorizations.

e) Resources objects

These objects handle the information necessary for supporting the users' activities related to the management of resources.

f) Classification objects

These objects handle the information necessary for supporting the users' activities related to the management of classifications, coding criteria and dictionaries.

g) Messaging objects

These objects handle the information necessary for supporting the structuring of data and the communications with other systems through messaging mechanisms.

ISO 12967-2 has formalized the conceptual model of the information being manipulated by the information services, derived from the textual descriptions contained in ISO 12967-1. For each of the clusters of objects, an information model composed of information objects has been identified in ISO 12967-2.

This document defines the computational model, composed of computational objects, capable of meeting the requirements described in ISO 12967-1. It is necessary in this document to identify its relationship to the information model, and the interfaces or access mechanisms it provides to access and manipulate the information handled by the system, which are also referred to as 'methods' but more appropriately they are in the following referred to as 'information services'.

The individual information services provided by the computational objects are described illustrating how they allow actual access to the information handled by the system (identifying the interfaces, the constraints, as well as which information of the underlying overall information model is accessed), and eventual parallel actions to be taken.

5.3 Computational language

This document is directly concerned with the distribution of processing but not with the interaction mechanisms that enable distribution to occur. The computational specification decomposes the system into objects performing individual functions and interacting at well-defined interfaces.

The heart of the computational language is the computational object model, which constrains the computational specification by defining:

— the form of interface that an object can have;

— the way the interfaces can be bound and the forms of interaction which can take place at them;

— actions an object can perform, in particular the creation of new objects and interfaces.

5.4 The computational objects and interfaces

The computational objects provide the interfaces through which it is possible to access and manipulate the information managed by the information objects described in the information viewpoint. Each cluster itself can be seen as a computational object, providing several interfaces that comprise all interfaces of the information objects belonging to such cluster. The computational objects are defined at the level of the HISA object.

For each cluster of objects, there will be a set of computational objects providing interfaces allowing the management of the common information and business logic relevant to the organization. Two types of computational object are foreseen per cluster:

— 'basic' computational objects deriving directly from the corresponding information object (i.e. one computational object per information object);

— higher-level eHealth-business related computational objects providing interfaces achieving higher-level business logic.

Thus, the majority of the computational objects will be derived directly from the corresponding information objects. The further higher-level computational objects also envisaged provide interfaces achieving higher-level eHealth business logic on possibly multiple information objects within the same operation. Such eHealth business logic is described in ISO 12967-1 and has to do with the main workflow processes (i.e. patient management, activity management, etc.).

The basic computational objects, corresponding one-to-one to the information objects, will be equipped with standardized lower-level basic interfaces having the scope of creating, reading, updating and deleting — in short maintaining, listing, and getting one instance of — the main classes described in the information viewpoint.

These basic information services allow the access to and the manipulation of each element of the underlying model. Their availability secure the openness of the system.

Figure 2 shows an example.

Figure 2 — Example of "basic services"

NOTE 1 The basic services are detailed in 6.2.

The higher-level computational objects implement eHealth business-related transactions on the objects of the information model, simplifying and ensuring consistency of developments and allowing the building up of common fundamental procedures of the organization.

Figure 3 shows an example of the possible information handled by an "eHealth business-related information service"

EXAMPLES

— Patient/person area: registering a person, patient administration, merging patient identifiers, period of care, etc.;

— Activity management and life cycle: requests, planning, booking, etc.;

— Clinical and EHR: terminologies, classifications, problem-orientation, etc.;

— Resource management: standard usages, etc.

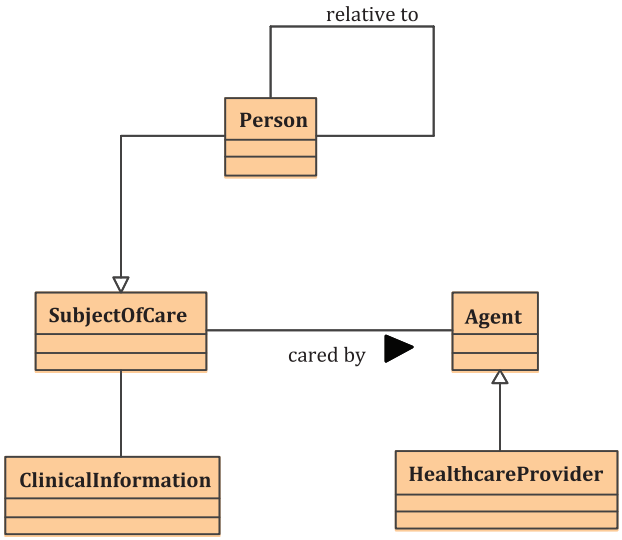

Figure 3 — Example of the information handled by an "eHealth business-related information service"

NOTE 2 The eHealth business-related information services are detailed in 6.4.

The HISA service architecture also provides a set of interfaces relating to functionalities of general utility for the management of the overall system, with respect to the execution of particular functionalities.

These services do not pertain to any specific cluster of objects, and are related to general-purpose issues like session management (e.g. when consumer programs and services are communicating back and forth, logging in and out of the system, etc.), transaction management, setting system variables, etc. These information services will be provided by at least a further computational object equipped with appropriate services, namely the general-purpose interface.

