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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

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.
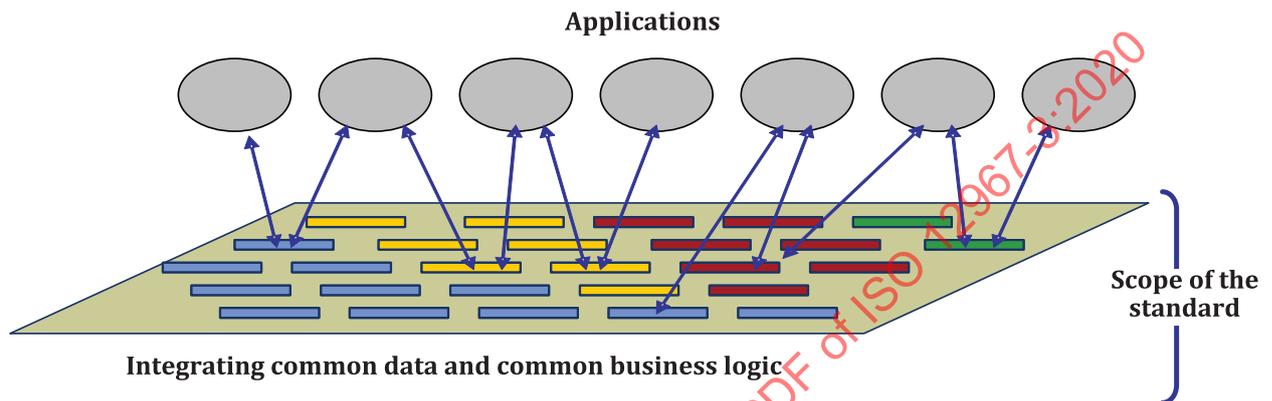
Figure 1 — Scope of the ISO 12967 series

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.

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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.
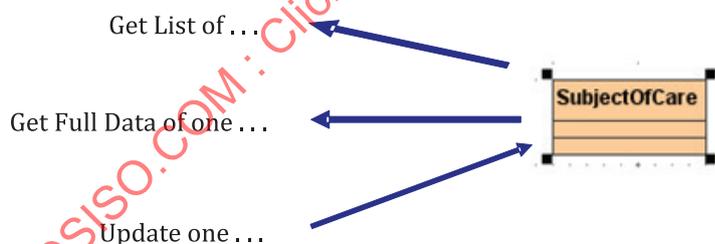
Figure 2 — Example of "basic services"

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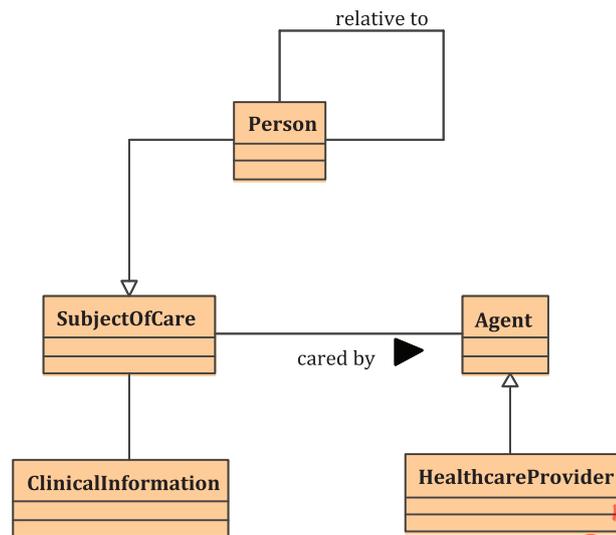
Figure 3 — Example of the information handled by an "eHealth business-related information service"

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'.
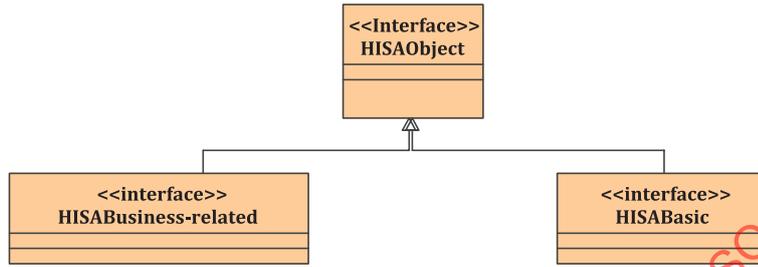
Figure 4 — types of computational object

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

The following information services shall be available in the basic computational objects. Each information service has a scope and a description. Many of the information service specification tables also include an example.

6.2.2 'Add' basic information services

6.2.2.1 General

The "add" information services shall allow the client of the computational object to create instances of HISA objects.

6.2.2.2 List of information services

6.2.2.2.1 Information service add

Information service	add
Scope	Shall be used to create a new instance of a HISA object.
Description	The instances that shall be added are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The instance, its class-specific attribute set, and the common system and version properties shall be created through this information service.
Example	The addition of a new person in the system shall be accomplished by calling the add information service of the person computational object [Person.add]. The caller will pass as input several fields belonging to the class-specific attribute set (id, name, birthTime, deceasedTime, gender, address, etc.). The information service shall also allow the user to pass information to override any default value for its common system and version-related attributes.

