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**HL7 Cross Paradigm Specification:
Health Service Reference Architecture (HL7-HSRA),**

Release 1

January 2023

HL7 STU Ballot

**Sponsored by:
Services Oriented Architecture**

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Project Lead	Stefano Lotti Co-Chair Service Oriented Architecture WG Vincent McCauley Co-Chair Service Oriented Architecture WG
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1 Introduction

The **HL7- Health Service Reference Architecture (HL7-HRSA)** objective is to support the design of medium/large-scale eHealth architectures based on HL7 services and standards.

The audience of the HL7-HRSA is principally architects and CIOs that need to focus, design, plan, and evaluate enterprise-wide solutions for medium to complex organizations.

Building enterprise service architectures requires an understanding of composite solutions that include different services organized in choreographies and/or orchestrations that cover many areas within medium to large-scale organizations.

The HL7-HRSA intends to support the process of architectural design with a map of building blocks and solution patterns based on existing HL7 Standards, which can be used with multiple Architecture Frameworks such as ISO 23903 or TOGAF.

HRSA complements the HL7-related standard with an architectural map that organizes HL7 Service Functional Models (SFM), Functional Profiles, and Domain Models into a set of business capabilities.

The service inventory includes projections with FHIR, OMG/HL7 Soap services and IHE Soap.

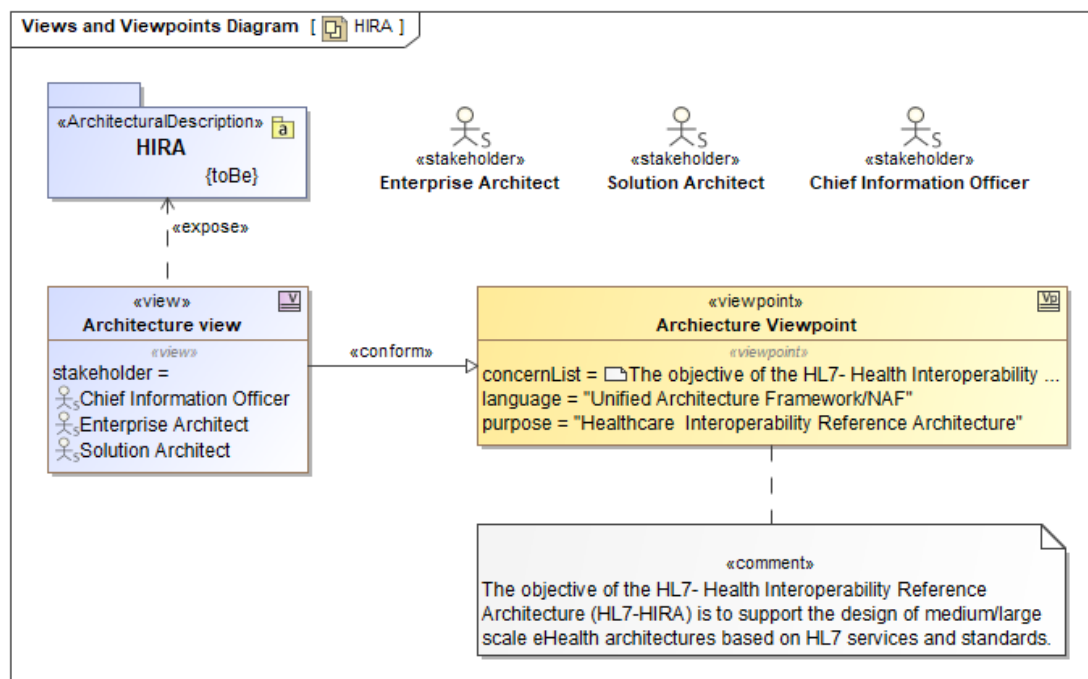


Figure 1 – HSRA View and Viewpoint

It should be emphasized that the focus of the Reference Architecture is the behaviors (services¹): the content is identified here only when required to understand the behavioral aspect.

1.1 Scope

In a medium/large scale architecture, the scope of a reference architecture is to support the identification of appropriate services, patterns and consistent standardized options.

¹ Messaging isn't considered in this version.

A particular Standard specification should not only be used against functional requests in a specific limited context - but interoperability really works *if and only if* one considers the architecture and not just the single application or service.

In this context, a Reference Architecture is a valuable tool to improve the scalability and resilience of the system.

1.2 Health Service Reference Architecture Components

The HSRA will be composed of:

- A Service Inventory (covered in this document)
This includes the HL7 Service Functional Models and maps of different standards-based technical specification projections from FHIR, HL7, OMG and IHE
- The Architectural Patterns Catalog
This combines the technical specifications into architectural patterns.
- Guidelines for Enterprise Service discovery and orchestration
The guidelines aim to support architecture design for service discovery and orchestration (informative)

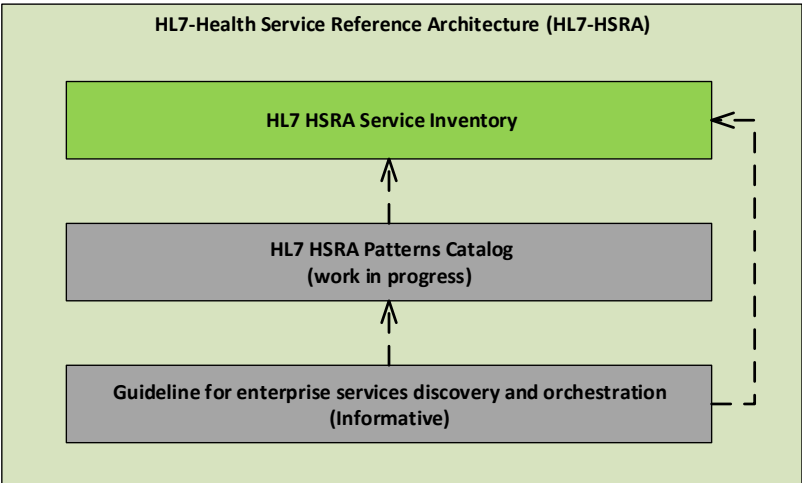


Figure 2 – HSRA components

1.3 Structure of the Service Inventory

The HSRA Service Inventory shows how functional capabilities are performed with different technical standards (Technical Model Projections).

Each functional model is mapped to existing technical specifications. In this way, an architect can have a clear understanding of the coverage of the standards in each area.

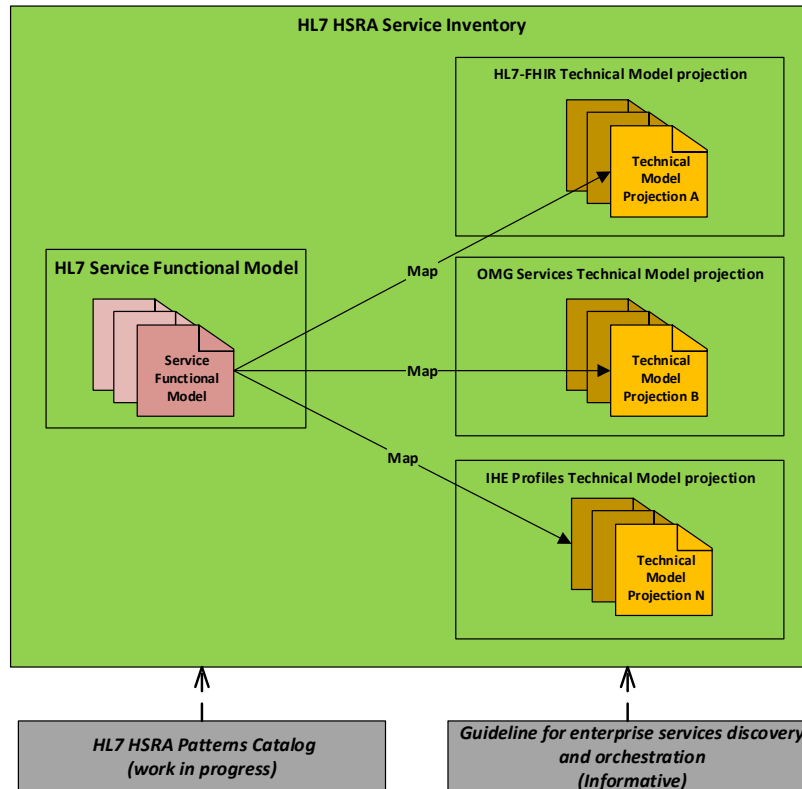


Figure 3 – Service Inventory Structure

1.4 Modeling Language

The HSRA's modeling language is the OMG Unified Architecture Framework (UAF)² and the framework is based on NAF 4.0 (UAF-based framework)³.

Note:

This document is the first version of HSRA. It includes only the Service inventory. The linked Patterns catalog is being prepared and will be balloted in the following cycles.

Another aspect that will be addressed appropriately in the following cycles is to include a fully functional online/web-based version.

This is probably a critical point for the Reference Architecture's ease of use and practical navigability.

The main objective of this ballot is to verify the structure and mapping of the Service Inventory.

² OMG, Unified Architecture Framework, 1.1, 2020. See: <https://www.omg.org/uaf/>

³ NATO, NATO Architecture Framework (NAF), Version 4, 2020. See https://www.nato.int/cps/en/natohq/topics_157575.htm

2 Health Service Reference Architecture: Overview

The diagram below represents a general overview of HSRA

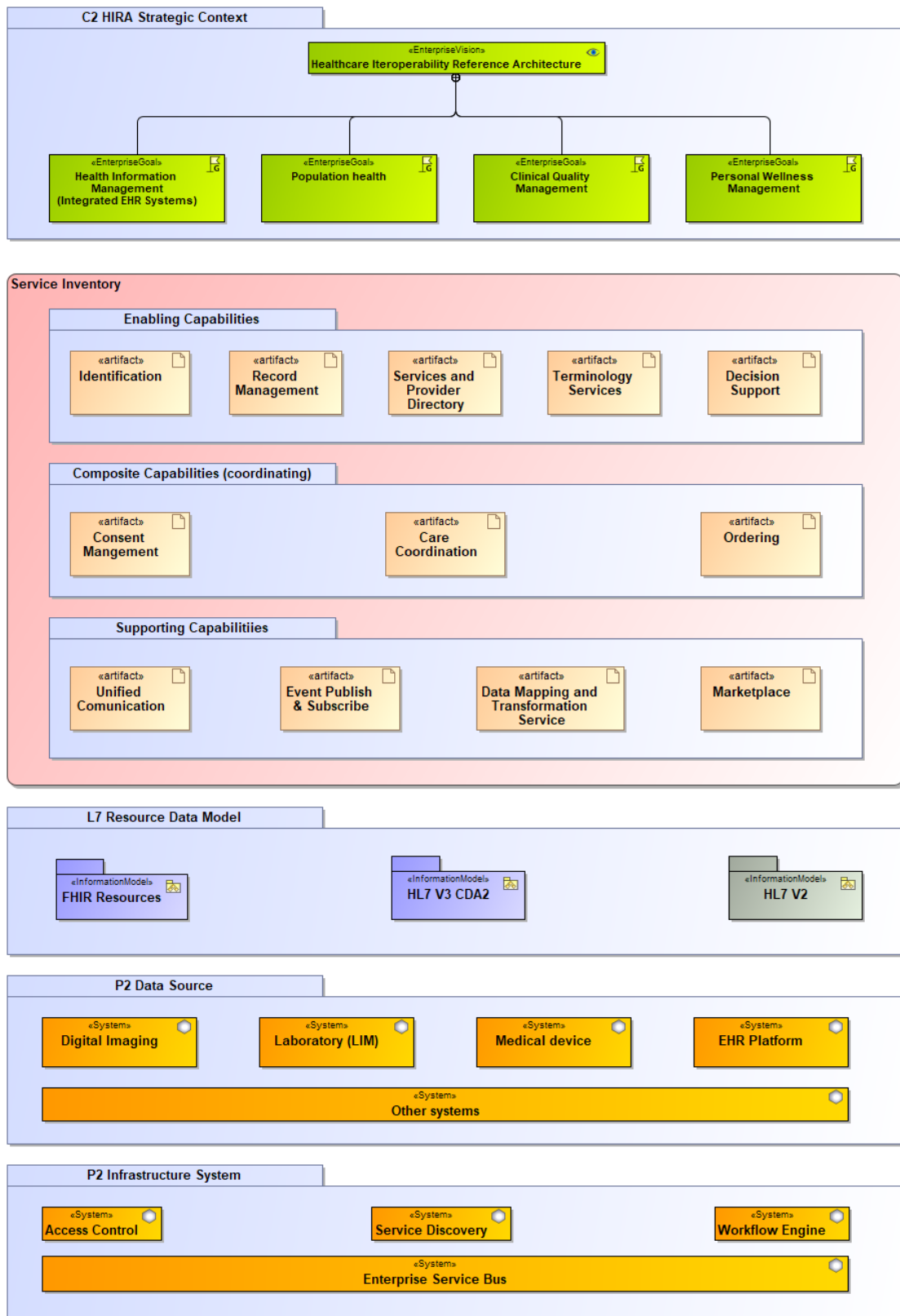


Figure 4 – HSRA overview

3 Strategic context

The Strategic Context illustrates the extent and main goals of the Reference Architecture. The context is illustrated by a notional Vision and a set of high-level goals that the architecture aims to cover.

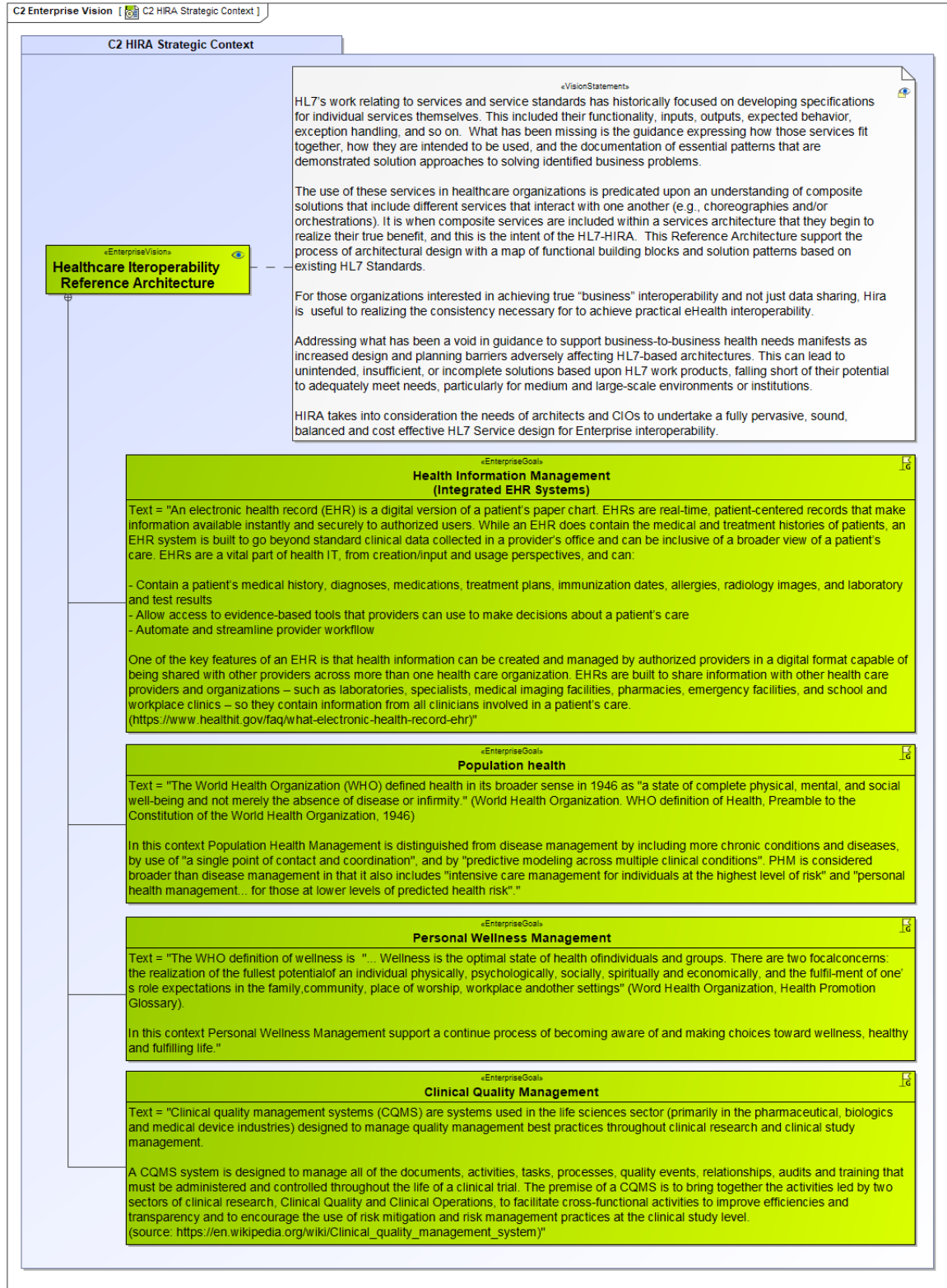


Figure 5 – HSRA Strategic Context

3.1 Vision

HL7's work relating to services and service standards has historically focused on developing specifications for individual services and messages. This work line includes detailed functionality, inputs, outputs, expected behavior, exception handling, and so on.

