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Contents

Foreword

This document (prEN 12967-3:2006) has been prepared by Technical Committee CEN/TC 251 “Health Informatics”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

This is part 3 of a multipart standard under the general title Health informatics – Service architecture with the following parts:

Part 1: Enterprise viewpoint

Part 2: Information viewpoint

Part 3: Computational viewpoint

Introduction

This document represents the third part of EN 12967, 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 organisations through an architecture integrating the common data and business logic into a specific architectural layer (i.e. the middleware), distinct from individual applications and accessible throughout the whole information system through services, as shown in figure 1.1.

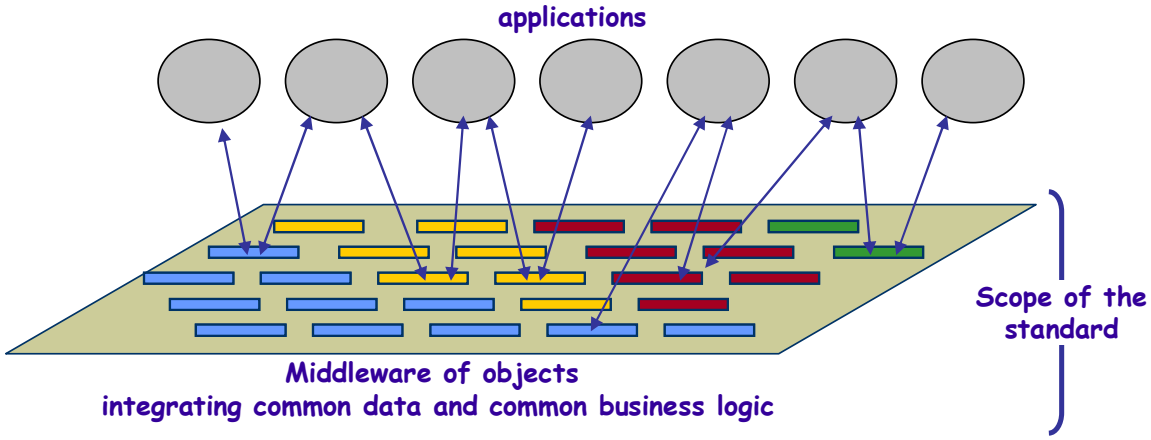

Figure 1 — Scope of this standard

The overall architecture specified by the EN 12967 standard is formalised according to the ISO/IEC 10746 criteria and is therefore structured through the three viewpoints:

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

   The Enterprise Viewpoint is specified in Part 1 of the standard; document EN 12967-1

b) The Information Viewpoint that specifies the fundamental semantics of the information model to be implemented by the middleware to integrate the common enterprise data and to support the enterprise requirements formalised in the Enterprise Viewpoint. It also provides guidance on how one individual enterprise may extend the standard model with additional concepts, needed to support local requirements in terms of information to be put in common.

   The Information Viewpoint is specified in Part 2 of the standard; document EN 12967-2

c) The Computational Viewpoint that specifies the scope and characteristics of the services that must be provided by the middleware for allowing the access to the common data as well as the execution of the business logic supporting the enterprise processes identified in the Information and Enterprise Viewpoints. It also provides guidance on how one individual enterprise may specify additional services, needed to support local specific requirements in terms of business logic to be put in common.

   The Computational Viewpoint is specified in this document, representing Part 3 of the standard; document EN 12967-3

1 Scope

HISA specifies fundamental requirements for 'information infrastructure' and healthcare specific middleware services.

This part of the standard specifies the fundamental characteristics of the computational model to be implemented by a specific architectural layer of the information system (i.e. the middleware) to provide a comprehensive and integrated interface to the common enterprise information and to support the fundamental business processes of the healthcare organisation, as defined in document “Health Informatics – Service Architecture - Part 1: Enterprise Viewpoint”. The computational model is specified without any –explicit or implicit- assumption on 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 that 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 organisation and individual computational objects- identified as fundamental and common to all healthcare organisations, and that shall be satisfied by the computational model implemented by the middleware.