6.2.2.2.2 Information service Xadd

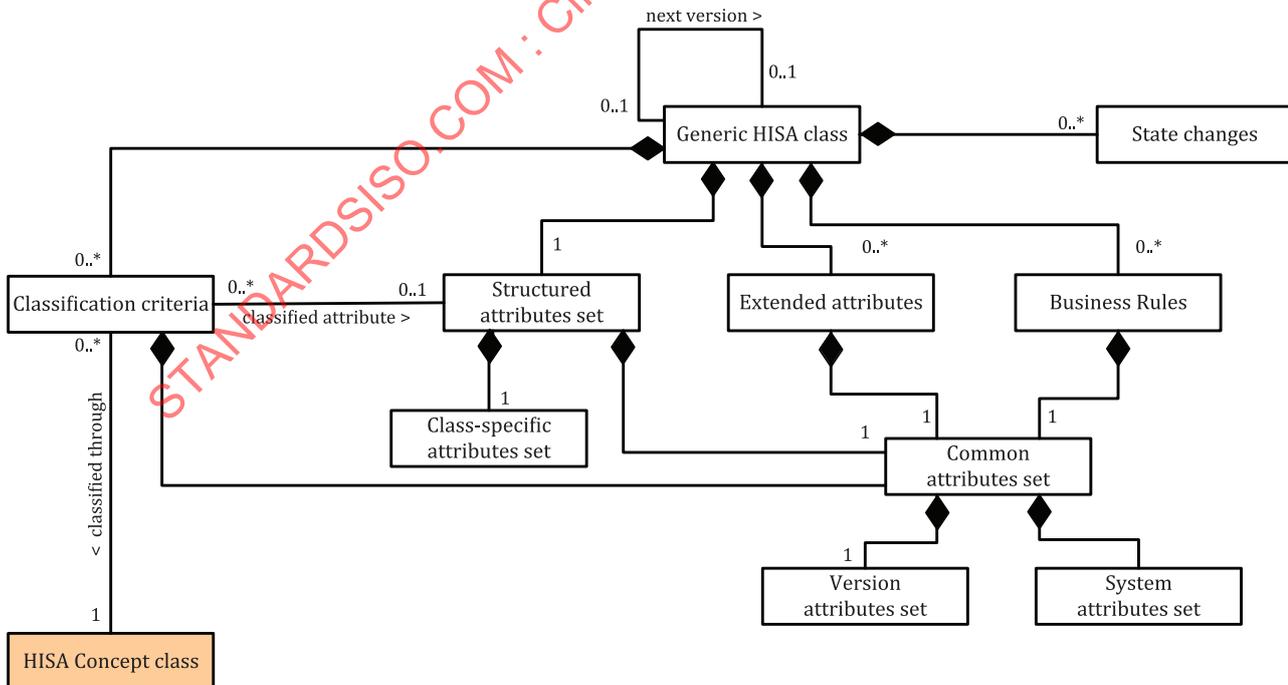| Information service	Xadd
Scope	Shall be used to create a new instance of extended data and associate it to a HISA object.
Description	The specification of the extended data object that will be created is found in ISO 12967-2:2020, 6.3.7. The instances to which the extended data shall be attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The extended data properties and the common system and version properties it comprises shall be created through this information service.
Example	The calling of this information service [Person.Xadd] shall allow doing things such as adding, among others: the digital photograph of the person to the instance of the person object, the scanned image of the signed consent to receive treatment, etc. The semantics of the extended datum shall be classified in its property type, the media type in the property mediaType, the language in the language property, etc.

6.2.2.2.3 Information service Cadd

Information service	Cadd
Scope	Shall be used to create a new instance of classification criteria data and associate it to a HISA object.
Description	The specification of the classification criteria data that will be created is found in ISO 12967-2:2020, 6.3.10. The instances to which the classification data shall be attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The classification data properties and its common system and version properties shall be created through this information service.
Example	Persons might be classified in healthcare organizations according to their education. The calling of this information service [Person.Cadd] allows classifying the person according to the criteria in use e.g. in the national, regional, or local classification in use.

6.2.2.2.4 Information service BRadd

Information service	BRadd
Scope	Shall be used to create a new instance of a business rule concerning the HISA object to which it is associated.
Description	The specification of the business rule data that will be created is found in ISO 12967-2:2020, 6.3.9. The instances to which the business rule data shall be attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The business rule properties and its common system and version properties shall be created through this information service.
Example	Experimental drugs are often used in specific treatments and require the identification of specific business rules for their correct usage, for example that a specific drug can be prescribed only by certain physicians for a certain class of illnesses. In this case, the information service [Resource.BRadd] shall be used once the business rule is defined.

6.2.2.3 Behavioural specifications

It is up to the client of the object (i.e. the caller) to pass valid data as input for the class-specific properties and for those system and version attributes for which the default values should be overridden.

The system shall generate appropriate values for the common system and version attributes of the HISA class when the instance is created, for those parameters that are not passed by the caller. In particular the following.

— Instance identifier shall be unique within the open distributed processing environment of the system within the enterprise. A unique identifier of the HISA class may be specified by the caller of the operation. In this case the service shall verify the uniqueness of the identifier.

— System shall take care of managing state changes by adding dynamically and automatically the values that record the changes occurred in the specific properties of the class or when extended data, classification data and business rules are attached to it, thus keeping track of the life cycle of the instance during time. The state changes class is specified in ISO 12967-2:2020, 6.3.8.

— Information service shall return to the client at least the set of common attributes related to the HISA object created. Such information shall include a value indicating successful execution of the operation or an error indicating the reason for failure.

— Information service shall implement all integrity checks with respect to the information passed by the client of operation, aborting it if the operation would lead to an inconsistent informational state.

6.2.3 "Update" basic information services

6.2.3.1 General

The "update" information services shall allow the client of the operation to update instances of HISA objects.

6.2.3.2 List of information services

6.2.3.2.1 Information service update

Information service	update
Scope	Shall be used to update an existing instance of a HISA object.
Description	The instances that shall be updated are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The instance, its class-specific attribute set, and the common system and version properties shall be updated through this information service.