What has been missing is guidance on expressing how those services fit together, how they are intended to be used, and the documentation of basic patterns that are demonstrated solution approaches to solving real complex business problems.

The use of real services in healthcare organizations is predicated upon an understanding of composite solutions that include different services that interact with one another (e.g., choreographies and orchestrations).

This Reference Architecture aims to support the process of architectural design with a map of functional building blocks and solution patterns based on existing HL7 Standards.

For those organizations interested in achieving true "business" interoperability and not just data sharing, the HSRA will be helpful to support the consistency necessary to achieve practical eHealth interoperability.

The objective is to address a void in guidance to support health needs. This void manifest itself as increased design and planning barriers which adversely affect HL7-based architectures.

This void can lead to unintended, insufficient, or incomplete solutions based upon good HL7 building blocks that fall short of their full potential to adequately meet needs, particularly for medium and large-scale environments or institutions.

HSRA considers the needs of architects and CIOs to undertake a fully pervasive, sound, balanced, and cost-effective HL7 Service design for Enterprise level interoperability.

3.1.1 HSRA Goals/Coverage

Name	Text
Health Information Management (Integrated EHR Systems)	<p>An electronic health record (EHR) is a digital version of a patient's paper chart. EHRs are real-time, patient-centered records that make information available instantly and securely to authorized users. While an EHR does contain the medical and treatment histories of patients, an EHR system is built to go beyond standard clinical data collected in a provider's office and can be inclusive of a broader longitudinal view of a patient's care by multiple providers. EHRs are a vital part of health IT from creation/input and usage perspectives. and can:</p> <ul style="list-style-type: none">- Contain a patient's medical history, diagnoses, medications, treatment plans, immunization dates, allergies, radiology images, and laboratory and test results- Allow access to evidence-based tools that providers can use to make decisions about a patient's care- Automates and streamlines provider workflow from initial data entry to use in patient care by clinicians and decision support systems. <p>One of the key features of an EHR is that health information can be created and managed by authorized providers in a digital format capable of being shared with other providers across more than one health care</p>

	<p>organization. EHRs are built to share information with other health care providers and organizations – such as laboratories, specialists, medical imaging facilities, pharmacies, emergency facilities, and school and workplace clinics – so they contain information from all clinicians involved in a patient’s care.</p> <p>(see: https://www.healthit.gov/faq/what-electronic-health-record-ehr)</p>
Population health	<p>The World Health Organization (WHO) defined health in its broader sense in 1946 as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." (World Health Organization. WHO definition of Health, Preamble to the Constitution of the World Health Organization, 1946)</p> <p>In this context Population Health Management is distinguished from disease management by including more chronic conditions and diseases, by use of "a single point of contact and coordination", and by "predictive modeling across multiple clinical conditions". PHM is considered broader than disease management in that it also includes "intensive care management for individuals at the highest level of risk" and "personal health management... for those at lower levels of predicted health risk".</p>
Personal Wellness Management	<p>The WHO definition of wellness is "... Wellness is the optimal state of health of individuals and groups. There are two focal concerns: the realization of the fullest potential of an individual physically, psychologically, socially, spiritually and economically, and the fulfilment of one’s role expectations in the family, community, place of worship, workplace and other settings" (Word Health Organization, Health Promotion Glossary).</p> <p>In this context Personal Wellness Management supports a continuous process of awareness of, and making choices contributing to, wellness, health and a fulfilling life.</p>
Clinical Quality Management	<p>Clinical quality management systems (CQMS) are systems used in the life sciences sector (primarily in the pharmaceutical, biologics and medical device industries) designed to manage quality management best practices throughout clinical research and clinical study management.</p> <p>A CQMS system is designed to manage all of the documents, activities, tasks, processes, quality events, relationships, audits and training that must be administered and controlled throughout the life of a clinical trial. The premise of a CQMS is to bring together the activities led by two sectors of clinical research, Clinical Quality and Clinical Operations, to facilitate cross-functional activities to improve efficiencies and transparency and to encourage the use of risk mitigation and risk management practices at the clinical study level.</p> <p>(source: https://en.wikipedia.org/wiki/Clinical_quality_management_system)</p>

4 Resource Data Model

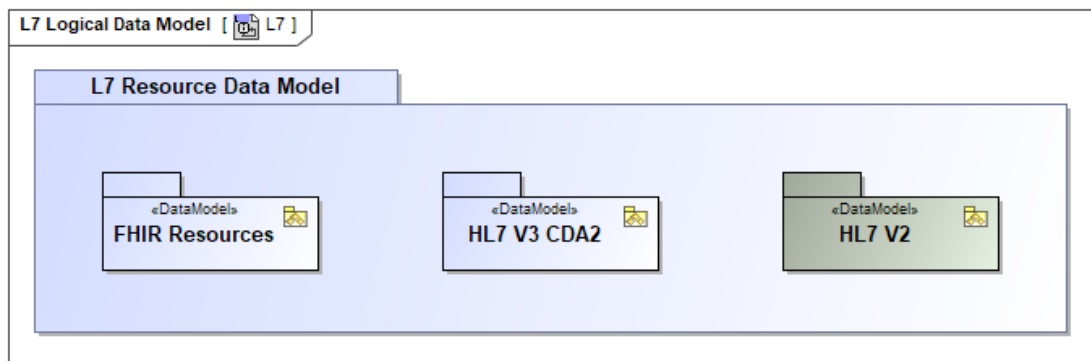


Figure 6 – Resource data model

The Resource Data Model represents the HL7 content standards covered by HSRA:

Currently the covered standards are:

- **FHIR Resources**

Resources are specified in the FHIR specification.

See <https://www.hl7.org/fhir/index.html>

- **HL7 Version 3 – CDA 2**

The CDA2 standard specification - see:

https://www.hl7.org/implement/standards/product_section.cfm?section=10

The HL7-V3 messages are included in some IHE profiles.

The base standard can be found at

https://www.hl7.org/implement/standards/product_brief.cfm?product_id=186

- **HL7 Version 2**

The HL V2 standard can be found at

https://www.hl7.org/implement/standards/product_section.cfm?section=13

In this HSRA version HL7-V2 is not fully considered, however, V2 messages can be, in several cases, a payload supported by generic HL7-OMG services.

Due to the Reference Architecture focus on behavior, only the RESTful resources (static Model), and some messages are specifically cited. In other cases where operations are generic enough and can support different payloads, the payloads are not specifically considered.

5 Service inventory

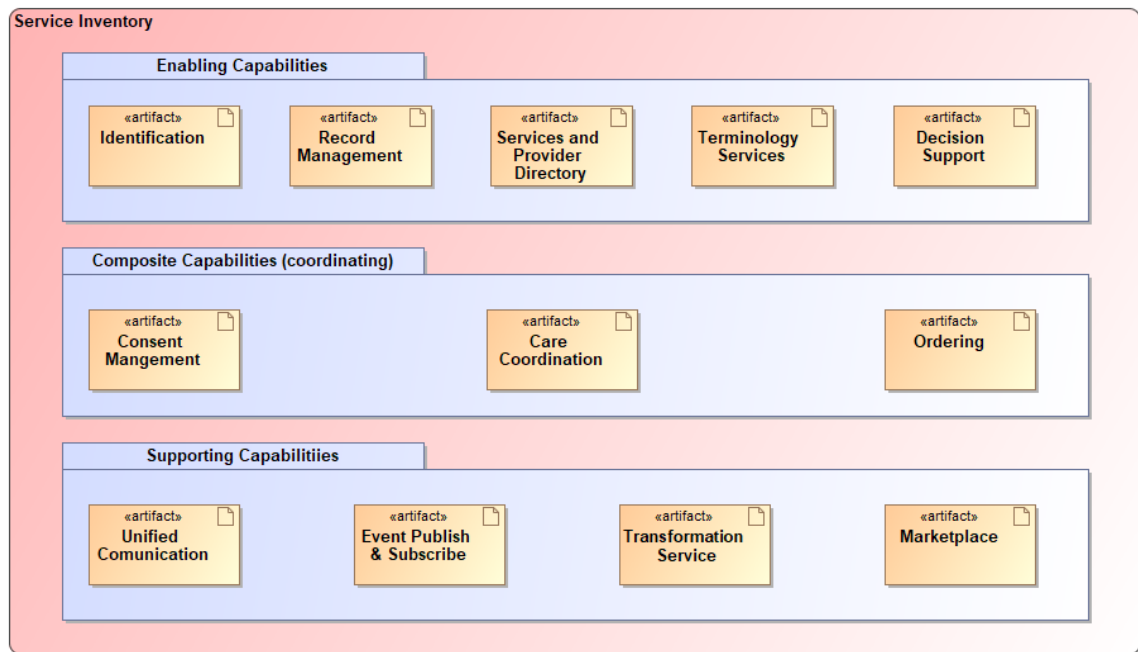


Figure 7 – Service Inventory

The service inventory maps the capabilities specified in the HL7 Service Functional Models with the projections in each technology/standard:

- FHIR (REST)⁴
- HL7/OMG (SOAP and REST)
- IHE Profile (SOAP and REST)

The following sections detail the service inventory content.

5.1 Identification Service

The HL7 Identification Service (IS) is charged with defining the functional specifications of a set of service interfaces to uniquely identify various kinds of entities (e.g. people, patients, providers, devices) within disparate systems within a single enterprise and/or across a set of collaborating enterprises.

This service is intended to allow for the resolution of demographics and other identifying characteristics (aka properties or traits) to a unique identifier. This allows any clinical system that uses the Service to maintain a common description for each entity and to manage the entities. Having a standard interface for accessing and maintaining entity identification information allows systems and applications to have a consistent means of indexing data related to an entity.

⁴ FHIR Messaging Is not considered in this first HSRA version.

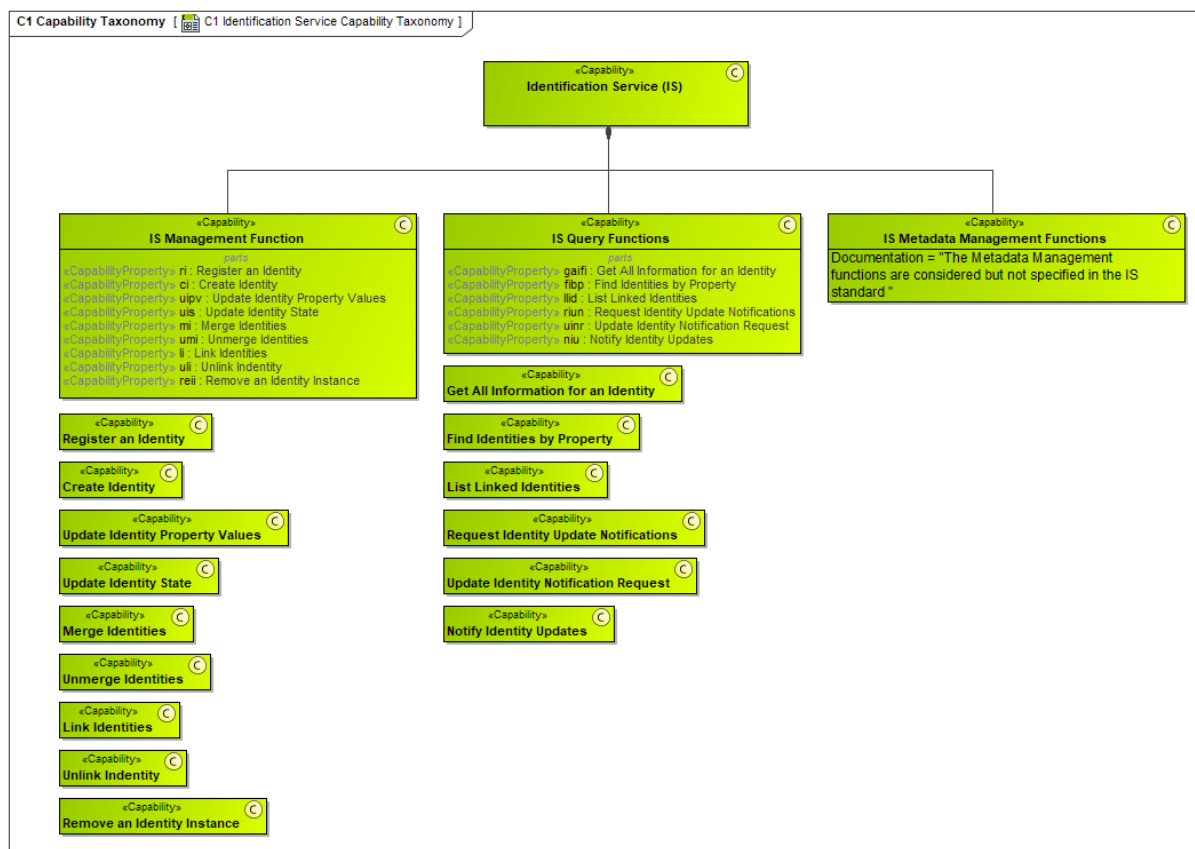




Figure 8 - Capability taxonomy of the HL7 Identification Service



5.1.1 Identification Service Capabilities




The HL7 Identification Service Platform independent model can be found at:







http://www.hl7.org/implement/standards/product_brief.cfm?product_id=87




Name	Definition
IS Management Function	Core identity management functions
Register an Identity	<p>Allows for creation of an identity with a supplied set of property values. Uses an identifier supplied by the service consumer which is unique within the Domain for the EntityType.</p> <p>Although it does not directly impact the description of the interface or parameters other than the potential output message, it is expected that IS implementations will typically provide some level of automated implicit linking capabilities. This could be policy driven or be handled manually using the explicit linking operations described in this specification. This functionality is similar to that described by the IHE PIX profile. This would be triggered when a new entity is created, or the properties of an entity updated. The</p>