Preserving the consistency with the provisions of this standard, 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 extensible over time according to the evolution of the applicable standardisation initiatives. The specification of extensions shall be carried out according to the methodology defined in § 7 “Methodology for extensions” of document EN 12967-1 “Health Informatics – Service Architecture - Part 1: Enterprise Viewpoint”, which identifies a set of healthcare common information services, describing their need and the methodology through which they will be used. These are only the minimal identifiable set according to the needs of the healthcare enterprise, and constituting the 'middleware' platform (i.e. integration platform) to serve as the basis for healthcare applications, e.g. EHCR or patient administration.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ENV 12967-1: 1997	Medical Informatics – Healthcare Information System Architecture Part 1 (HISA) – Healthcare Middleware Layer
ISO/IEC 10746-1:1998	Information technology – Open Distributed Processing – Reference model: Overview
ISO/IEC 10746-2:1996	Information technology – Open Distributed Processing – Reference model: foundations
ISO/IEC 10746-3:1996	Information technology – Open Distributed Processing – Reference model: Architecture
ISO/IEC 10746-4:1998	Information technology – Open Distributed Processing – Reference model: Architectural semantics

3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1
interface
abstraction of the behaviour of an object that 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

HISA Health Informatics - Service Architecture

ODP Open Distributed Processing

5 Methodological Principles (informative)

This part three of the standard encompasses the computational viewpoint, which is concerned in answering HISA middleware 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 part 1 Enterprise Viewpoint and further detailed in part 2 Information Viewpoint.

5.1 Clusters of Objects

The **Enterprise Viewpoint** has identified the scope, need and use of the HISA standard by both developers and end users. It has described the scope of the business objects from the organisation 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 the Enterprise Viewpoint

2. **Activity management objects**

   These objects handle the information necessary for supporting the users' activities identified in the "Activity Management workflow" of the Enterprise Viewpoint.

3. **Clinical information objects**

   These objects handle the information necessary for supporting the users' activities identified in the "Clinical Information workflow" of the Enterprise Viewpoint.

4. **Users and authorisation objects**

   These objects handle the information necessary for supporting the users' activities related to the management of users and authorisations, as identified in the Enterprise Viewpoint

5. **Resources objects**

These objects handle the information necessary for supporting the users' activities related to the management of resources, as identified in the Enterprise Viewpoint.

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 the Enterprise Viewpoint.

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 the Enterprise Viewpoint.

The **Information Viewpoint** has formalised the conceptual model of the information being manipulated by the services, descending from the textual descriptions contained in the Enterprise Viewpoint. For each of the clusters of objects, an information model composed of information objects has been identified in the information viewpoint.

This **Computational Viewpoint** shall define the computational model, composed of computational objects, capable of meeting the requirements described in the Enterprise Viewpoint. It is necessary here to identify its relationship to the information model, and the mechanisms it provides to access the information handled by the system (i.e. methods or services).

The individual methods provided by the computational objects shall be described illustrating how they allow to actually access the information handled by the system, identifying the interfaces of each, the constraints, as well as which information of the underlying overall information model are accessed and eventual parallel actions are taken. The scope of the interfaces for each cluster of objects is outlined, and the system will be illustrated in more detail through a textual and formal specification of the interfaces to use the services (also called the "access mechanisms").

5.2 Computational language

The computational viewpoint 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
- the actions an object can perform, in particular the creation of new objects and interfaces.

5.3 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 interfaces that comprise all interfaces of the objects belonging to such cluster. The computational objects shall be defined at the level of the HISA object.

For each cluster 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 objects are foreseen per cluster:

- Computational objects deriving directly from the corresponding information object (i.e. one computational object per information object),

- Higher-level computational objects providing interfaces achieving higher-level complex business logic.