Information service	update
Example	The updating of a person in the system shall be accomplished by calling the update information service of the person computational object [Person.update]. The information service shall also allow the user to pass information to override any default value for its common system and version-related attributes.

6.2.3.2.2 Information service Xupdate

Information service	Xupdate
Scope	Shall be used to update an existing instance of the extended data associated to a HISA object.
Description	The extended data instances that shall be updated are the ones already attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The extended data object and its common system and version properties shall be updated through this information service.
Example	The updating of the properties of the extended data of a person in the system shall be accomplished by calling the update information service of the person computational object [Person.Xupdate]. The information service shall also allow the user to pass information to override any default value for the extended data's common system and version-related attributes.

6.2.3.2.3 Information service Cupdate

Information service	Cupdate
Scope	Shall be used to update an existing instance of classification data associated to a HISA object.
Description	The classification data instances that shall be updated are the ones already attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The classification object and its common system and version properties shall be updated through this information service.
Example	The updating of the classification criteria of a person in the system shall be accomplished by calling the update information service of the person computational object [Person.Cupdate]. The information service shall also allow the user to pass information to override any default value for its common system and version-related attributes.

6.2.3.2.4 Information service BRupdate

Information service	BRupdate
Scope	Shall be used to update an existing instance of a business rule associated to the HISA object.
Description	The specification of the business rule that will be created is found in ISO 12967-2:2020, 6.3.9. The instances to which the business rule data shall be attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The business rule properties and its common system and version properties shall be updated through this information service.
Example	Experimental drugs are often used in treatments and need specific business rules to be identified for their correct usage, e.g., that a specific drug can be prescribed only by certain physicians for a certain class of illnesses. When these business rules need to be updated, the information service [Resource.BRupdate] shall be used.

6.2.3.3 Behavioural specifications

It is up to the client of the object to pass valid data as input for the class specific properties and for those system and version attributes for which the default values should be overridden.

The system shall generate and/or update the appropriate values for the common system and version attributes of the HISA class when it is updated. In particular the following.

— Operation shall require as input the common attributes necessary for the update information.

— Instance identifier shall never be updated.

— Update shall not occur if the timestamp of the instance to be updated differs from the timestamp received as input, since this indicates that the value in the HISA system has changed since the client originally read the instance from the system. The change occurred while the caller was performing the operation and the update would cause inconsistency in the common information heritage.

> NOTE   Such an approach in managing concurrent access to data is generally called "optimistic-locking".

— System shall take care of managing state changes when the update operation is invoked by adding dynamically and automatically the values that record the changes occurred in the specific properties of the class or when extended data, classification data and business rules attached to it are updated, thus keeping track of the life cycle of the instance during time. The state changes class is specified in ISO 12967-2:2020, 6.3.8.

— Operations shall return to the client at least the set of common attributes related to the HISA object updated with the update operation. Such information shall include a value indicating successful execution of the operation or an error indicating the reason for failure.

— Operations shall implement all integrity checks with respect to the information passed by the client of operation, aborting it if the operation would lead to an inconsistent informational state.

6.2.4   "Delete" basic information services

6.2.4.1   General

The "delete" information services shall allow the client of the operation to logically delete instances of HISA objects.

6.2.4.2   List of information services

6.2.4.2.1   Information service delete

Information service	delete
Scope	Shall be used to logically delete an existing instance of a HISA object.
Description	The instances that shall be logically deleted are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The object, its class-specific attribute set, and its common system and version properties shall be deleted through this information service

6.2.4.2.2   Information service Xdelete

Information service	Xdelete
Scope	Shall be used to logically delete an existing instance of the extended data associated to a HISA object.
Description	The extended data instances that are logically deleted shall be the ones already attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The extended data object and its common system and version properties shall be logically deleted through this information service.

6.2.4.2.3   Information service Cdelete

Information service	Cdelete
Scope	Shall be used to logically delete an existing instance of classification data associated to a HISA object.

Information service	Cdelete
Description	The classification data instances that shall be logically deleted are the ones already attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The object and its common system and version attributes shall be logically deleted through this information service.

6.2.4.2.4   Information service BRdelete

Information service	BRdelete
Scope	Shall be used to logically delete an existing instance of a business rule associated to the HISA object.
Description	The specification of the business rule that shall be logically deleted is found in ISO 12967-2:2020, 6.3.9. The instances to which the business rule data is attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The business rule properties and its common system and version properties shall be deleted through this information service.

6.2.4.2.5   Information service Pack

Information service	Pack
Scope	Shall be used to physically delete the logically deleted instances.
Description	The logical deletion allows keeping in the system instances for which clients have requested the logical deletion. This functionality shall be available mainly for system administration purposes, to physically remove elements that have been logically deleted and can safely be removed from the system. Operation shall require as input the representation of the information object to carry out the Pack.

6.2.4.3   Behavioural specifications

The system shall generate and/or update the appropriate values for the common system and version attributes of the HISA class when it is logically deleted. In particular the following.

— Operation shall require as input the common attributes necessary for the delete information.

— Logical deletion shall cause the "isDeleted" attribute of the object to be set to "True", without physically removing the instance from the common information heritage of the enterprise.

— Delete operation shall not occur if the timestamp of the instance to be logically deleted differs from the timestamp received as input, since this indicates that the value has changed in the HISA system since the client originally read the value from the system. The change occurred while the caller was performing the operation and the logical delete operation would cause inconsistency in the common information heritage.

— System shall take care of managing state changes when the logical delete operation is invoked by adding, dynamically and automatically, the values that record the changes occurred in the specific properties of the class or when extended data, classification data and business rules attached to it are deleted, thus keeping track of the life cycle of the instance during time. The state changes class is specified in ISO 12967-2:2020, 6.3.8.