Name	Definition
	<p>triggered behavior should be as described for the Link Identities capability.</p> <p>Actually “merging” entities based on automated logic is not encouraged. Note that the actual policies are handled through “out of band” agreements.</p>
 Create Identity	<p>Allows for creation of an Identity Instance with a list of property values, where the Identifier is generated and passed back to the service consumer. This would only be used where the consumer cannot generate and supply its own “local identifiers”, although this is an implementation and technical specification choice. This identifier is different from the IS Id.</p> <p>The IS Id is an identifier for a Real-World Entity that is guaranteed to be unique across an instance of an IS (i.e. across all Policy Domains covered by the instance). This may be generated by the IS implementation and is only used internally by the Service, although this is an implementation and technical specification choice.</p> <p>Although it does not directly impact the description of the interface or parameters other than the potential output message, it is expected that an IS implementations will typically provide some level of automated implicit linking capabilities. This could be policy driven or be handled manually using the explicit linking operations described in this specification. This functionality is similar to that described by the IHE PIX profile. This would be triggered when a new entity is created, or the properties of an entity updated. The triggered behavior should be as described for the Link Identities capability.</p> <p>Actually “merging” entities based on automated logic is not encouraged. Note that the actual policies are handled through “out of band” agreements.</p>
 Update Identity Property Values	<p>Allows for addition and/or update of a set of property values for an identity specified by a unique Identifier.</p> <p>Note on automated linking as for Register Identity</p> <p>The Update Qualifier input consists of the following elements:</p> <ul style="list-style-type: none"> • updateMode: Indicates the mode to be utilized during the update process - values include: <ul style="list-style-type: none"> ○ OVERWRITE - Replaces the entire set of data elements with the entire supplied set. Null values in the submitted data will replace existing non-null values. ○ VALUED - Replaces only those data elements that are valued in the input data. Null values in the

Name	Definition
	<p>submitted data will not replace existing non-null values.</p> <ul style="list-style-type: none"> ○ UNSPECIFIED - Implementation specific. • updateSchemaDefinition: a reference to an external resource (e.g. XSL) that can be utilized to extract properties from the supplied SemanticSignifier
 Update Identity State	<p>Changes the processing “state” of an identity (e.g., to “inactive”, “active” or other states to be defined in appropriate semantic profiles).</p> <p>Reasons may be codified. This is left to the technical specification. The simple state model of active and inactive as defined for the HL7 RIM “Entity” is defined as a minimum set of states, whereby “inactive” entities do not show up in normal searches.</p> <p>However, the definition and meaning of states is seen as something that should be configurable and tailored to individual realms and even for organizations internal use. It also may vary depending on the different Entity Type that is being identified.</p> <p>For example, in HL7 RIM terms, it is feasible to use this Service to identify specific kinds of “Acts”, which have a different state model to rim Entities.</p>
 Merge Identities	<p>Allows for the merging of two identities. The Target Identifier is the “winner” in the merging capability. The deprecated Identity should be automatically set to a pre-configured state (e.g. inactive, but the actual value is semantic profile specific – implementations can default where a more static solution is desired).</p> <p>Merge capability is restricted to be within a single Policy Domain only. The Link capability should be used across Domains.</p> <p>In general, it should also be restricted to identities of the same Entity Type, however implementations may apply this to different Entity Types that represent the same Entity Concept, providing that the semantic signifiers used are compatible.</p> <p>Identifying attributes in the target which are empty, are filled from the source, and existing attributes in the target remain AS-IS. The implementation must provide a mechanism to indicate that the two identities have been merged (e.g. by use of an explicit link relationship or by using a Correlation set).</p> <p>The mechanism for relating the two identities is left to the technical specification. A link relationship class was identified in the conceptual mode above. Another alternative is to define a “correlation” set, i.e., a separate “master Id” which collects together</p>

Name	Definition
	<p>related identities. Reasons may be codified. This is left to the technical specification.</p> <p>If automated implicit linking capabilities are provided, then the rules for dealing with such links need to be specified in implementations.</p> <p>A default should be used for target state, so input is optional</p>
 Unmerge Identities	<p>Allows for the unmerging of two Identities. This would reinstate a previously deprecated Identity. Note that the state of the unmerged Identities cannot be guaranteed to be valid and assumes that some subsequent manual updates would be carried out to correct both entries.</p> <p>Whatever mechanism was used to record the “merge” association between the two identities will be reversed. No other attribute values are updated, merely the states.</p> <p>From an overall process perspective, the “unmerge” should require manual intervention afterwards. The Technical Specification may choose to enforce an inactive status on the unmerged entities until a further update is carried out. This may also be driven by the optional input state parameters.</p> <p>Reasons may be codified.</p>
 Link Identities	<p>Allows for the linking of two Identity. Linking capability can be carried out within a single domain or across two different domains.</p> <p>For cross-Entity-Domain linking, Technical Specifications may choose to allow “peer to peer” linking or enforce that the link is to and from a “Master” Policy Domain for the IS instance. Note that this does not affect the structure of the interface but is an important behavioral aspect.</p> <p>This capability permits linking of entities of different types; however, it is recommended that they map to the same Entity Concept (unlike merge, this is NOT an absolute requirement). Reasons may be codified. This is left to the technical specification.</p> <p>Note: this capability could be triggered by implicit logic as part of the register, create or update actions.</p>
 Unlink Identity	<p>Allows for the unlinking of two entities.</p> <p>Reasons may be codified.</p>

Name	Definition
 Remove an Identity Instance	<p>Allows for the “complete” removal of an Identity Instance from an IS service.</p> <p>Technical Specifications must define whether the Identity Instance Identifier may be reused after this operation although this is strongly discouraged.</p> <p>The concept of “removal” implies that there is some persistent storage of identity information within the implementation of the service. This may be achieved in many different ways, but this is outside the scope of the interface definition. This functional model assumes that identity instance identifiers cannot be reused, but this is an issue that must be defined precisely in technical specifications.</p>
 IS Query Functions	Core identity query functions
 Get All Information for an Identity	<p>Retrieves all information for an Identity known by the IXS (properties, status etc).</p> <p>A specific unique identifier is input (qualified by PolicyDomain and EntityType). An error is returned if the identifier is not found.</p> <p>The optional “Return Statuses” parameter may be used to restrict the return only to specific statuses. (Implementations may then restrict which user roles may see certain statuses).</p> <p>If the identity has been merged into another “main” identifier, then a warning message should be returned with the identifier of the identity into which the supplied identifier has been merged.</p>
 Find Identities by Property	<p>Given a partially populated semantic signifier and other search filter criteria, this allows for a search of matching Identities.</p> <p>Search qualifiers enable directing the search behavior but are not explicitly business data content filter criteria.</p> <p>Outputs include a quality of match.</p>
 List Linked Identities	<p>Given an Identifier, list all other entities that are linked to the Identity (optionally constrained within one or more Policy Domains).</p> <p>The content of search qualifiers. One example could be enabling filtering based on particular kinds of automated linking.</p>
 Notify Identity Updates	<p>The service produces a notification of an update that has been made to any information relating to a specific identity or identities within a Policy Domain and/or Entity Type (previously notified by a “Request Update Notifications” request).</p>

Name	Definition
	This is effectively a publication operation resulting from an earlier subscription operation. This could be implemented using a publish-and-subscribe capability.
 Update Identity Notification Request	The service consumer provides an update to a previously submitted request to be notified if the IXS becomes aware of any changes to information for a specific Identity (properties, status or entity links) or identities of a specific type and/or domain combination. This includes cancellation of the request. This is an update operation on a subscription already created.
 Request Identity Update Notifications	The service consumer lodges a request to be notified if the IXS becomes aware of any changes to information for a specific Identity (properties, status or entity links) or identities of a specific type and/or domain combination. The input information is validated, and if valid a request identifier is generated and returned. This is effectively a subscription operation. This could be implemented using a publish-and-subscribe capability.
 IS Metadata Management Functions	The Metadata Management functions are considered but not specified in the Identification Service standard

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318 **5.1.2 Identification Service implementation**

319 The identification capabilities can have 3 standard projections in

- 320 • OMG IXS (soap based and content independent),
- 321 • HL7 FHIR
- 322 • IHE profiles based on different technologies and standards.

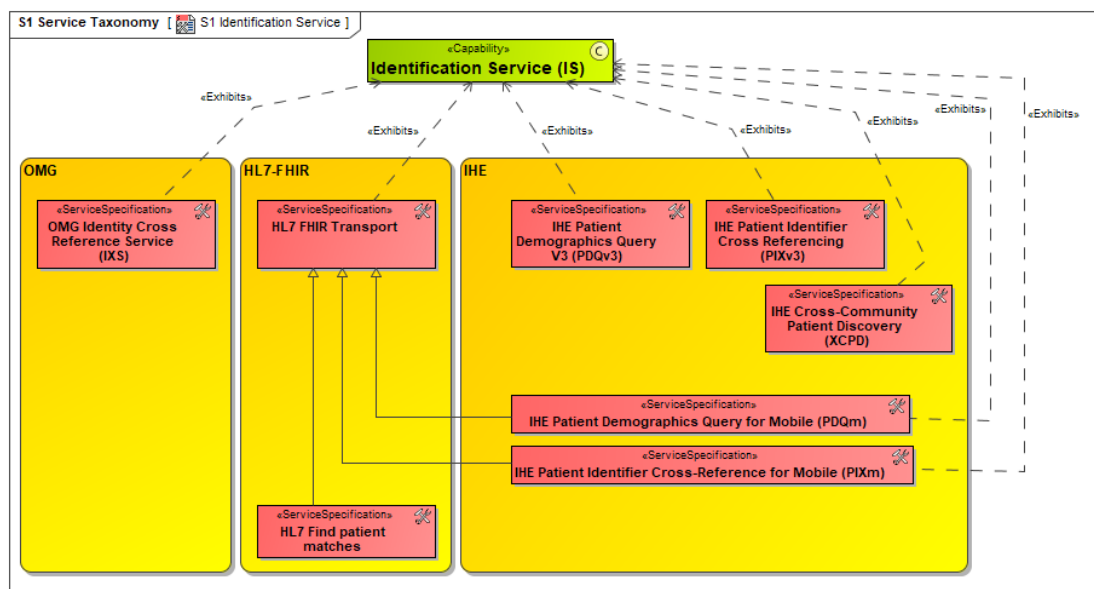


Figure 9 – Identification capability technical projections

5.1.2.1 HL7 Identification to OMG soap projection (IXS)

The Identity Cross Reference Service (IXS) Platform Independent Model (PIM), specified in the IXS interface as a WSDL, represents a wire and payload implementation independent means to describe the IXS interfaces.

IXS includes three Interfaces:

- IXSAdminEditorInterface
- IXSManagementAndQueryInterface
- IXSMetaDataInterface

It is important to note that the structure of interfaces is specifically defined for the Service provider and reflects a natural structure of components that may provide the IXS functionality. These are effectively orthogonal to the groupings of capabilities defined in Functional Profiles that form the basis for conformance and for consumption of the service by Clients. In some cases, the functional profiles may approximate the interface structure.

The complete specification of a platform specific model can be found at the OMG Site:

<https://www.omg.org/spec/IXS>

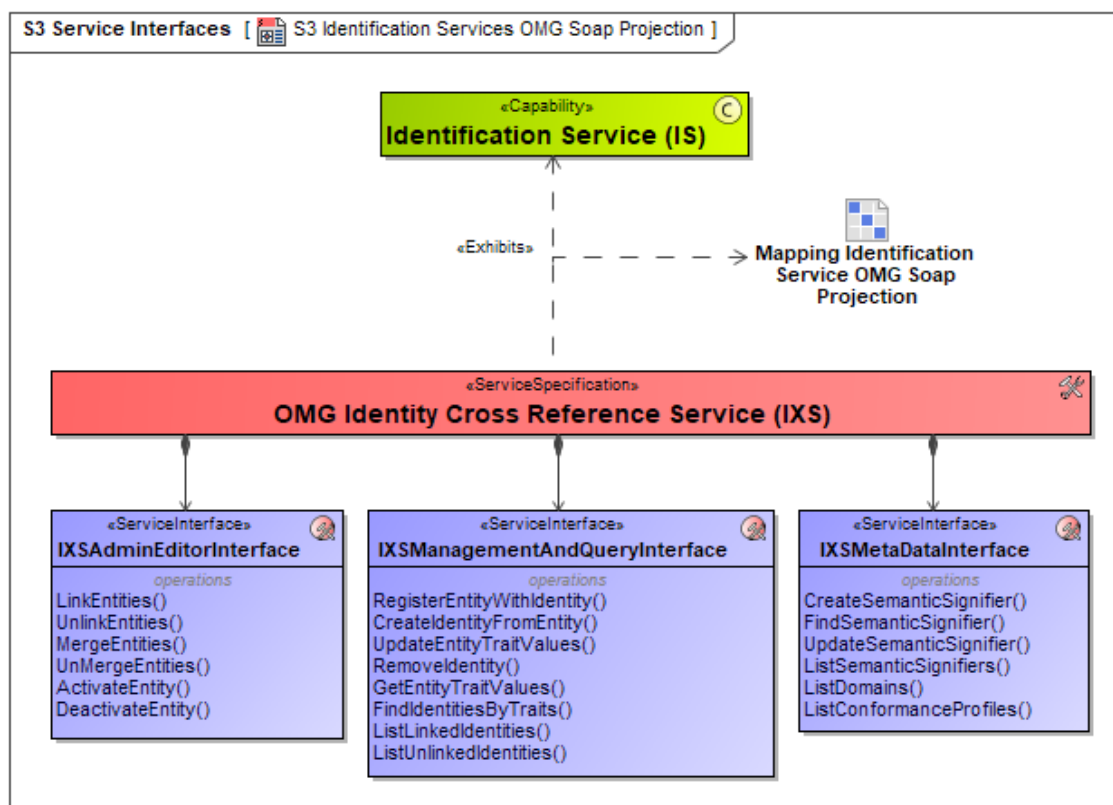









Figure 10 – OMG Identity Cross Reference Service (IXS)




5.1.2.1.1 IXSAdminEditorInterface

Name	Definition
ActivateEntity	This operation marks the record as “active” in the IXS repository, effectively marking it as logically un-deleted.
DeactivateEntity	This operation marks the record as “inactive” in the IXS repository, effectively marking it available for Get() or List() operations at the entity level but not from the IXS repository.
LinkEntities	This operation provides the means to create an explicit linking between the source and target record IDs in the IXS repository.
MergeEntities	This operation provides the means to explicitly consolidate IXS member records in the IXS repository. The source record is effectively merged into the target, leaving only the resulting target record in the IXS repository. Identifying attributes in the target that are empty are filled from the source, and existing attributes in the target remain AS-IS. The source record is inactivated in the IXS repository at the successful end of this operation.

Name	Definition
 UnlinkEntities	This operation provides the means for explicitly breaking the link between the source and target record IDs in the IXS repository.
 UnMergeEntities	This operation is a rollback of merge operation







343 5.1.2.1.2 IXSManagementAndQueryInterface

Name	Definition
 CreateIdentityFromEntity	This operation generates an Entity ID on behalf of a Source that does not generate Entity IDs. It inserts the Source ID/newly-generated Entity ID pair and supplied Traits into the IXS with implicit linking to other matching Source ID/ Entity ID pairs, based on the configured internal matching algorithm. This operation may be used in environments where the RegisterEntityWithIdentity cannot be used because the Source does not assign Identifiers to Entities.
 FindIdentitiesByTraits	This operation provides the means to perform a broad search of all records in the IXS whose Traits match some criteria in the supplied search criteria (such as find all records who match the name “Jones, Bob”). This operation is equivalent to the IHE PDQ transaction.
 GetEntityTraitValues	Retrieves the Traits associated with a Source ID/Entity ID pair.
 ListLinkedIdentities	This operation retrieves all the Source ID/Entity ID pairs that are linked to the supplied Source ID/Entity ID pair. The operation can be filtered with the sourceConstraintSet property of the IXSSearchQualifier to only return entities within specified Source domains. This operation is equivalent to the IHE PIX transaction
 ListUnlinkedIdentities	This operation retrieves duplicately specified, yet unlinked records in the IXS repository. It filters the record set to only return matching, but unlinked records. The operation can be filtered with sourceConstraintSet to only return entities within specified Source domains.

