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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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The committee responsible for this document is ISO/TC 215, Health informatics.

This second edition is a revision of, cancels and replaces the first edition (ISO 12967-3:2009), which was based on the European Standard EN 12967-3:2007.

ISO 12967 consists of the following parts, under the general title Health informatics — Service architecture:

— *Part 1: Enterprise viewpoint*

— *Part 2: Information viewpoint*

— *Part 3: Computational viewpoint*

The main changes compared to the previous edition of this part (part 3, computational viewpoint) are as follows:

— Use of terms, definitions and concepts from parts 1 and 2 of ISO 12967, in turn aligned with ISO 13490:2016 (Contsys)

— Reference to further standards, such as HL7 and FHIR, the latter of which is treated in new Annex B with respect to the HISA service architecture

— Updating regarding text, tables, etc. related based on the revision of parts 1 and 2 of this 3-part standard, aligned in turn with ISO 13940:2016 Contsys

— Updates to the Bibliography

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Introduction

ISO 12967 is a multi-part standard that 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 service architecture), distinct from individual applications and accessible throughout the whole information system through information services, as shown in Figure 1.

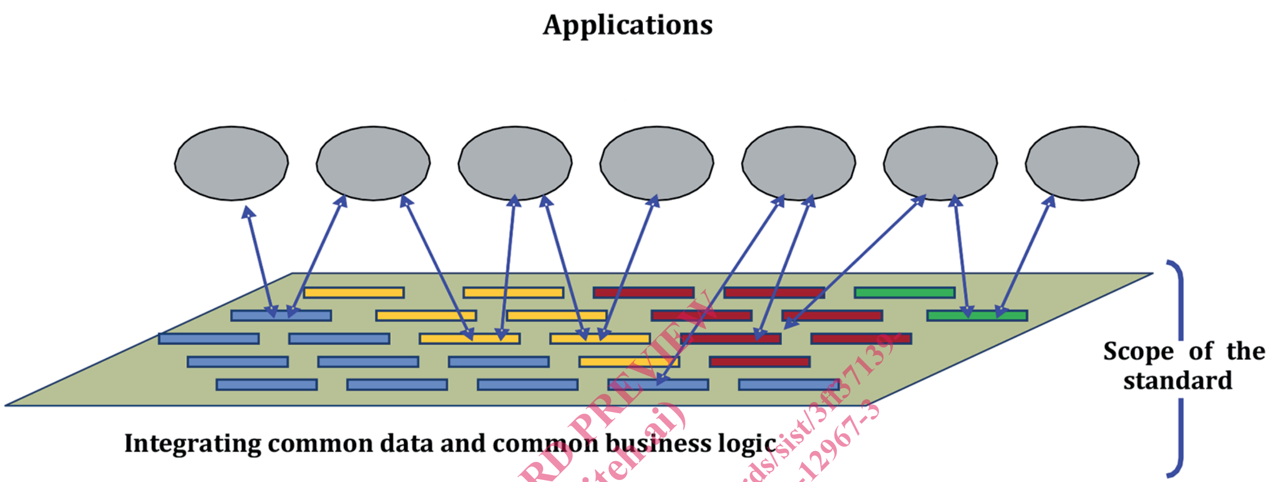

Figure 1 — Scope of this International Standard

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The overall architecture is formalized according to ISO/IEC 10746 (all parts)[10][11][12][13] 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 must 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 standard 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 must 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 requirements in terms of common business logic to be implemented.

   Computational viewpoint is specified in this part of ISO 12967.

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Health informatics — Service Architecture (HISA) —

Part 3: Computational viewpoint

1 Scope

HISA specifies fundamental requirements for 'information infrastructure' and healthcare specific ‘service architecture’.

This part of ISO 12967 specifies the fundamental characteristics of the computational model to be 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 be adopted 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 provides the basis for ensuring consistency between different engineering and technology specifications (including programming languages and communication mechanisms) since they must be consistent with the same computational object model. This consistency allows open inter-working and portability of components in the resulting implementation.

This specification does not aim at representing a fixed, complete, specification of all possible interfaces that may 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 part of ISO 12967, physical implementations shall allow extensions to the standard computational model in order to support additional and local requirements. Extensions shall include both the definition of additional properties in the objects of the standard model and the implementation of entirely new objects.

Also, this standard specification shall be extendable over time according to the evolution of the applicable standardization initiatives. The specification of extensions shall be carried out according to the methodology defined in Clause 7 of ISO 12967-1:2019, which identifies a set of healthcare common information services, describing their need and the methodology through which they will be used.