— Operation shall return to the client a value indicating successful execution of the operation or an error indicating the reason for failure.

— Operation shall implement all integrity checks with respect to the information passed by the client of the operation aborting it if the operation would lead to inconsistent information.

6.2.5   "Detail" basic information services

6.2.5.1   General

The "detail" operations shall allow the client of the operation to fetch one fully detailed instance of a HISA object.

6.2.5.2   List of information services

6.2.5.2.1   Information service detail

Information service	detail
Scope	Shall be used to get the information regarding an existing instance of the HISA object.
Description	The instances that shall be retrieved are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The object, its class-specific attribute set and its common system and version attributes shall be retrieved through this information service.
Example	The retrieval of the full detail of a person's properties in the system to display it through user functionality shall be accomplished by calling this information service of the person computational object [Person.detail], thus accessing the person's id, his/her birthDate, etc.

6.2.5.2.2   Information service Xdetail

Information service	Xdetail
Scope	Shall be used to retrieve an existing instance of the extended data associated to a HISA object.
Description	The extended data instances that shall be retrieved from the system are described in ISO 12967-2:2020, 6.3.7 and are attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The extended data object and its common system and version attributes shall be extracted and presented to the caller through this information service.
Example	The retrieval of the extended data properties of a person in the system, such as the person's picture or the signed consensus for receiving treatment, are examples of extended data that may need to be visualized by user functionality by calling the Xdetail information service of the person computational object [Person.Xdetail].

6.2.5.2.3   Information service Cdetail

Information service	Cdetail
Scope	Shall be used to retrieve an existing instance of the classification data associated to a HISA object.
Description	The classification data instances that shall be retrieved form the system are described in ISO 12967-2:2020, 6.3.10 and attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The classification data object's common system and version attributes shall be extracted and presented to the caller through this information service.
Example	The retrieval of the classification data properties of a person, such as the level of education coded according to national, regional, or local criteria shall be accomplished by calling this information service of the person computational object [Person.Cdetail].

6.2.5.2.4 Information service BRdetail

Information service	BRdetail
Scope	Shall be used to retrieve an existing instance of a business rule associated to the HISA object.
Description	The specification of the business rule that shall be retrieved is found in ISO 12967-2:2020, 6.3.9. The instances to which the business rule data is attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The business rule properties and its common system and version properties shall be extracted through this information service and presented to the caller.

6.2.5.2.5 Information service Sdetail

Information service	Sdetail
Scope	Shall be used to retrieve an existing instance of the state change data associated to a HISA object.
Description	The state change data instances that shall be retrieved from the system are described in ISO 12967-2:2020, 6.3.8 and attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The state change object's properties and its common system and version properties shall be extracted through this information service.
Example	During the life cycle of an activity, from the moment it is defined and requested till the moment it is completed, it can undergo quite a few changes in terms of status and properties. This information service [Activity.Sdetail] allows retrieving the full detail of one change that the activity has undergone.

6.2.5.3 Behavioural specifications

— Operation shall require as input the selection criteria necessary for retrieving the detailed information of the HISA class involved in the operation, usually being the identifier(s) of the object.

— Operation shall also return to the client the set of common attributes related to the HISA object fetched from the common information heritage. The set of information returned shall include a value indicating successful execution of the operation or an error indicating the reason for failure.

— For operations that return the detail of text and extended data items:

  — input parameter shall allow the user to specify the maximum size (in number of characters or bytes) that are expected to be in the output of the information service;

  — input parameter shall allow to specify an offset parameter to fetch remaining characters (bytes) with respect to the previous maximum number of characters (bytes) parameter;

  — output parameter shall specify the actual number of characters (bytes) fetched;

  — output parameter shall specify whether there are still characters (bytes) to fetch.

6.2.6 "List" basic information services

6.2.6.1 General

The "list" operations shall allow the client of the operation to fetch a list of instances of a HISA object.

6.2.6.2   List of information services

6.2.6.2.1   Information service list

Information service	list
Scope	Shall be used to fetch the information regarding existing instances of the HISA object that meet the selection criteria passed by the client of the operation.
Description	The instances that shall be retrieved are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The objects, a significant subset of their class-specific attribute set and some common system and version properties shall be fetched through this information service.
Example	The retrieval of the list of persons meeting the example selection criteria "living in Rome and born in 1980" shall be accomplished by calling this information service [Person.list].

6.2.6.2.2   Information service Xlist

Information service	Xlist
Scope	Shall be used to fetch the information regarding existing extended data instances attached to one HISA objects meeting the selection criteria passed by the client of the operation.
Description	Several instances of extended data, which is described in ISO 12967-2:2020, 6.3.7, shall be retrieved according to the selection criteria passed by the caller. The classification data are attached to one of the individual HISA classes specified in ISO 12967-2:2020, Clause 7. The objects, a significant subset of their class-specific attribute set and some common system and version properties shall be fetched through this information service.
Example	This information service [Person.Xlist] can be used to fetch information regarding all extended data available in the system for one person, identified through his/her identifier.

6.2.6.2.3   Information service Clist

Information service	Clist
Scope	Shall be used to fetch the information regarding existing classification data instances attached to one HISA object meeting the selection criteria passed by the caller.
Description	The instances that shall be retrieved are the classification data described in ISO 12967-2:2020, 6.3.10 that are associated to the existing instances of individual HISA classes specified in ISO 12967-2:2020, Clause 7. The objects, a significant subset of their class-specific attribute set and some common system and version properties shall be fetched through this information service.
Example	The retrieval of the list of classification objects associated to one Person shall be accomplished by calling this information service [Person.Clist], possible examples of which are the level of education, the employment status, etc.