Name	Definition
 RegisterEntityWithIdentity	This operation inserts a Source ID/Entity ID pair and supplied Traits into the IXS with implicit linking to other matching Source ID/ Entity ID pairs, based on the configured internal matching algorithm. It is the normal operation for the insertion of new Entity data into the IXS.
 RemoveIdentity	This function deletes a Source ID/Entity ID pair and its associated Traits from the IXS repository. This operation is designed to correct a true invalid data condition, such as the data entry of practice or testing data. All of the operations in the IXSAdminInterface are the normal operations to deal with changes and corrections to otherwise valid data.
 UpdateEntityTraitValues	This operation updates the Traits stored in the IXS for the Entity identified by the supplied Source ID/Entity ID pair. Whether this entails re-analyzing matching identities is implementation specific, although it would be done in most cases. How it would be done is also implementation specific.

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345 5.1.2.1.3 IXSMetaDataInterface

Name	Documentation
 CreateSemanticSignifier	Creates a semantic signifier definition in the IXS meta-data repository.
 FindSemanticSignifier	Locates and returns a semantic signifier definition from the IXS meta-data repository.
 ListConformanceProfiles	Returns the list of conformance profile names and versions that this implementation of IXS supports.
 ListDomains	List the domain hierarchy configured in the IXS meta-data repository.
 ListSemanticSignifiers	List the traits registered with the system.
 UpdateSemanticSignifier	Updates a semantic signifier definition in the IXS meta-data repository.

5.1.2.1.4 Capabilities to Service interface mapping

	IXSAdminEditorInterface	Activate Entity()	Deactivate Entity()	Link Entities()	Merge Entities()	Unlink Entities()	UnMerge Entities()	IXSManagementAndQueryInterface	Create IdentityFromEntity()	FindIdentitiesByTraits()	GetEntityTraitValues()	ListLinkedIdentities()	ListUnlinkedIdentities()	RegisterEntityWithIdentity()	Remove Identity()	UpdateEntityTraitValues()	IXSMetadataInterface	CreateSemanticSignifier()	FindSemanticSignifier()	ListConformanceProfiles()	ListDomains()	ListSemanticSignifiers()	UpdateSemanticSignifier()
IS Management Function	<							<															
ci : Create Identity									<														
li : Link Identities				<																			
mi : Merge Identities					<																		
reii : Remove an Identity Instance															<								
ri : Register an Identity														<									
uipv : Update Identity Property Values																<							
uis : Update Identity State		<	<																				
uli : Unlink Identity					<																		
umi : Unmerge Identities						<																	
IS Query Functions								<															
fibp : Find Identities by Property									<														
gaifi : Get All Information for an Identity										<													
llid : List Linked Identities											<	<											
niu : Notify Identity Updates																							
riun : Request Identity Update Notifications																							
uivr : Update Identity Notification Request																							
IS Metadata Management Functions																<	<	<	<	<	<	<	<

5.1.2.2 Identification FHIR Projection

The Identification FHIR Projection uses the FHIR RESTful API transport with an implementation of a specific FHIR operation “HL7 Find patient matches”.

There are also two FHIR based IHE profiles: IHE Patient Demographics Query for Mobile (PDQm) and IHE Patient Identifier Cross-Reference for Mobile (PIXm)

The involved FHIR Resource is Patient (<https://hl7.org/FHIR/patient.html>)

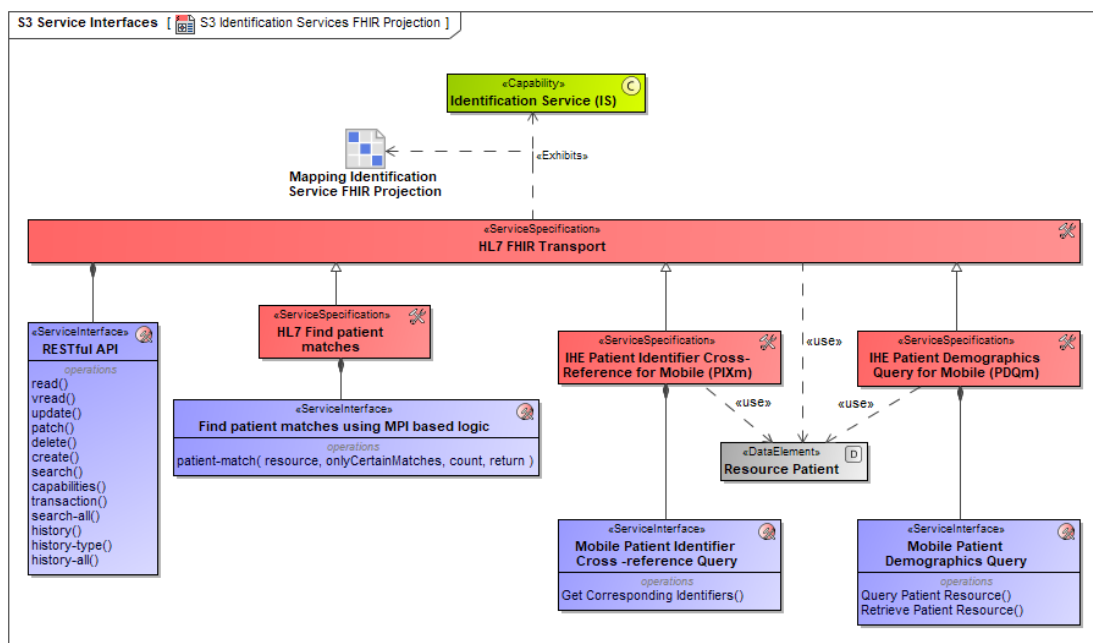


Figure 11 – Identification FHIR Projection

5.1.2.2.1 HL7 FHIR Find patient matches using MPI based logic

A Master Patient Index (MPI) is a service used to manage patient identification in a context where multiple patient databases exist. Healthcare applications and middleware use the MPI to match patients between the databases, and to store new patient details as they are encountered. MPIs are highly specialized applications, often tailored extensively to the institution's particular mix of patients. MPIs can also be run on a regional and national basis.

The complete specification can be found here:

<https://www.hl7.org/fhir/patient.html#match>

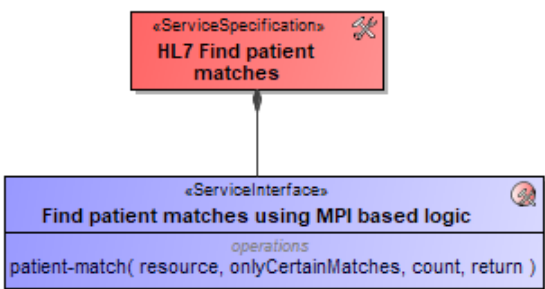


Figure 12 - HL7 FHIR Find patient matches using MPI based logic

Name	Documentation
patient-match	To ask an MPI to match a patient, clients use the "\$match" operation, which accepts a patient resource which may be only partially complete. The data provided is interpreted as an MPI input and processed by an algorithm of some kind that uses the data to determine the most appropriate matches in the patient set. Note that different MPI matching algorithms have different required inputs. The generic \$match operation does not specify any particular algorithm, nor a minimum set of information that must be provided when asking for an MPI match operation to be performed, but many implementations will have a set of minimum information, which may be declared in their definition of the \$match operation by specifying a profile on the resource parameter, indicating which properties are required in the search. The patient resource submitted to the operation does not have to be complete, nor does it need to pass validation (i.e. mandatory fields don't need to be populated), but it does have to be a valid instance, as it is used as the reference data to match against.

5.1.2.2.2 IHE Patient Demographics Query for Mobile (PDQm)

The Patient Demographics for Mobile (PDQm) Profile provides a transaction for mobile and lightweight browser -based applications to query a patient demographics supplier for a list

of patients based on user-defined search criteria and retrieve a patient’s demographic information.

This profile provides a lightweight alternative to PDQ Patient Demographics Query [ITI-21] or PDQV3 Patient Demographics Query V3 [ITI-47].

The complete specification can be found here:
[https://wiki.ihe.net/index.php/Patient_Demographics_Query_for_Mobile_\(PDQm\)](https://wiki.ihe.net/index.php/Patient_Demographics_Query_for_Mobile_(PDQm))

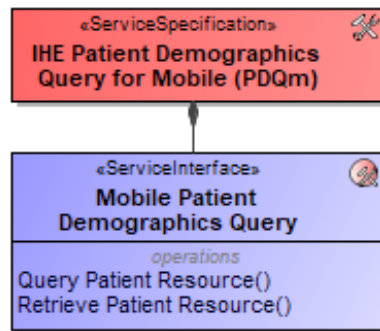




Figure 13 – IHE Patient Demographics Query for Mobile (PDQm)

Name	Documentation
 Query Patient Resource	This message represents an HTTP GET parameterized query from the Patient Demographics Consumer to the Patient Demographics Supplier.
 Retrieve Patient Resource	This message represents an HTTP GET from the Patient Demographics Consumer to the Patient Demographics Supplier and provides a mechanism for retrieving a single Patient Resource with a known resource identifier.

5.1.2.2.3 IHE Patient Identifier Cross-Reference for Mobile (PIXm)

The Patient Identifier Cross-reference for Mobile Profile is intended to be used by lightweight applications and mobile devices present in a broad range of healthcare enterprises (hospital, a clinic, a physician office, etc.). It supports the cross-reference query of patient identifiers from multiple Patient Identifier Domains via the following interaction:

- The ability to access the list(s) of cross-referenced patient identifiers via a query/response

The complete specification can be found here:
[https://wiki.ihe.net/index.php/Patient_Identifier_Cross-Reference_for_Mobile_\(PIXm\)](https://wiki.ihe.net/index.php/Patient_Identifier_Cross-Reference_for_Mobile_(PIXm))

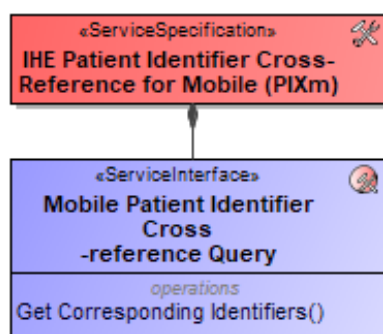


Figure 14 – IHE Patient Identifier Cross-Reference for Mobile (PIXm)

Name	Documentation
Get Corresponding Identifiers	This message is implemented as an HTTP GET operation from the Patient Identifier Cross-reference Consumer to the Patient Identifier Cross-reference Manager using the FHIR ihe-pix operation.

5.1.2.2.4 Capabilities to Service interface mapping

	RESTful API	capabilities()	create()	delete()	history-all()	history-type()	history()	patch()	read()	search-all()	search()	transaction()	update()	vread()	Find patient matches using MPI based logic	patient-match()	Mobile Patient Demographics Query	Query Patient Resource()	Retrieve Patient Resource()	Mobile Patient Identifier Cross-reference Query	Get Corresponding Identifiers()
IS Management Function																					
ci : Create Identity			↖																		
li : Link Identities								↖					↖								
mi : Merge Identities																					
reii : Remove an Identity Instance				↖																	
ri : Register an Identity			↖																		
uipv : Update Identity Property Values													↖								
uis : Update Identity State								↖					↖								
uli : Unlink Indentity								↖					↖								
umi : Unmerge Identities																					
IS Query Functions																					
fibp : Find Identities by Property											↖					↖		↖			
gaifi : Get All Information for an Identity											↖								↖		
llid : List Linked Identities											↖										↖
niu : Notify Identity Updates																					
riun : Request Identity Update Notifications																					
uinr :Update Identity Notification Request																					
IS Metadata Management Functions		↖																			

5.1.2.3 HL7 Identification service to IHE soap Projection

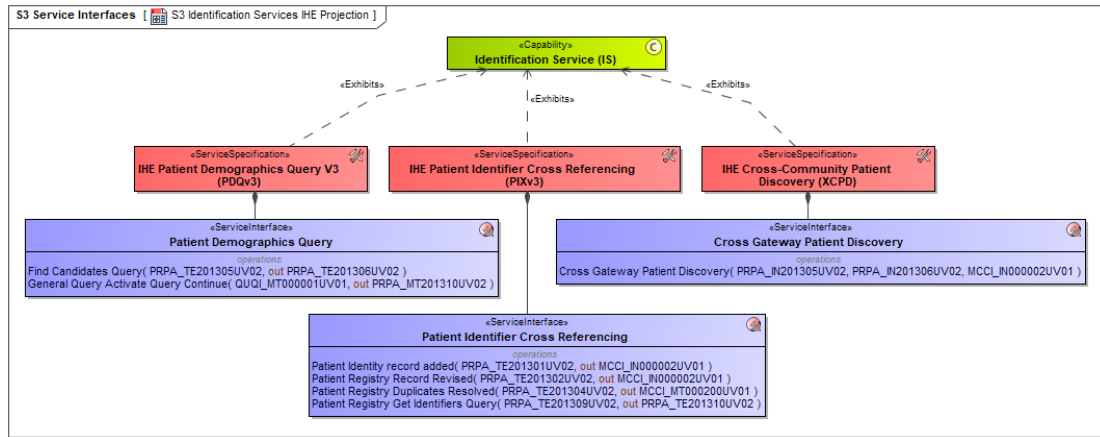


Figure 15 – IHE Identification Service soap projection

Includes three profiles based on HL7 V3 messages:

- IHE Patient Demographics Query V3 (PDQv3)
- IHE Patient Identifier Cross Referencing (PIXv3)
- IHE Cross-Community Patient Discovery (XCPD)

5.1.2.3.1 IHE Patient Demographics Query V3 (PDQv3)

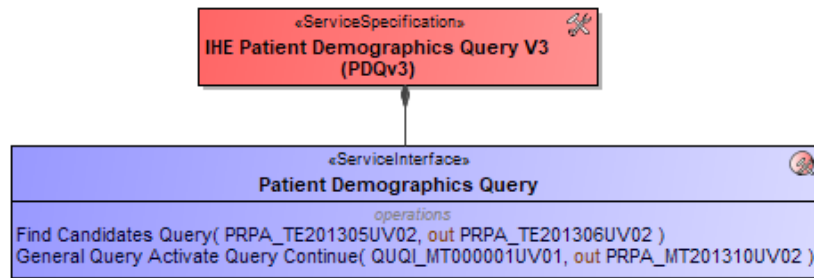


Figure 16 – IHE Patient Demographics Query V3

The complete specification can be found here:

https://wiki.ihe.net/index.php/Patient_Demographics_Query_HL7_v3

Name	Documentation	Service Parameters
Find Candidates Query	An application, in the role of Query Placer, sends a query-by-parameter message to request that the application return all person records that match the demographic information sent in the query parameters.	in PRPA_TE201305UV02 out PRPA_TE201306UV02
General Query Activate Query Continue	An application, in the role of Query Placer, sends a query continuation message to request that the application return up to a specified number of	in QUQI_MT000001UV01 out PRPA_MT201310UV02

Name	Documentation	Service Parameters
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matching records based on a previous demographics query.