Thus, the majority of the computational objects shall derive directly from the corresponding information objects. The further higher-level of computational objects also envisaged, shall be providing interfaces achieving higher-level complex business logic on possibly multiple information objects within the same operation. Such more complex business logic is described in the Enterprise Viewpoint and has to do with the main workflow processes (i.e. patient[1] management, activity management, etc.).

The basic computational objects, corresponding to the information objects, will be equipped with *standard* lower-level **basic** interfaces having the scope of *adding, updating and deleting –in short maintaining-*, *listing*, and *getting one instance* of the main classes described in the information viewpoint. These basic methods allow the access to and the manipulation of each element of the underlying model and secure the openness of the system.

An exemplification is found in the following figure.

Figure 2 — An example of a "basic services"

The higher-level computational objects implement more complex business transactions on the objects of the information model, simplifying and ensuring consistency of developments and building common fundamental procedures of the organisation.

Examples are:

- Patient/person area, including registering a person, Patient Administration (ADT), merging patient identifiers, period of care, etc.
- Activity management and life cycle, including requests, planning, booking, etc.
- Clinical and EHC record, including terminologies, classifications, problem-orientation, etc.
- Resource management, including standard usages, etc.

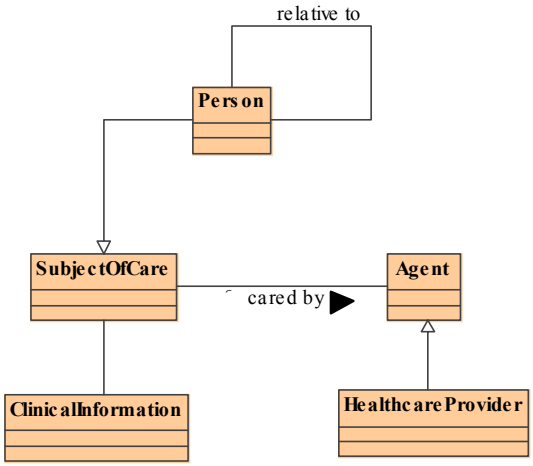

Figure 3 — An example of "complex service"

[1] In this specification, the term patient shall sometimes be used for Subject of Care.

The HISA middleware shall also provide 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 middleware component, and are related to general-purpose issues like session management (logging and out of the system, setting system variables, etc.), transaction management, etc.

5.4 Interaction

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, 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 we shall focus 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 the standard. Thus, the role shall always be “server”.

6 General characteristics of the Model

6.1 The two types of computational objects

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. The two types of computational objects are displayed in the following figure, and shall be referred to in the following as “basic” and “complex” computational objects according to the terminology adopted in section 5.3. The methods that these will expose shall also be referred to in the following as “basic” and “complex”.

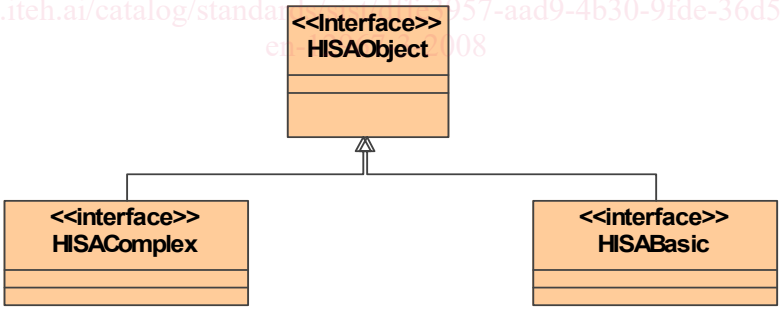

Figure 4 — The two types of computational objects

6.2 The basic methods

6.2.1 General requirement

For each class belonging to the seven clusters of objects defined in the information viewpoint the middleware shall be equipped with a computational object equipped with a set of methods allowing to access and to manipulate every concept (i.e. objects and properties) of the class, the generic structure of which is displayed in the following figure.