6.2.6.2.4   Information service BRlist

Information service	BRlist
Scope	Shall be used to retrieve a list of existing instances of business rules meeting specific selection criteria and currently associated to a well identified HISA object.
Description	The specification of the business rules that shall be retrieved is found in ISO 12967-2:2020, 6.3.9. The instances to which the business rules are attached are the individual HISA classes specified in ISO 12967-2:2020, Clause 7. A significant subset of the properties of the business rules and some of the common system and version properties shall be fetched through this information service and presented to the caller.

Information service	BRlist
Example	Calling this information service [Resource.BRlist] shall result in the retrieval of all business rules related to the usage of the specific drug.

6.2.6.2.5   Information service Slist

Information service	Slist
Scope	Shall be used to fetch several existing instances of state change data associated to one well identified HISA object.
Description	The state change data instances that shall be retrieved form the system are described in ISO 12967-2:2020, 6.3.8 and attached to the individual HISA classes specified in ISO 12967-2:2020, Clause 7. A significant subset of the properties of the state change objects and some of the common system and version properties shall be fetched and presented to the caller of this information service.
Example	The retrieval of the several state changes that a diagnosis, handled as healthcare information in HISA, has undergone in the system, shall be accomplished by calling this information service of the person computational object [ClinicalInformation.Slist].

6.2.6.3   Behavioural specifications

— Operation shall require as input the selection criteria necessary for retrieving the list of instances of the HISA class involved in the operation invocation.

— Operation shall return to the client also the set of common attributes related to the HISA object. The set of information returned shall include a value indicating successful execution of the operation or an error indicating the reason for failure.

— For these operations that return multiple elements:

  — input parameter shall allow the user to specify the maximum number of elements that are expected to be in the output of the information service call;

  — input parameter shall allow the specification of an offset parameter to fetch remaining elements with respect to the previous maximum number of elements parameter, thus retrieving the elements starting from offset;

  — output parameter shall specify the actual number of elements fetched;

  — output parameter shall specify whether there are still elements to fetch.

6.3   General-purpose interface

6.3.1   General

The service architecture shall provide at least one computational object providing a set of interfaces for information services relating to functionalities of general utility for the access to and the management of the system in the physical implementation. These information services shall take care of managing and providing session-management information that needs to be passed to and from the computational objects for the correct functioning of HISA information services.

NOTE   The general-purpose interface, unlike the two presented in 6.1, does not relate to the handling of information managed by HISA, rather to the functioning of the system as service architecture.

6.3.2   List of information services

6.3.2.1   General

At least the following information services shall be provided by the general-purpose component.

6.3.2.2   Information service login

Information service	Login
Scope	Shall be used to create a client session with the system.
Description	The information service shall take as input the information regarding the user that is requesting the session connection, which is specified in ISO 12967-2:2020, 7.6.3.2, and create a connection to the system.

6.3.2.3   Information service logout

Information service	Logout
Scope	Shall be used to close a client session with the system.

6.3.2.4   Information service setParameter

Information service	setParameter
Scope	Shall be used to establish a specific modality within a connection session.
Description	The information service shall take as input the information regarding the desired parameter and set it for the user (consumer) session.
Example	For certain specific queries the expert user may need to consult the logically deleted records of a HISA object. Such functionality shall be enabled by setting a session parameter through this functionality.
	Another example is represented by the number of elements that the client of the list operations wishes to be returned. This shall also represent a parameter that can be configured in the system.

6.3.2.5   Information service getParameter

Information service	getParameter
Scope	Shall be used to retrieve information about a specific modality within a connection session with the system.
Description	The information service shall take as input the information regarding the desired parameter and fetch its value for the specific user session, passing it back to the caller.

NOTE   The parameters referred to in the last two tables relate to the interaction between the user or consumer of the interface or client of the operation and the service architecture providing the service. There are several different parameters referring to different behavioural modalities of the system.

6.3.3   Behavioural specifications

— It is up to the consumer (i.e. caller) of the operation to pass valid data as input for the operations.

— System shall populate a system log with information about the session and the operations invoked by the consumer during a session.

— Operation shall return to the consumer a value indicating successful execution of the operation or an error indicating the reason for failure.

— Operations that set the system parameters shall require valid data as input for configuring the parameter.

6.4 The eHealth business-related interfaces supporting the workflow computational objects

6.4.1 General

The workflows that will be specified in terms of information services in the following clauses have been introduced in ISO 12967-1:2020, Clause 10, which also provides use cases and appropriate specification at ISO 12967-1 level.

6.4.2 eHealth business-related services managing healthcare workflows

The information services of these interfaces shall implement transactions of consistent eHealth business logic supporting the events and processes of the organization.

NOTE   It is clarified that each of these transactions could also be implemented by the consumer through algorithms comprising calls to several basic interfaces, adding/updating information in each class one at a time. From the HISA perspective, it is useful and appropriate to group such "eHealth business-related logic" into specific functions provided by an object to provide common functionality to the whole organization, at the same time optimizing performance and scalability of the overall system.

The service architecture shall, at least, provide computational objects providing information services supporting:

— fundamental events of the workflows identified in ISO 12967-1:

— subject of care;

— activity management;

— healthcare information management;

— general purpose activities relating to the access to, and the management of the system.

6.4.3 Interfaces supporting the "Subject of care workflow"

6.4.3.1 General

The service architecture shall provide at least one computational object providing interfaces to operations supporting the following fundamental business activities related to the subject of care workflow, described in ISO 12967-1:2020, 10.4 , in which some example use cases can also be found.