5.1.2.3.2 IHE Patient Identifier Cross Referencing V3 (PIXv3)

The complete specification can be found here:

https://wiki.ihe.net/index.php/Patient_Demographics_Query_HL7_v3

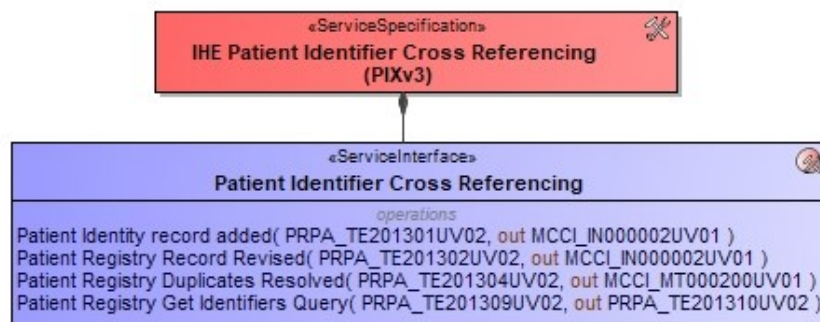



Figure 17 – IHE Patient Identifier Cross Referencing v3

The Patient Identifier Cross Referencing (PIXv3) Integration Profile supports the cross-referencing of patient identifiers from multiple Patient Identifier Domains by:

- Transmitting patient identity information from an identity source to the Patient Identifier Cross-reference Manager.
- Providing the ability to access the list(s) of cross-referenced patient identifiers either via a query/ response or via an update notification.

Name	Documentation	Service Parameters
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 Patient Registry Record Added



This trigger event signals that a new patient was added to a Patient Identity Source.

in
PRPA_TE201301UV02
out
MCCI_IN000002UV01

 Patient Registry Duplicates Resolved

This trigger event signals that duplicate records were resolved in a patient registry. A Patient Registry Duplicates Resolved message indicates that the Patient Identity Source has done a merge within a specific Patient Identification Domain. That is, the surviving identifier (patient ID) has subsumed a duplicate patient identifier.

in
PRPA_TE201304UV02
out
MCCI_MT000200UV01

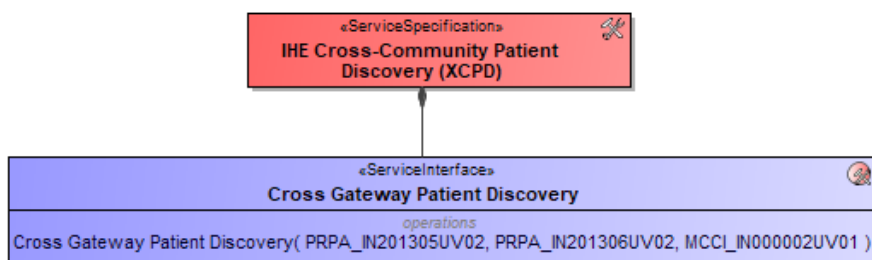
Name	Documentation	Service Parameters
 Patient Registry Get Identifiers Query	This query requests all other identifiers associated with a particular person identifier.	in PRPA_TE201309UV02 out PRPA_TE201310UV02
 Patient Registry Record Revised	This trigger event signals that patient information was revised in a Patient Identity Source.	in PRPA_TE201302UV02 out MCCI_IN000002UV01

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418 5.1.2.3.3 IHE Cross-Community Patient Discovery (XCPD)

419 The complete specification can be found here:

420 https://wiki.ihe.net/index.php/Cross-Community_Patient_Discovery




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422 *Figure 18 – IHE Cross-Community Patient Discovery Profile*

423 The Cross-Community Patient Discovery (XCPD) Profile supports the means to
424 locate communities that hold patient relevant health data and the translation of
425 patient identifiers across communities holding the same patient's data.

426 A community is defined as a group of facilities/enterprises that have agreed to work
427 together using a common set of policies for the purpose of sharing health information
428 within the community via an established mechanism.

429 Facilities/enterprises may host any type of healthcare application such as EHR, PHR,
430 etc. A community is identifiable by a globally unique id called the homeCommunityId.
431 Membership of a facility/enterprise in one community does not preclude it from being
432 a member in another community.

Name	Documentation	Service Parameters
 Cross Gateway Patient Discovery	The Cross Gateway Patient Discovery transaction supports the ability for Initiating Gateways and Responding Gateways to discover mutually known patients. This transaction assumes an environment where patient data is well described, and high-quality demographic data is available.	in PRPA_IN201305UV02 out PRPA_IN201306UV02 out MCCI_IN000002UV01

Name	Documentation	Service Parameters
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Because the transaction supports the mutual discovery of patients it can be seen as having dual purposes.

- To support a query by the Initiating Gateway requesting a demographically matching patient from within the Responding Gateway's community.

- To support a feed to Responding Gateway announcing that the patient is known by the Initiating Gateway's community.

This dual nature of the transaction is chosen for scalability purposes, as demographic matching algorithms are expensive on a large scale and once a match is identified it is important that both the initiating and responding sides of the transaction can use the results of that successful match.

The Cross Gateway Patient Discovery transaction has several modes, useful in different environments:

- Demographic Query only mode – in this mode only the demographics of the patient are included in the request. The initiating community does not have, or does not choose to specify, a patient identifier for use by the Responding Gateway.

- Demographic Query and Feed – in this mode both the demographic and initiating community identifier are included in the request.

- Shared/national Patient Identifier Query and Feed – in this mode only a shared/national identifier is specified. Demographics are not necessary because matching can be done on the identifier alone.

This transaction can be used synchronously and asynchronously.

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5.2 HL7 Record Management service (RLUS)

The Retrieve, Locate, and Update Service (RLUS) Service Functional Model specification provides a set of capabilities through which information systems can access and manage information resources.

RLUS realizes, at its core, a basic set of CRUD capabilities plus location for health information resources management thus standardizing the way in which the resources are exposed and consumed independently from the nature of the resources.

The full specification can be found on:

http://www.hl7.org/implement/standards/product_brief.cfm?product_id=89

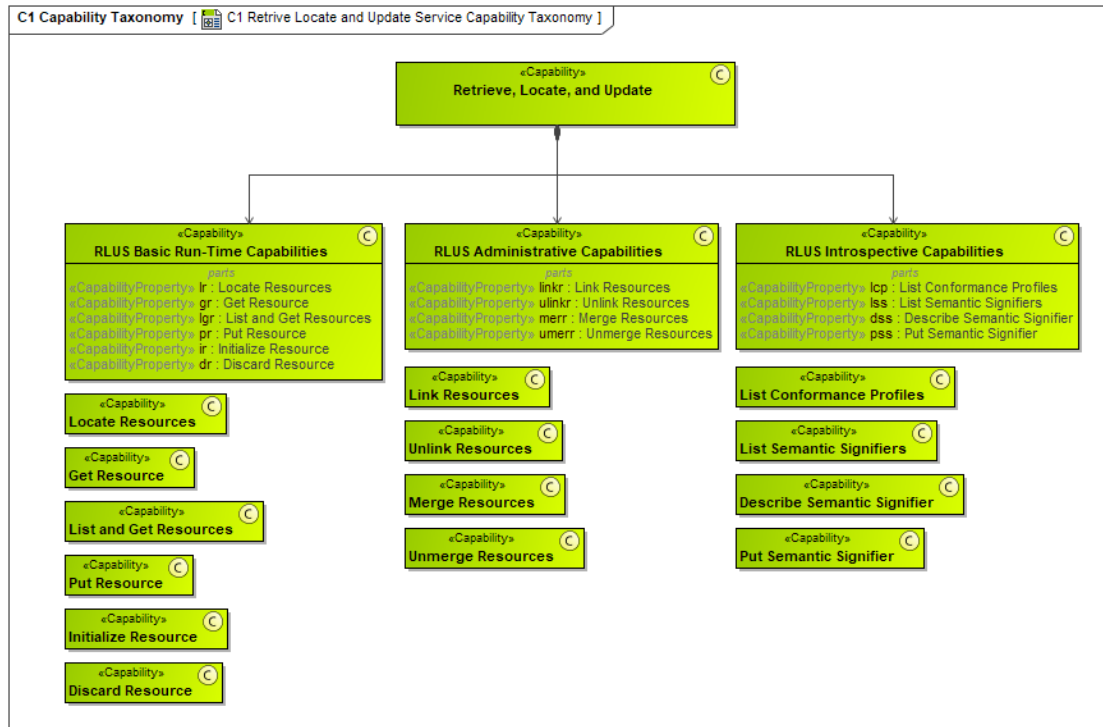















Figure 19 – HL7 Record Management (Retrieve Locate and Update) Service

5.2.1 HL7 Record Management Capabilities

Name	Definition
RLUS Basic Run-Time Capabilities	Core runtime capabilities of RLUS
Locate Resources	Given a set of parameters, returns a list of matching resource locations and a set of metadata
Get Resource	Given a set of parameters that uniquely describes a resource, returns the identified resource.
List and Get Resources	Given a set of parameters, returns a set of resources that matches the parameters

Name	Definition
 Put Resource	Stores a resource in underlying RLUS storage and makes it accessible.
 Initialize Resource	The consumer notifies a resource creation, but the resource is not necessarily stored in the underlying RLUS instance system. Other initialization contexts can be possible on an instance-by-instance basis.
 Discard Resource	Removes a resource from a RLUS instance (in the underlying storage) or makes it unavailable. Also removes the RLUS reference to that resource (e.g. link) or makes it unavailable.
 RLUS Administrative Capabilities	Administrative capabilities of RLUS
 Link Resources	Creates a (typed) relation between two resources of a RLUS instance
 Unlink Resources	Discard a relation between two resources of a RLUS instance
 Merge Resources	Merge two resources of a RLUS instance. The operation transforms two existing resources into a combined resource and removes (discards) the previous resources
 Unmerge Resources	Unmerge two resources of a RLUS instance. The operation discards the merged resource and exposes the original resources (as was before the previous merge operation)
 RLUS Introspective Capabilities	Introspective capabilities of RLUS
 List Conformance Profiles	Produces a list of conformance profiles supported by this RLUS instance
 List Semantic Signifiers	Lists semantic signifiers that are available from this RLUS implementation, for example, what is available and how it is retrieved

Name	Definition
 Describe Semantic Signifier	Retrieves a description and formal model of a local semantic signifier
 Put Semantic Signifier	Send a new or updated Semantic Signifier to a RLUS instance

5.2.2 Record Management Service Implementations

The Service model has currently three standard technical projections:

- FHIR REST
- OMG (SOAP)
- IHE XD* Profiles (SOAP)

The content standard can be:

- FHIR Resource (FHIR RESTful transport and OMG SOAP service)
- HL7 V2 (OMG SOAP service)
- HL7 V3-CDA2 (IHE Profiles and OMG soap services)

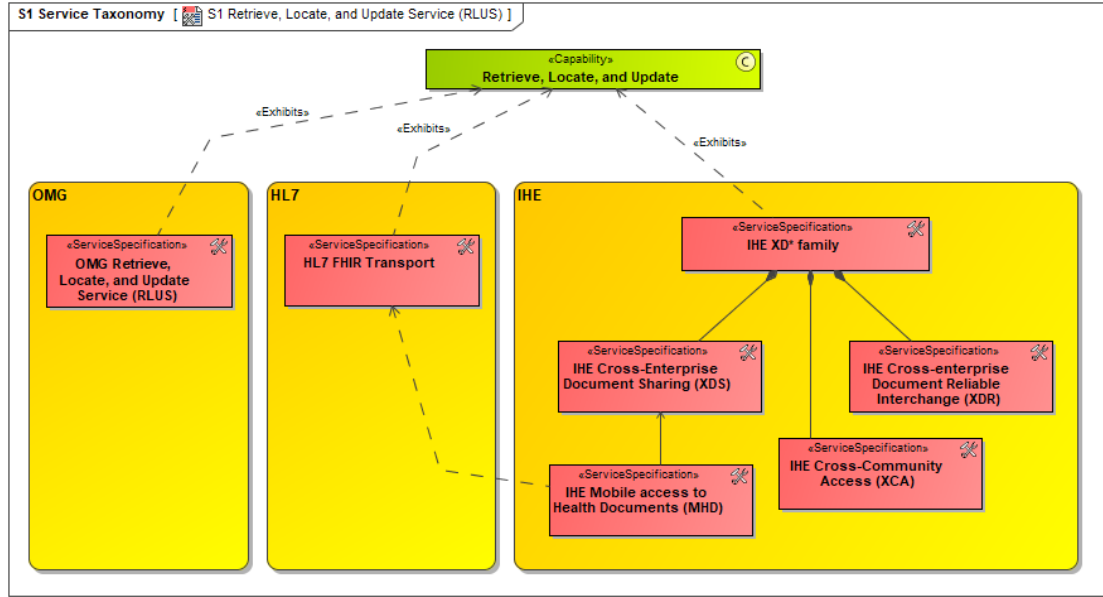


Figure 20 – Record management (Retrieve, Locate and Update) capability technical projections (RLUS)

5.2.2.1 Record Management OMG soap projection (RLUS)

The Retrieve, Locate, and Update Service (RLUS) provides a set of interfaces through which information systems can access and manage information. RLUS allows health data to be located, accessed, and updated regardless of underlying data structures, security concerns, or delivery mechanisms. RLUS explicitly occupies the service space within an information processing environment. It is independent of but compatible with underlying structures, including local security implementations, data models, or delivery mechanisms. By separating and exposing those aspects of resources that facilitate inter-organization

workflows in a service layer, this specification abstracts the problem of interoperability away from underlying systems. It is this abstraction and reconfiguration that allows interoperability and system durability independent of burdensome technology integration.

The Retrieve, Locate, and Update Service (RLUS) web service specification seeks to define, at a service level, appropriate interfaces to locate, retrieve, and update resources among and between healthcare organizations. It is not intended to replace existing systems or implementations, but to create an interface standard for a service-oriented layer to expose those healthcare assets and resources within an organization that are needed to meet business or clinical needs.