These information services are only the minimal set identifiable according to the needs 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 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 12967-1:2019, *Health informatics — Service architecture — Part 1: Enterprise viewpoint*

ISO 12967-2:2019, *Health informatics — Service architecture — Part 2: Information viewpoint*

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3 Terms and definitions

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

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

4 Abbreviations

EHR Electronic Health Record

HISA Health Informatics - Service Architecture

ODP Open Distributed Processing

UML Unified Modelling Language

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5 Methodological principles

5.1 General

This part of ISO 12967 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. The 'Health Informatics - Service Architecture' 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 HISA standard by both developers and end users. It has described the scope of the business objects from the organization's viewpoint, by summarising the related user activities and requirements through natural language. During this process the main healthcare common clusters of objects have been identified:

1) Subject of care objects

These objects handle the information necessary for supporting the users' activities identified in the "Subject of Care workflow" of ISO 12967-1.

2) Activity management objects

These objects handle the information necessary for supporting the users' activities identified in the "Activity Management workflow" of ISO 12967-1.

3) Healthcare information objects

These objects handle the information necessary for supporting the users' activities identified in the "Healthcare Information workflow" of ISO 12967-1.

4) Users and authorization objects

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These objects handle the information necessary for supporting the users' activities related to the management of users and authorizations, as identified in ISO 12967-1.

5) Resources objects

These objects handle the information necessary for supporting the users' activities related to the management of resources, as identified in ISO 12967-1.

6) Classification objects

These objects handle the information necessary for supporting the users' activities related to the management of classifications, coding criteria and dictionaries, as identified in ISO 12967-1.

7) Messaging objects

These objects handle the information necessary for supporting the structuring of data and the communications with other systems through messaging mechanisms, as identified in ISO 12967-1

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 part of ISO 12967 defines the computational model, composed of computational objects, capable of meeting the requirements described in ISO 12967-1. It is necessary here to identify its relationship to the information model, and the interfaces or access mechanisms it provides to access the information handled by the system, which may also be 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.

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5.3 Computational language

This part of ISO 12967 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.

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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.).

NOTE The term patient is used in this specification as a synonym of subject of care as has been done in the other parts of ISO 12967.

The basic computational objects, corresponding one-to-one to the information objects, will be equipped with standard 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.

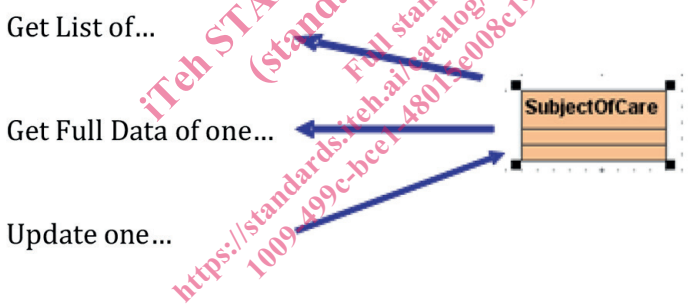

Figure 2 — Example of "basic services"

NOTE 1 The actual basic services that shall be available for HISA objects 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.

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.

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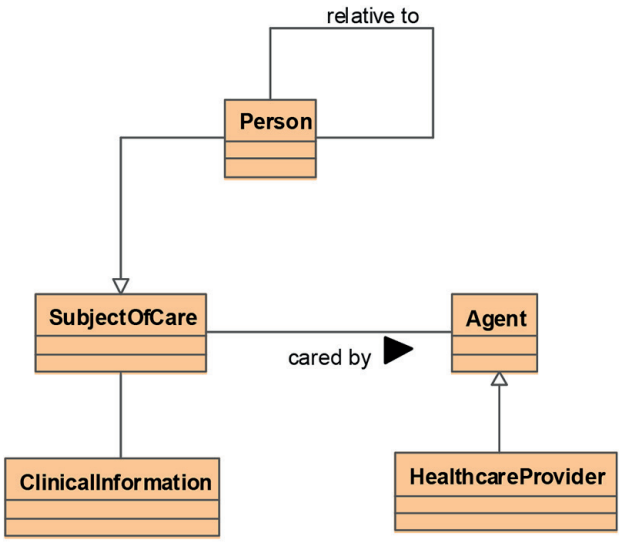

Figure 3 — Example of an "eHealth business-related information service"

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NOTE 2 The actual eHealth business-related information services that shall be available for HISA objects 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 part of ISO 12967. 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

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