6.4.3.2 List of information services

6.4.3.2.1 General

At least the following information services shall be provided by the service architecture.

6.4.3.2.2   Information service registerSOC

Information service	registerSOC
Scope	Shall be used to register a subject of care, together with associated information (i.e. relatives, general practitioner, etc.).
Description	The service shall allow the registering of all available/relevant information related to the person regardless of whether or not that person is or will be a patient. This information covers not only the person and subject of care class but also several other related classes, such as the patient's general practitioner (i.e. an agent or healthcare provider), the patient's relatives (i.e. handled in the person class), etc. A very important part of this process is the unique identification of the subject of care within the organization running the HISA Service Architecture. The information managed in the person and subject of care classes and handled in this information service is described in ISO 12967-2:2020, 7.2.3.2 and ISO 12967-2:2020, 7.2.3.3. The information regarding the agent is described in ISO 12967-2:2020, 7.6.3.2.
Example	When a first encounter is established, a health informatics service architecture will provide such information service to register the subject of care.

6.4.3.2.3   Information service admit

Information service	admit
Scope	Shall be used to admit one patient (i.e. a subject of care) to receive treatment and define a new contact if not already foreseen, or modify an already registered admission.
Description	The service shall allow the registering of all available/relevant information related to the admission of a patient in a healthcare organization by not only identifying the contact, but also by identifying the person responsible for the treatment (i.e. agent). The classes that will be involved in such transaction are subject of care described in ISO 12967-2:2020, 7.2.3.2, Agent described in ISO 12967-2:2020, 7.6.3.2, and contact described in ISO 12967-2:2020, 7.2.3.5.
Example	This is the typical procedure that takes place in patient administration systems when a contact is initialized and the patient is admitted to the healthcare centre.

6.4.3.2.4   Information service discharge

Information service	discharge
Scope	Shall be used to discharge one patient and end the treatment process, closing the contact within the organization.
Description	The service shall allow the registering of all available/relevant information related to the discharge of a patient in a healthcare organization. The classes that shall be involved in such transaction are subject of care described in ISO 12967-2:2020, 7.2.3.2, agent described in ISO 12967-2:2020, 7.6.3.2 and contact described in ISO 12967-2:2020, 7.2.3.5.
Example	During discharge, the appropriate values related discharge (e.g. termination of the contact, etc.) need to be set, so that all clinical and administrative procedures can be finalized. In Italy, for example, at each discharge, a Hospital Discharge Form ("Scheda Dimissione Ospedaliera") needs to be filled out and sent to the regional authorities.

6.4.3.2.5   Information service transfer

Information service	transfer
Scope	Shall be used to transfer the responsibility of one patient from one provider to another within the same healthcare organization. This usually also implies changing the patient location inside the organization.

Information service	transfer
Description	The service shall allow the registering of all available/relevant information related to the transfer of a patient in a healthcare organization from one organizational unit to another. The classes that will be involved in such transaction are subject of care described in ISO 12967-2:2020, 7.2.3.2, agent described in ISO 12967-2:2020, 7.6.3.2 and contact described in ISO 12967-2:2020, 7.2.3.5.

6.4.3.2.6 Information service merge

Information service	merge
Scope	Shall be used to merge contact data from source to target by moving all dependencies to the target after which the source contact shall be annulled.
Description	The service shall require as input the identifiers of the two contacts to merge. The classes that will be involved in such transaction are contact described in ISO 12967-2:2020, 7.2.3.5, and possibly all classes associated to the contact as specified in that same subclause.
Example	It is a routine procedure to assign a temporary contact identifier when it is necessary to provide treatment before having performed a fully-fledged admission or in the case of (temporary) unavailability of a dedicated patient management system handling the master contact and/or person index. When the admission is finally completed or the connection is re-established, the contacts shall be merged.

6.4.3.2.7 Information service getContact

Information service	getContact
Scope	Shall be used to retrieve full detailed information on one contact.
Description	The service shall require as input the identifier of the contact, the information of which shall be retrieved. The class that will be involved in such transaction is contact described in ISO 12967-2:2020, 7.2.3.5.

6.4.3.2.8 Information service getSOC

Information service	getSOC
Scope	Shall be used to retrieve full detailed information on one subject of care.
Description	The service shall require as input the identifier of the subject of care, the information on whom shall be retrieved. The service shall retrieve all available/relevant information related to the person. This information covers not only the person and subject of care class but also several other related classes, such as the patient's general practitioner (i.e. an agent or healthcare provider), the patient's relatives (i.e. handled in the person class), etc. The information managed in the person and subject of care classes and handled through this information service is described in ISO 12967-2:2020, 7.2.3.2. The information regarding the agent is described in ISO 12967-2:2020, 7.6.3.2.

6.4.4 Interfaces supporting the "Healthcare information workflow"

6.4.4.1 General

The service architecture shall provide at least one computational object providing interfaces to operations supporting the following fundamental business activities related to the Healthcare Information Workflow, described in ISO 12967-1:2020, 10.5, in which also some example use cases are found.

6.4.4.2　List of information services

6.4.4.2.1　General

At least the following information services shall be provided by the service architecture.

NOTE　　This document uses the term 'HealthCare Information' in place of 'Clinical Information' used in the previous revisions thanks to a harmonization process with Contsys. In order to maintain backward compatibility with implementations of the HISA ISO 12967 series, the naming criteria of the services has however, not been updated.