The complete specification can be found here:

<https://www.omg.org/spec/RLUS>

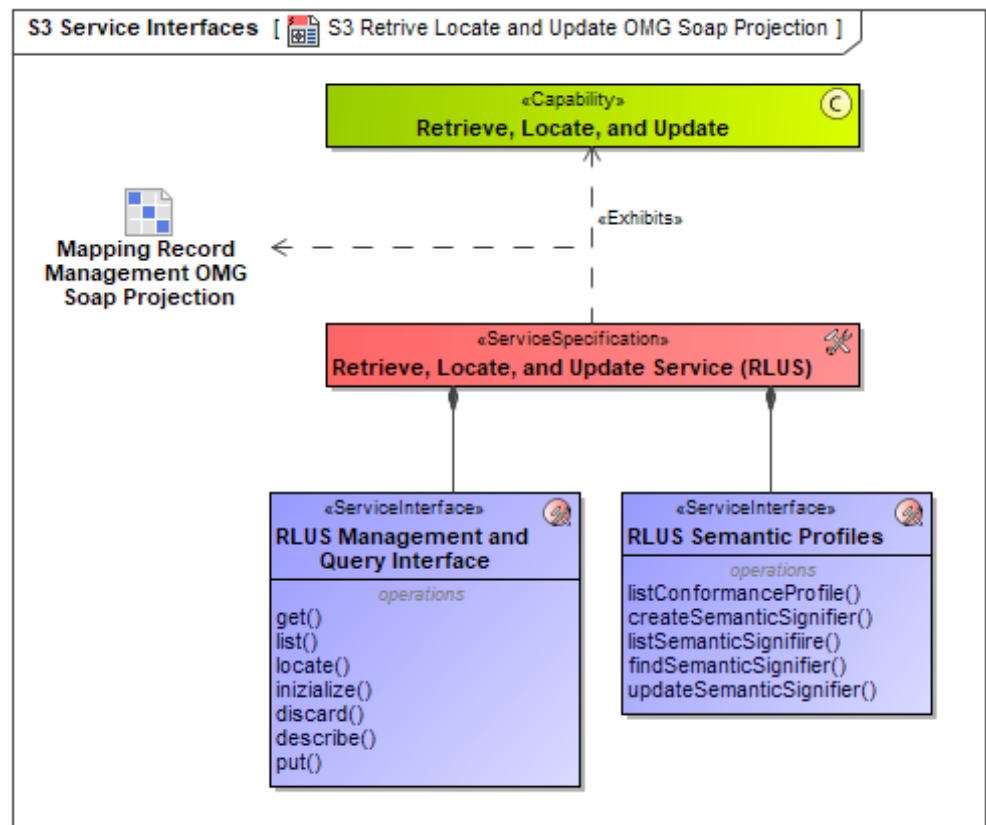
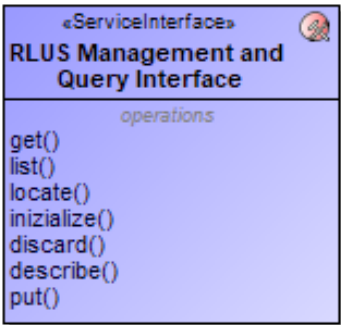


Figure 21 – Record Management OMG soap projection (RLUS)






484 **5.2.2.1.1 RLUS Management and Query Interface**





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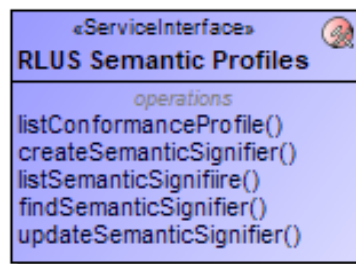
Figure 22 – RLUS Management and Query Interface

Name	Documentation
 get	This is an operation for retrieving a single logical record based on parameters supplied by the RLUS Search Struct that uniquely identifies a single record.
 list	This operation returns a list of logical record instances based on the contents of the RLUSearchStruct in a manner consistent with Get() but is capable of streaming many records from the underlying source to the calling client.
 locate	This operation is for returning a list of RLUS service locations where the desired logical record can be found.
 initialize	This optional operation is used to send a record from an internal source system onto an RLUS network in response to record create, update, or delete events “inside-out” from a local system. That is, the local system is generating a logicalRecordInstance in response to a system generated event (like SQL table insert) and the data generated is “initialized” in order to be shared across a network of RLUS service instances.
 discard	This operation is for discarding records (either physically or logically deleting records from the underlying source). A selection filter is created and all logical records that meet that filter criteria are discarded.

Name	Documentation
 describe	This operation is used to output the detailed schema definition of the associated semantic signifier.
 put	This operation is for writing an instance of the logical record to the RLUS implementation. This includes insert / update (“upsert”) operations.

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488 5.2.2.1.2 RLUS Semantic Profiles



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Figure 23 – RLUS Semantic Profiles

Name	Documentation
 createSemanticSignifier	This operation provides the means to create a semantic signifier definition.
 findSemanticSignifier	This operation provides the means to retrieve the semantic signifier definition by name.
 listConformanceProfile	Returns the list of named conformance profiles that the service implementation supports.
 listSemanticSignifiire	This operation provides the means to list all available semantic signifiers that an RLUS service implementation supports.
 updateSemanticSignifier	This operation provides the means to update a semantic signifier structure.

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492 **5.2.2.1.3 Capabilities to Service Interface mapping**

	RLUS Management and Query Interface	describe()	discard()	get()	initialize()	list()	locate()	put()	RLUS Semantic Profiles	createSemanticSignifier()	findSemanticSignifier()	listConformanceProfile()	listSemanticSignifiire()	updateSemanticSignifier()
RLUS Basic Run-Time Capabilities														
lr : Locate Resources							<-							
gr : Get Resource				<-										
lgr : List and Get Resources						<-								
pr : Put Resource								<-						
ir : Initialize Resource					<-									
dr : Discard Resource			<-											
RLUS Administrative Capabilities														
linkr : Link Resources														
ulinkr : Unlink Resources														
merr : Merge Resources														
umerr : Unmerge Resources														
RLUS Introspective Capabilities														
lcp : List Conformance Profiles												<-		
lss : List Semantic Signifiers													<-	
dss : Describe Semantic Signifier		<-												
pss : Put Semantic Signifier									<-					<-

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5.2.2.2 Record Management (RLUS) HL7 FHIR projection

The FHIR projection includes FHIR Transport and the IHE Mobile access to Health Documents (MHD) profile.

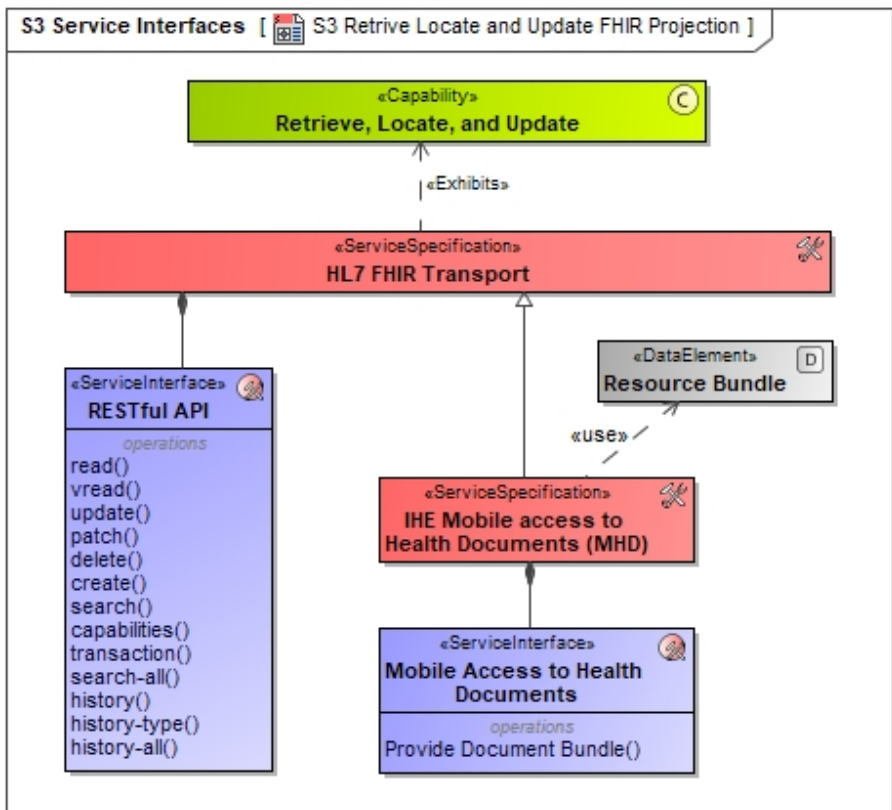


Figure 24 - Record Management (RLUS) to HL7 FHIR projection

5.2.2.2.1 IHE Mobile Access to Health Documents

The Mobile access to Health Documents (MHD) Profile defines a single standardized interface to health document sharing for use by mobile devices so that deployment of mobile applications is more consistent and reusable. In this context, mobile devices include tablets, smart-phones, and embedded devices including home-health devices. This profile is also applicable to more capable systems where needs are simple, such as pulling the latest summary for display. The critical aspects of the “mobile device” are that it is resource-constrained, has a simple programming environment (e.g., JSON, JavaScript), simple protocol stack (e.g., HTTP), and simple display functionality (e.g., HTML browser).

The complete specification can be found here:

<https://profiles.ihe.net/ITI/MHD/index.html>

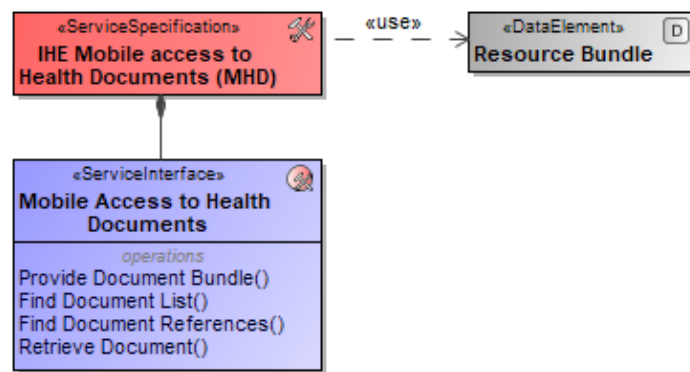






Figure 25 – IHE Mobile Access to Health Documents

The below table describes the interface operations for the MHD profile.

Name	Documentation
 Find FHIR Document List	The Find Document Lists transaction is used to find List Resources that satisfy a set of parameters. see: https://profiles.ihe.net/ITI/MHD/ITI-66.html
 Find FHIR Document References	The Find Document References transaction is used to find DocumentReference Resources that satisfy a set of parameters. See: https://profiles.ihe.net/ITI/MHD/ITI-67.html
 Provide FHIR Document Bundle	The Provide Document Bundle transaction passes a Provide Document Bundle Request from a Document Source to a Document Recipient. See: https://profiles.ihe.net/ITI/MHD/ITI-65.html
 Retrieve FHIR Document	The Retrieve Document transaction is used by the Document Consumer to retrieve a document from the Document Responder. See: https://profiles.ihe.net/ITI/MHD/ITI-68.html

5.2.2.2.2 RLUS Capabilities to FHIR/MHD Service Interface mapping

	RESTful API	capabilities()	create()	delete()	history-all()	history-type()	history()	patch()	read()	search-all()	search()	transaction()	update()	vread()	Mobile Access to Health Documents	Find Document List()	Find Document References()	Provide Document Bundle()	Retrieve Document()
RLUS Administrative Capabilities																			
linkr : Link Resources																			
merr : Merge Resources																			
ulinkr : Unlink Resources																			
umerr : Unmerge Resources																			
RLUS Basic Run-Time Capabilities																			
dr : Discard Resource				<-															
gr : Get Resource									<-										<-
ir Initialize Resource			<-																
lgr : List and Get Resources										<-						<-			
lr : Locate Resources										<-							<-		
pr : Put Resource			<-										<-					<-	
RLUS Introspective Capabilities																			
dss : Describe Semantic Signifier																			
lcp : List Conformance Profiles		<-																	
lss : List Semantic Signifiers																			
pss : Put Semantic Signifier																			

5.2.2.3 HL7 Record Management (RLUS) to IHE soap projection (XD* profiles)

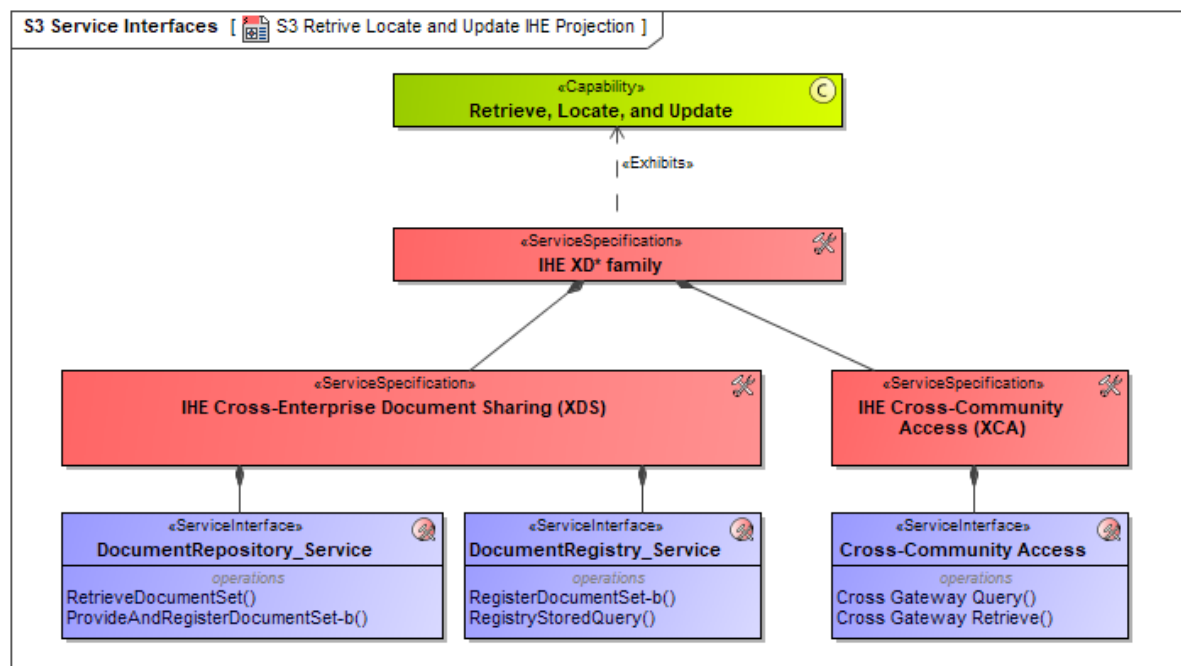


Figure 26 – HL7 Record Management (RLUS) to IHE soap projection (XD* profiles)

XD* is a well-known family of document-sharing profiles based on the OASIS ebXML Registry Repository v3.0.

The OASIS ebXML RegRep standard *can be found at:*

https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=regrep

The profile family includes 2 main profiles:

- IHE Cross-Enterprise Document Sharing (XDS)
- IHE Cross-Community Access (XCA)

Other IHE profiles re-use the same interfaces in specific use-case scenarios.

5.2.2.3.1 IHE Cross-Enterprise Document Sharing (XDS)

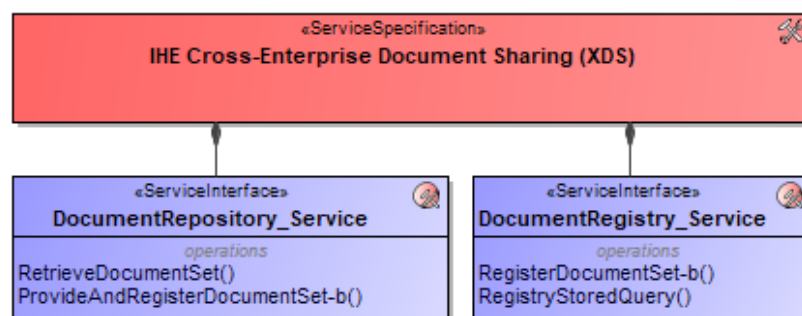


Figure 27 – Cross-Enterprise Document Sharing (XDS) Service interface

The Cross-Enterprise Document Sharing (XDS.b) IHE Integration Profile facilitates the registration, distribution and access across healthcare enterprises of patient electronic health records.

Cross-Enterprise Document Sharing is focused on providing a standards-based specification for managing the sharing of documents between any healthcare enterprise, ranging from a private physician's office to a clinic or an acute care in-patient facility.

In the rest of the ITI Technical Framework the term XDS refers generically to any flavor of XDS, currently only XDS.b.

The XDS.b Profile assumes that these enterprises belong to one or more XDS Affinity Domains. An XDS Affinity Domain is a group of healthcare enterprises that have agreed to work together using a common set of policies and share a common infrastructure.

The full specification can be found here:

<https://profiles.ihe.net/ITI/TF/Volume1/ch-10.html>

From an architectural viewpoint the specification includes two main service interfaces:

- Document Repository Service
- Document Registry Service

The two interfaces reflect that for the XDS architecture the registry and repository are separate.