5.5 Interactions

Three types of interaction are envisaged in ODP: signals, operations and flows. Signals are single actions conveying data from one object to another, while operations can be seen as “client-server” interactions between objects in which the server object elaborates the data provided by the client or better ‘consumer’, sending back a result. Flows can be considered as a sequence of interactions (i.e. information exchanges) between objects pertaining to a specific domain.

The interaction type is part of the interface signature. In HISA the focus is on the interaction type operation. For this reason, it will not be explicitly referred to in this specification. Such interaction type implies the need to identify for each computational object the role it plays in the client-server interaction. However, HISA prescribes the general external characteristics through which each identified computational object provides interfaces, while the interaction amongst the computational objects is not part of this document. Thus, the role is always “server”.

NOTE Of the three types of interaction, operations are the ones that present the service-oriented call/return, or client-server pattern required in the service architecture. The other interaction types can, when necessary, be described as particular type of operations.

6 General characteristics of the model

6.1 The two types of computational objects for handling the information

The computational objects provide the interfaces through which it is possible to access and manipulate the information managed by the information objects described in the information viewpoint. An example of the two types of computational objects is displayed in Figure 4 and shall be referred to in the following as 'basic' and eHealth business-related' computational objects according to the terminology adopted in 5.4. The information services that these will expose shall also be referred to in the following as 'basic' and business-related'.

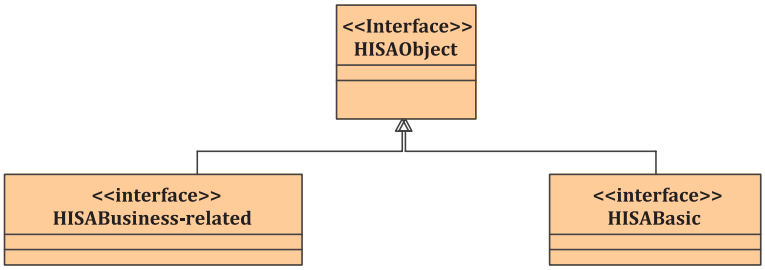

Figure 4 — types of computational object

6.2 The 'basic' information services

6.2.1 General requirements

For each class belonging to the seven clusters of objects defined in ISO 12967-1 and specified in the information viewpoint, the service architecture shall be equipped with a computational object each of which is in turn equipped with a set of information services allowing to access and to manipulate every concept (i.e. objects and properties) of the class. The generic structure is displayed in Figure 5.

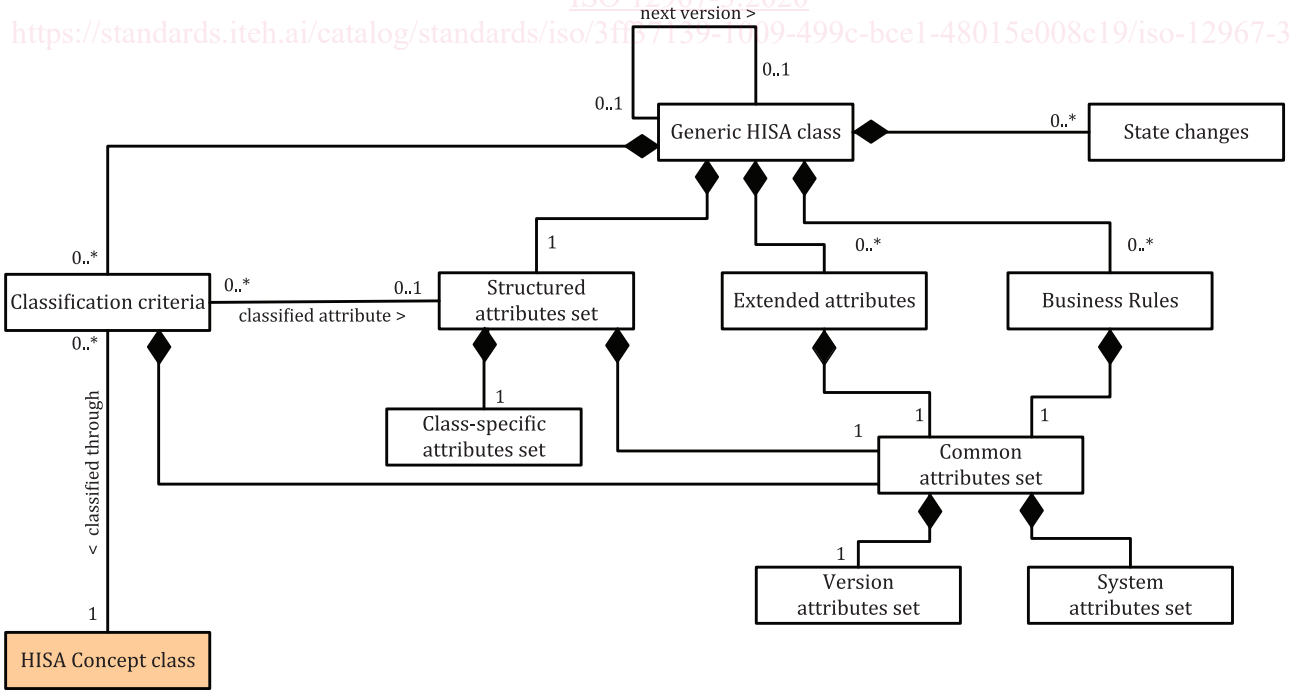

Figure 5 — Generic structure of the computational objects