6.4.4.2.2　Information service annul

Information service	annul
Scope	Shall be used to annul (declare invalid, cancel) some clinical information.
Description	The service shall require as input the identifier of the healthcare information that will be annulled. The information managed in the healthcare information class handled through this information service is described in ISO 12967-2:2020, 7.4.3.1.
Example	In case of errors in the registration of clinical information, this information service can be used in a use case to rectify the errors, creating a new instance of the healthcare information with the correct information, annulling the previous one, and associating the new instance to the old through the association class 'reason for association of C.I.'

6.4.4.2.3　Information service registerCI

Information service	registerCI
Scope	Shall be used to register (i.e. commit in the HISA service architecture) the clinical information.
Description	The service shall require as input the information of the healthcare information that will be handled. The information managed in the healthcare information class handled through this information service is described in ISO 12967-2:2020, 7.4.3.1.
Example	This information service would, for example, allow the insertion of the daily measurement of the patient's body temperature.

6.4.4.2.4　Information service validateCI

Information service	validateCI
Scope	Shall be used to certify the validity of the healthcare information by an authorized agent.
Description	The service shall require as input the information of the healthcare information that will be validated and of the agent actually validating it. The information managed in the healthcare information class handled through this information service is described in ISO 12967-2:2020, 7.4.3.1.
Example	The presence of healthcare information coming, for example, from laboratory instrumentation has to be validated and certified by a competent clinician, before it is considered valid and disclosed in clinical reporting.

6.4.4.2.5　generateAggregation

Information service	generateAggregation
Scope	Shall be used to create an aggregated structure of the healthcare information, structuring elementary healthcare information into meaningful aggregations, such as reports, extracts, etc.

Information service	generateAggregation
Description	The service shall require, as input, the information of the healthcare information that will be handled. The information managed in the healthcare information class handled through this information service is described in ISO 12967-2:2020, 7.4.3.1.
Example	The existing elementary healthcare information in the system may be aggregated into more complex aggregates according to structures that are commonly used for communication information, such as archetypes.

6.4.5 Interfaces supporting the "Activity management workflow"

6.4.5.1 General

The service architecture shall provide at least one computational object providing interfaces to operations supporting the following fundamental business activities related to the activity management workflow, described in ISO 12967-1:2020, 10.6, in which also some example use cases are to be found. ISO 12967-1:2020, 10.6.1 also specifies the states in which an activity will find itself within its life cycle.

6.4.5.2 List of information services

6.4.5.2.1 General

At least, the following information services shall be provided by the service architecture.

6.4.5.2.2 Information service request

Information service	request
Scope	Shall be used to request the execution of one or more activities.
Description	The service shall require as input the information of the activities that are requested. The service registers new actual activities with the resources, healthcare information and any other associated property, which are planned for their execution. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes (e.g. resources, clinical Information, etc.).

6.4.5.2.3 Information service accept

Information service	accept
Scope	Shall be used to accept the responsibility to actually execute the requested activities by the activity provider.
Description	The service shall require as input the information of the activities that have been requested. The activity is specified in ISO 12967-2:2020, 7.3.3.2.

6.4.5.2.4 Information service annul

Information service	annul
Scope	Shall be used to annul (declare invalid, cancel) the activity for certain reasons.
Description	The service shall require as input the identifier of the activity that is to be annulled. The activity is specified in ISO 12967-2:2020, 7.3.3.2.

6.4.5.2.5 Information service plan

Information service	plan
Scope	Shall be used to explicitly plan (i.e. assign to date, time and service point of execution) one set of activities.
Description	The service shall require as input the identifiers of the activities that are planned, together with the information of the agents that will act to perform the activities, and eventual resources that are deemed necessary for carrying out the activity. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes. The agent class is specified in ISO 12967-2:2020, 7.6.3.2.

6.4.5.2.6 Information service registerExecution

Information service	registerExecution
Scope	Shall be used to register (commit in the HISA system) the execution details of the activity.
Description	The service shall require as input the identifiers of the activities that have been executed, plus all information regarding the execution, such as the actual resources used and eventual healthcare information that has been generated as a result of the activity. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes.

6.4.5.2.7 Information service report

Information service	report
Scope	Shall be used to create the report of the execution of the activity.
Description	The service shall require as input the identifier of the activity that has been executed, plus all information regarding the execution, for example the information regarding the actual resources used and eventual healthcare information that has been generated as a result of the activity. Output shall be then aggregated into a report. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes involved in the transaction.

6.4.5.2.8 Information service setReady

Information service	setReady
Scope	Shall be used to set the status of the activity as "ready for execution", meaning that all preliminary activities have been completed and the execution of the activity can actually start.
Description	The service shall require as input the identifier of the activity that has to be executed, plus any further information regarding the execution, for example the information regarding the actual resources used and eventual healthcare information that has been generated as a result of the activity. The status of the activity shall be set accordingly. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes involved in the transaction.
Example	Examinations at a laboratory are planned in advance, possibly a matter of days. Once the resources planned to be used for the examination are prepared for the time slot and the subject of care attends, registering his/her presence to the acceptance desk, the activity is set to the appropriate status through this information service.

6.4.5.2.9 Information service startExecution

Information service	startExecution
Scope	Shall be used to set the status of the activity as "in progress".

Information service	startExecution
Description	The service shall require as input the identifier of the activity that is being executed, plus any further information regarding the execution. The status shall be set accordingly. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes involved in the transaction.

6.4.5.2.10 Information service terminate

Information service	terminate
Scope	Shall be used to terminate a group of activities.
Description	The service shall require as input the identifiers of the activities that have been executed, plus any further information regarding the execution, for example the information regarding the actual resources used and eventual healthcare information that has been generated as a result of the activity. The status shall be set accordingly. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes involved in the transaction.