Figure 28 – IHE Document Registry Service Interfaces

The below list shows the IHE Document Registry Service interface methods exposed by an XDS Registry





Name	Documentation
 RegisterDocumentSet-b	The Register Document Set-b transaction passes a Document Submission Request from a Content Sender to a Content Receiver.
 RegistryStoredQuery	<p>The Registry Stored Query transaction supports a variety of pre-defined queries. Examples include the following:</p> <ul style="list-style-type: none"> - Query for DocumentEntry objects by patient (Id) for a time interval on creation time and/or service time, by document type(s), by practice setting(s), by author person - Query for SubmissionSets by Document Source - Query for Folders updated during a time interval - Query for all contents in a Folder or SubmissionSet - Query for SubmissionSets by time of submission <p>Depending on the value of the returnType parameter, all queries return:</p> <ul style="list-style-type: none"> - Metadata for one or more types of registry object, or - Object references for one or more types of registry object



Figure 29 – IHE Document Repository Service interfaces

The below list shows the IHE Document Repository Service interface list methods exposed by an XDS Repository

Name	Documentation
 ProvideAndRegisterDocumentSet-b	The Provide and Register Document Set-b transaction passes a Document Submission Request from a Content Sender to a Content Receiver.
 RetrieveDocumentSet	This transaction is used by the Document Consumer to retrieve a set of documents from the Document Repository, On-Demand Document Source, or Initiating Gateway.

5.2.2.3.2 IHE Cross-Community Access (XCA)

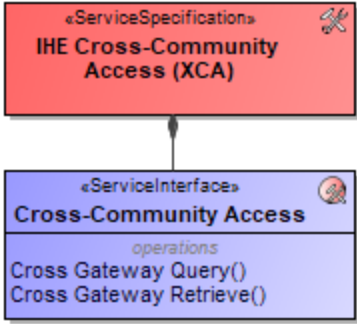




Figure 30 – IHE Cross-Community Access (XCA) Service interfaces

The IHE Cross-Community Access (XCA) Profile supports the means to query and retrieve patient relevant medical data held by other communities. A community is defined as a coupling of facilities/enterprises that have agreed to work together using a common set of policies for the purpose of sharing clinical information via an established mechanism.

Facilities/enterprises may host any type of healthcare application such as EHR, PHR, etc. A community is identifiable by a globally unique identifier called the homeCommunityId. Membership of a facility/enterprise in one community does not preclude it from being a member in another community. Such communities may be XDS Affinity Domains which define document sharing using the XDS Profile or any other communities, no matter what their internal sharing structure.

List of IHE XCA Service methods:

Name	Documentation
 Cross Gateway Query	The scope of the Cross Gateway Query transaction is based on the Registry Stored Query transaction. The same set of stored queries is required to be supported and the options controlling what kind of data is returned are the same. Differences from the

Name	Documentation
	<p>Registry Stored Query transactions are:</p> <ul style="list-style-type: none"> - The Cross Gateway Query is between an Initiating Gateway and Responding Gateway. - Initiating Gateway shall specify the homeCommunityId attribute in all Cross-Community Queries which do not contain a patient identifier. - The homeCommunityID attribute shall be returned within all appropriate elements. - Responding Gateways shall support the Asynchronous Web Services Exchange Option on the Cross Gateway Query. Support for this function is required in order to enable use of Asynchronous Web Services Exchange in any cross-community interaction. Without this support an Initiating Gateway would require unique configuration, per Responding Gateway, to know if Asynchronous Web Services Exchange was supported. It is expected that Asynchronous Web Services Exchange will be desired by the majority of communities. - Asynchronous Web Services Exchange is an option on the Initiating Gateway. - For stored queries that rely on concepts that a community may not support, namely associations, folders and submission sets, a Responding Gateway is allowed to respond with zero entries. <p>There shall be an agreed upon common coding/vocabulary scheme used for the Cross Gateway Query. For example, a common set of privacy consent vocabularies shall be used.</p>
 Cross Gateway Retrieve	<p>The scope of the Cross Gateway Retrieve transaction is semantically the same as the Retrieve Document Set transaction. Differences from the Retrieve Document Set transactions are:</p> <ul style="list-style-type: none"> - The Cross Gateway Retrieve is between an Initiating Gateway and a Responding Gateway. - The 'homeCommunityId' parameter is required. This means that the homeCommunityId parameter which is optional on the Retrieve Document Set

Name	Documentation
------	---------------

transaction is required by this transaction.

- Responding Gateways shall support the Asynchronous Web Services Exchange Option on the Cross Gateway Retrieve. Support for this function is required in order to enable use of Asynchronous Web Services Exchange in any cross-community interaction. Without this support an Initiating Gateway would require unique configuration, per Responding Gateway, to know if Asynchronous Web Services Exchange was supported. It is expected that Asynchronous Web Services Exchange will be desired by the majority of communities.
- Asynchronous Web Services Exchange is an option on the Initiating Gateway

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580 **5.2.2.3.3 HL7 RLUS Capabilities to IHE XD* profiles Service interface mapping**

	DocumentRegistry_Service	RegisterDocumentSet-b()	RegistryStoredQuery()	DocumentRepository_Service	ProvideAndRegisterDocumentSet-b()	RetrieveDocumentSet()	Cross-Community Access	Cross Gateway Query()	Cross Gateway Retrieve()
RLUS Administrative Capabilities									
linkr : Link Resources									
merr : Merge Resources									
ulinkr : Unlink Resources									
umerr : Unmerge Resources									
RLUS Basic Run-Time Capabilities									
dr : Discard Resource									
gr : Get Resource						<-			<-
ir Initialize Resource		<-							
lgr : List and Get Resources									
lr : Locate Resources			<-		<-			<-	
pr : Put Resource									
RLUS Introspective Capabilities									
dss : Describe Semantic Signifier									
lcp : List Conformance Profiles									
lss : List Semantic Signifiers									
pss : Put Semantic Signifier									

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5.3 HL7 Healthcare Community Services and Provider Directory service (HCSPD)

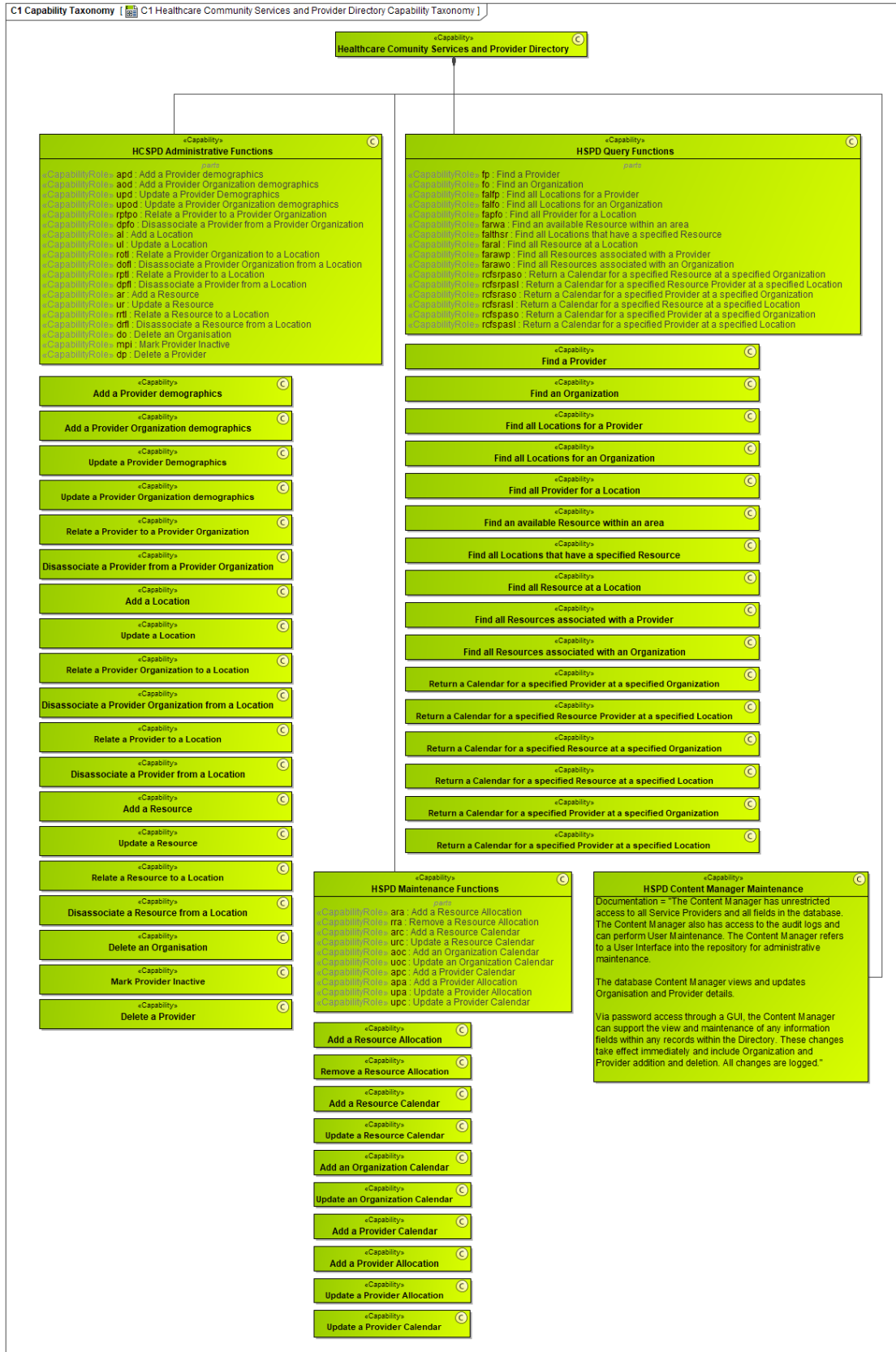








Figure 31 – HL7 Healthcare Community Services and Provider Directory capabilities













The Healthcare Community Services and Provider Directory (HCSPD) service provides key capabilities to enable practitioners, via a set of parameters, to locate other practitioners to assist in the continuum of care. Effective referral is an integral part of patient/client care. This enables the right treatment and/or diagnosis to be given at the right place at the right time. Enabling effective referral to take place means medical errors and unnecessary complications can be avoided and facilitates clinical handover.












The full specification can be found at:












http://www.hl7.org/implement/standards/product_brief.cfm?product_id=100

5.3.1 HL7 Healthcare Community Services and Provider Directory Capabilities

Name	Definition
 HCSPD Administrative Functions	These capabilities are to be used only by systems administrators who maintain the Information Technology Infrastructure.
 Add a Provider demographics	This capability verifies if a specified provider already exists within the registry, and if new, supports the addition of the new provider into the registry. Where required, the addition of a provider will trigger notifications and an approval process.
 Add a Provider Organization demographics	This capability verifies if a specified Provider Organization already exists within the registry, and if new, supports the addition of the new provider organization into the registry. Where required, the addition of a provider organization will trigger notifications and an approval process.
 Update a Provider demographics	This capability provides for the maintenance of demographic details about Providers. Where those changes affect status or licensing of providers, notification and approval processes will result.
 Update a Provider Organization demographics	This capability provides for the maintenance of demographic details about Provider Organizations. Where those changes affect status or licensing of providers, notification and approval processes will result.
 Relate a Provider to a Provider Organization	Providers MAY be related to zero, one or many provider organizations at one time (regardless of the nature of the employment contract.) This capability provides functionality to link a specified provider to a specified provider organization.

Name	Definition
 Disassociate a Provider from a Provider Organization	This capability is used to sever the relationship between a Provider and a Provider Organization at a specified date.
 Add a Location	This capability is used to identify Locations to the registry.
 Update a Location	This capability is used to change Location data within the registry.
 Relate a Provider Organization to a Location	This capability is used to create a relationship between a Provider Organization and a Location at a specified date
 Relate a Provider to a Location	This capability is used to create the relationship between a Provider and a Location at a specified date.
 Disassociate a Provider from a Location	This capability is used to sever the relationship between a Provider and a Location at a specified date.
 Add a Resource	This capability is used to create an instance of a resource.
 Update a Resource	This capability is used to update details about a specific resource.
 Relate a Resource to a Location	This capability creates a relationship between a specified resource and a specified location.
 Disassociate a Resource from a Location	This capability disables the relationship between a specified resource and a specified location.
 Delete an Organization	This capability is used to logically remove an organization.
 Mark Provider Inactive	This capability is used to "suspend" a provider and marking as inactive.

Name	Definition
 HCSPD Maintenance Functions	These functions provide capabilities to create and maintain details of Providers and Services that can subsequently be found and retrieved using the look-up capabilities.
 Add a Resource Allocation	This capability is used to block off some amount of time against a specified resource. This could be the booking of an appointment / referral, or identification of scheduled down-time for the resource (if equipment), or personal time off for a person. The result is the creation of an Event against which other resources can be assigned.
 Add a Resource Calendar	This capability is used to update the calendar with respect to a specific resource.
 Add an Organization Calendar	This capability is used to update details about a specific organization calendar. An Organization Calendar specifies the days when the organization is open for business, and the times within those days.
 Update an Organization Calendar	This capability is used to update details about a specific organization calendar.
 Add a Provider Calendar	This capability is used to update details about a specific Provider.
 Add a Provider Allocation	This capability is used to book time for a particular provider. The result is the creation of an Event against which other resources can be assigned.
 Update a Provider Allocation	This capability is used to update details about a specific resource, including cancelling an appointment (allocation.)
 Update a Provider Calendar	This capability is used to update details about a specific provider calendar.
 HCSPD Query Functions	Provide look-up capabilities for discovering providers and services and related information. Also includes the capability to query which service profiles an HCSPD instance supports
 Find a Provider	This capability provides a search for Provider function

Name	Definition
 Find an Organization	This capability provides a search for Organization function
 Find all Locations for a Provider	This capability finds all locations linked to a Provider
 Find all Locations for an Organization	This capability finds all locations linked to an Organization
 Find all Provider for a Location	This capability finds all Providers linked to a Location
 Find all Organizations for a Location	This capability finds all Providers linked to an Organization
 Find an available Resource within an area	This capability searches for an available Resource within a defined area
 Find all Locations that have a specified Resource	This capability searches for all Locations that have a specified Resource
 Find all Resource at a Location	This capability searches for all Resources at a Location
 Find all Resources associated with a Provider	This capability searches for all Resources associated with a Provider
 Find all Resources associated with an Organization	This capability searches for all Resources associated with an Organization
 Return a Calendar for a specified Resource at a specified Organization	This capability returns a Calendar for a specified Resource at a specified Organization

Name	Definition
<p>Return a Calendar for a specified Resource at a specified Location</p>	<p>This capability returns a Calendar for a specified Resource at a specified Location</p>
<p>Return a Calendar for a specified Provider at a specified Organization</p>	<p>This capability returns a Calendar for a specified Provider at a specified Organization</p>
<p>Return a Calendar for a specified Provider at a specified Location</p>	<p>This capability returns a Calendar for a specified Provider at a specified Location</p>