6.4.5.2.11 Information service suspend

Information service	suspend
Scope	Shall be used to suspend a group of activities.
Description	The service shall require as input the identifiers of the activities that have been suspended, plus any further information regarding the suspension. The status shall be set accordingly. The activity is specified in ISO 12967-2:2020, 7.3.3.2, which also references the clauses specifying the associated classes involved in the transaction.

A further overall example use case highlighting the activity life cycle is represented by the following situation, which illustrates the usage of some of the information services specified above.

— Outpatient clinic requests an exam for a certain out-patient to the radiology department. The functionality is achieved using the request information service.

— Request is accepted at the radiology department through the accept information service and the activity is scheduled by using the plan information service.

— Before being admitted for the actual execution of the exam, the patient has to pay the cost of the service to a third administrative office, which is different both from the outpatient clinic and from the radiology. Once this is achieved the activity status is set to "ready for execution", using the setReady information service.

— After the execution of the exam, the procedure needs to be completed, for example the administrative office shall be informed of the detail of the activities actually executed, to invoice the patient additional costs, should additional exams (not foreseen at the beginning) have been executed. This shall be achieved through the information service registerExecution.

— Process shall then be closed by terminating the activity using the information service terminate.

6.4.6 Behavioural specifications, common to the eHealth business-related services

It is up to the client of the operation to pass valid data as input for the class-specific properties and for those system and version attributes for which the default values should be overridden.

The system shall generate appropriate values for the common system and version attributes of the HISA classes when they are involved in the transaction, for those parameters that are not passed by the client of the operation. In particular the following.

— Instance identifier(s) shall be unique within the open distributed processing environment of the system within the enterprise. The client of the operation may specify a unique identifier of each HISA class involved in the operation. In this case the service shall verify the uniqueness of the identifier.

— System shall take care of managing state changes of the involved HISA object(s) by adding dynamically and automatically the values that record the changes occurred in the specific attributes of the class(es), thus keeping track of the life cycle of the instance(s) during time.

— Operations shall return to the client at least the set of common attributes related to the HISA object(s) involved in the operation. Such information shall include a value indicating successful execution of the operation or an error indicating the reason for failure.

— Operations shall implement all integrity checks with respect to the information passed by the client of operation, aborting it if the operation leads to an inconsistent informational state within the common information heritage.

— For operations that return multiple elements:

  — input parameter shall allow the user to specify the maximum number of elements that are expected to be in the output of the information service call;

  — input parameter shall allow an offset parameter to be specified to fetch remaining elements with respect to the previous maximum number of elements parameter;

  — output parameter shall specify the actual number of elements fetched;

  — output parameter shall specify whether there are still elements to fetch.

— For operations that return the detail of text and extended data items:

  — input parameter shall allow the user to specify the maximum number of characters (or bytes) that are expected to be in the output of the information service;

  — input parameter shall allow to specify an offset parameter to fetch remaining characters (bytes) with respect to the previous maximum number of characters (bytes) parameter;

  — output parameter shall specify the actual number of characters (bytes) fetched;

  — output parameter shall specify whether there are still characters (bytes) to fetch.

6.5 Common requirements of the interfaces

6.5.1 Interface documentation and organization

It is under the responsibility of the designer/supplier of a HISA-conformant system to describe and document the interfaces provided according to a consistent set of specifications, in accordance to this document and to the prescriptions of the ISO-ODP documents.

6.5.2 Naming criteria

Criteria according to which interfaces and information services are named and structured shall be common to the whole service architecture, shall allow an intuitive identification of the semantics and of the involved objects by human beings, and shall be independent of the technological platform adopted for the implementation of the service architecture.

In particular, in an object-oriented approach, the system shall be organized in packages, according to the division in clusters of objects identified in ISO 12967-1. A further package shall contain the objects related to the general-purpose interface.

The packages shall comprise objects corresponding to the computational objects and exposing properties and operations. The properties and operations shall follow the naming criteria identified in the previous sections.

On the other hand, where the design and development are done in a non-object-oriented practice, the system shall be organized in areas corresponding to the clusters of objects identified in ISO 12967-1. A further area shall contain the operations related to the general-purpose interface. In such cases the operations related to each section shall be named in a manner that allows identifying the area by prefixing the operation with:

— two characters identifying the cluster of objects or the general-purpose interface, according to the following rationale:

   1) Subject of care objects: **sc**

   2) Activity management objects: **am**

   3) Healthcare information objects: **ci**

   4) Users and authorization objects: **ua**

   5) Resources objects: **ro**

   6) Classification objects: **co**

   7) Messaging objects: **mo**

   8) General purpose interface: **gp**

— acronym of the HISA Class involved in the operation, where it is a basic operation.

6.5.3   Data types

The data types are tightly coupled to the technological platform on which the information services' interfaces will be developed and released. Where the data types do not correspond to the ones identified in the ISO 12967 series, the vendor shall provide mapping tables highlighting the correspondences with the HISA data types.

6.5.4   Structure and organization of the interfaces

All interfaces are organized according to the following common criteria:

datatype   servicename (in datatype i_parameter1, ..., in datatype i_parameterN out datatype pn, out datatype o_yyy)

where:

— first datatype is the data type of the value returned by the information service; this value will always represent the eventual error or success code related to the execution of the service, exceptions shall be based on such a return value;

— servicename is the name of the information service of the interface;

— in keyword specifies that the parameter is input to the information service;

— out keyword specifies that the parameter is output to the information service;

— between the in/out keywords the datatype of the parameter specifies the type of information exchanged through the information services.

Annex A provides some generic examples of the interfaces, while Annex B describer the synergy between the ISO 12967 series and FHIR®, providing also an example of a HISA Interface carrying a FHIR® resource as payload.