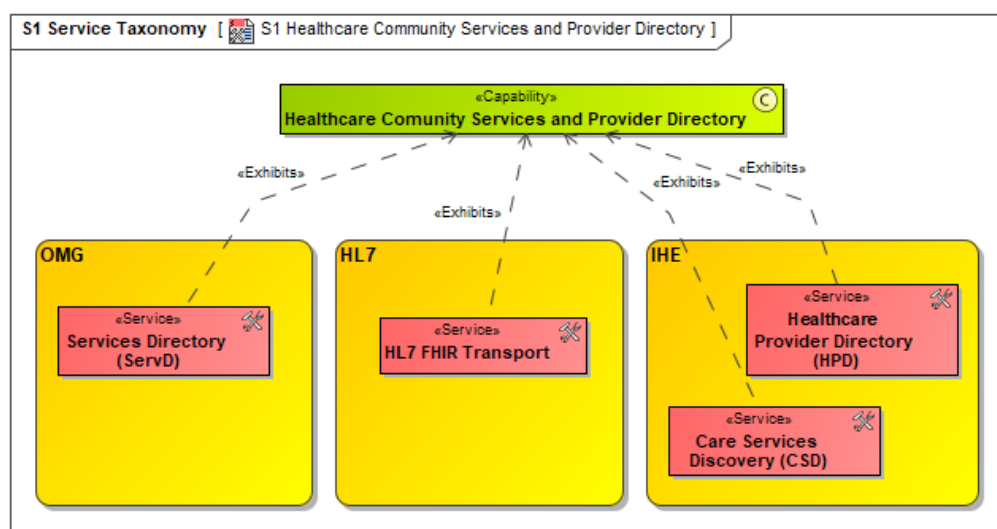
5.3.2 Healthcare Community Services and Provider Directory service projections

The HCSPD model has currently three standard technical projections defined:

- FHIR (REST API)
- OMG SOAP service (ServD)
- IHE Profiles:
 - Healthcare Provider Directory (HPD)
 - Care Services Discovery (CSD)

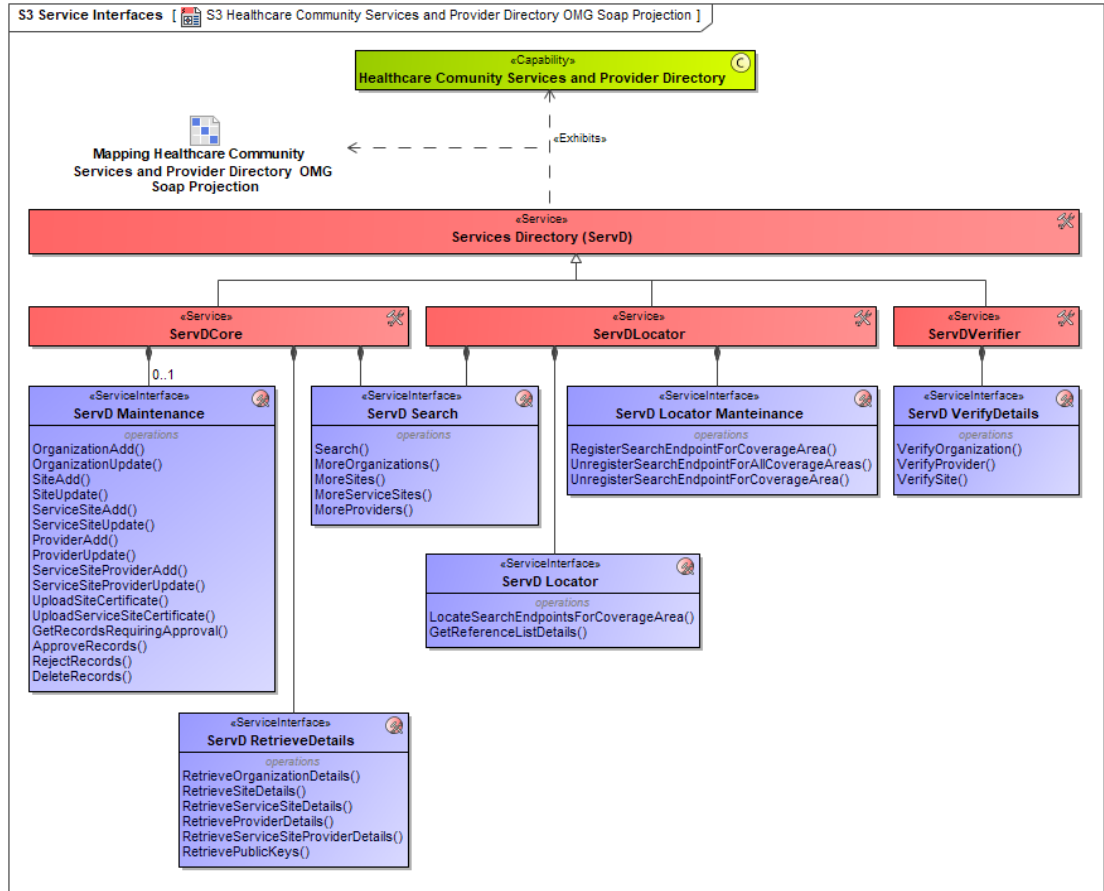
The defined standard content definitions are:

- FHIR Resources (for FHIR restful transport and OMG SOAP service)
- OMG and IHE use specific content included in the specification



608 **5.3.2.1 HL7 Healthcare Community Services and Provider Directory service**
609 **to OMG projection (ServD)**

610 The OMG Services Directory (ServD) specification provides an SOA model to support the
611 discovery of, and access to, service provider, individual, and organizational information
612 including locations, associations, contact details, services, identifiers and metadata. This
613 information can be relevant for use by both people and/or computers.
614 Defined Actors are able to use this information to support secure transfer of personal and
615 confidential information to network end point applications or shared repositories.
616
617 This specification was developed to meet the needs of interoperability in healthcare and
618 community services, although at its highest level of abstraction (ServD) it is non-domain
619 specific and can be used in a variety of settings where there is a need for a directory-based
620 search facility and secure transmission of sensitive documents among a large and dispersed
621 population of service providers.



622 *Figure 32 - Healthcare Community Services and Provider Directory service to OMG ServD projection*

5.3.2.1.1 ServD Core Service

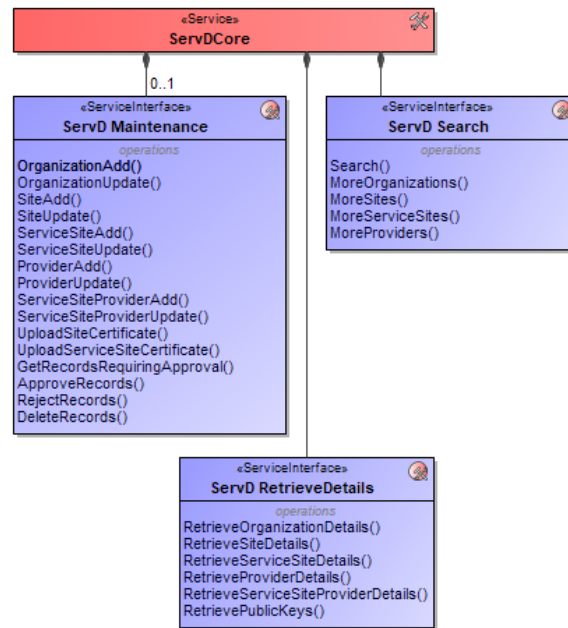


Figure 33 -ServDCore Service

The ServD Core is the minimum required implementation to be a ServD compliant service. All instances of a ServD Core must expose both the Search and Retrieve Details interfaces to permit searching for Service data.

An instance of a ServD Core component can have its Search and Retrieve Details interfaces hosted on one or more network resources, provided that the results from the Search service use the corresponding Retrieve Details component (enabling the use of web server farms).

The optional Maintenance ServD Core extends the ServD Core by exposing the Maintenance interface to enable Maintenance Applications to securely update an Organization's Service data.

The Maintenance Application may be a part of existing software such as a clinical application or may be a web application directly calling the API or may be a utility that processes an extract from another directory.

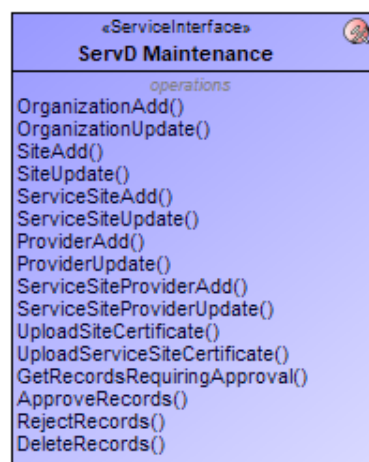















Figure 34 – ServD Maintenance interface

Name	Documentation
 ApproveRecords	<p>Approve the data as specified in the list of Identifiers.</p> <p>This method must be performed by Approvers or Content Managers.</p> <p>New Organizations and Providers must be approved by a Content Manager.</p>
 DeleteRecords	<p>Delete one or more records of a specified record type. This method must only be performed by Approvers or Content Managers.</p>
 GetRecordsRequiringApproval	<p>This method retrieves a list of added or updated records that are awaiting approval.</p>
 OrganizationAdd	<p>Add a new Organization. This will always create an unapproved Organization record. Organization records must be approved by a Content Manager before they are available via the search interfaces.</p>
 OrganizationUpdate	<p>Provide the details of an Organization that needs to be updated (including any child object information).</p>
 ProviderAdd	<p>Add a new Provider</p>
 ProviderUpdate	<p>Update a Providers Details.</p>
 RejectRecords	<p>Reject the data as specified in the list of Identifiers. This method must only be performed by Approvers.</p>
 ServiceSiteAdd	<p>Add a Service Site to a Site (by Site ID)</p>
 ServiceSiteProviderAdd	<p>Associate an existing Service Site with an existing Provider.</p>
 ServiceSiteProviderUpdate	<p>Update a specific Service Site Provider record.</p>
 ServiceSiteUpdate	<p>Update the details of a Service Site.</p>
 SiteAdd	<p>Add a new Site to an Organization.</p>









Name	Documentation
 SiteUpdate	Update the details of a Site.
 UploadServiceSiteCertificate	Upload a Public Key Certificate for a Service Site.
 UploadSiteCertificate	Upload a Public Key Certificate for a Site.



Figure 35 – ServD RetrieveDetails interface

Below is the operation list for the ServD RetrieveDetails interface:

Name	Documentation
 RetrieveOrganizationDetails	Retrieve the complete set of details about the Organization(s) based on the Identifier(s) returned in a search.
 RetrieveProviderDetails	Retrieve the Complete set of details about the Provider(s) based on the Identifier(s) returned in a Search.
 RetrievePublicKeys	Retrieve the Public Key(s) for the requested records based on the Identifier(s) returned by the Search. At least one Identifier should be provided, otherwise the function will return an empty collection.
 RetrieveServiceSiteDetails	Retrieve the Complete set of details about the Service Site(s) based on the Identifier(s) returned in a search.
 RetrieveServiceSiteProviderDetails	Retrieve the Complete set of details about the Service Site Provider (s) based on the Identifier(s) returned in a search.

Name	Documentation
------	---------------

 RetrieveSiteDetails

Retrieve the Complete set of details about the Site(s) based on the Identifier(s) returned in a search.



Figure 36 – ServD Search Interface

Below is the operation list for the ServD Search interface:

Name	Documentation
------	---------------

 Search

Perform a search for information in the ServD Core.
When a Search is performed with a SearchControlParameters GetUnModeratedData value of False, the ServD Core must return data that meets the following criteria:





1. The caller has access to the data.
2. The data has a RecordStatus of Complete; except when the SearchInputParameter.ModifiedAfterDate field is provided, in which case:

- a. The data has a RecordStatus of Complete and the LastModifiedDate is after the ModifiedAfterDate, or
- b. the data has a RecordStatus of Deleted and the LastModifiedDate is after the ModifiedAfterDate.

3. The data satisfies the search parameters provided.

When a Search is performed with a SearchControlParameters GetUnModeratedData value of True the ServD Core must return data that meets the following criteria:

4. The caller has access to the data.
5. The data has a Record Status of:

Name	Documentation
	<p>a. Complete (and no pending change that the caller is an author or approver of).</p> <p>b. Any other state where the caller is an author or approver of the record.</p> <p>6. The data satisfies the search parameters provided.</p>
 MoreOrganizations	Retrieve the requested page of Organization summary items based on a previous search.
 MoreProviders	Retrieve the requested page of Provider summary items based on a previous search.
 MoreServiceSites	Retrieve the requested page of Service Site summary items based on a previous search.
 MoreSites	Retrieve the requested page of Site summary items based on a previous search.

5.3.2.1.2 ServDLocator Service

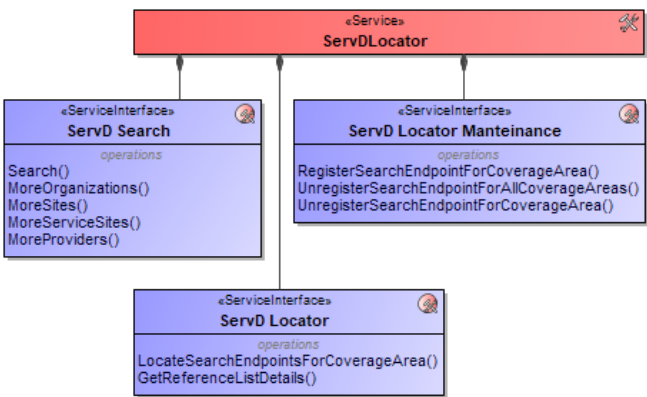


Figure 37 - ServDLocator Service

A ServD Locator provides an indexing service for the network locations of ServD Cores and their Coverage Areas or Jurisdiction. It does not store Service-related information.

A Searching Application uses the ServD Locator to derive the network location of ServD Core instance(s) that are associated with the specified Coverage Area(s).


The ServD Locator use the same Search interface of ServDCore and two specific interfaces:

- ServD Locator
- ServD Locator Maintenance.

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659



Figure 38 – ServD Search Interface

Name	Documentation
 Search	<p>Perform a search for information in the ServD Core.</p> <p>When a Search is performed with a SearchControlParameters GetUnModeratedData value of False, the ServD Core must return data that meets the following criteria:</p> <ol style="list-style-type: none"> 1. The caller has access to the data. 2. The data has a RecordStatus of Complete; except when the SearchInputParameter.ModifiedAfterDate field is provided, in which case: <ol style="list-style-type: none"> a. The data has a RecordStatus of Complete and the LastModifiedDate is after the ModifiedAfterDate, or b. the data has a RecordStatus of Deleted and the LastModifiedDate is after the ModifiedAfterDate. 3. The data satisfies the search parameters provided. <p>When a Search is performed with a SearchControlParameters GetUnModeratedData value of True the ServD Core must return data that meets the following criteria:</p> <ol style="list-style-type: none"> 4. The caller has access to the data. 5. The data has a Record Status of: <ol style="list-style-type: none"> a. Complete (and no pending change that the caller is an author or approver of). b. Any other state where the caller is an author or approver of the record.





Name	Documentation
	6. The data satisfies the search parameters provided.
 MoreOrganizations	Retrieve the requested page of Organization summary items based on a previous search.
 MoreProviders	Retrieve the requested page of Provider summary items based on a previous search.
 MoreServiceSites	Retrieve the requested page of Service Site summary items based on a previous search.
 MoreSites	Retrieve the requested page of Site summary items based on a previous search.



Figure 39 – ServD Locator Interface






Name	Documentation
 LocateSearchEndpointsForCoverageArea	This method locates web service URL(s) for ServD Core instances that implement the Search Interface. Finds the URL of the Web Server that provides the search interface details for the specified information.
 GetReferenceListDetails	This method is used to locate the URL(s) of the reference list(s) of the defined type(s). These can be used to populate drop down lists, create look-a-head-while-typing user interactions, or validate user input prior to issuing a call to the Search methods.



Figure 40 – ServD Locator Maintenance

Name	Documentation
 RegisterSearchEndpointForCoverageArea	Register a ServD Core instance with the ServD Locator.
 UnregisterSearchEndpointForAllCoverageAreas	Remove all coverage areas allocated to this ServD Core endpoint.
 UnregisterSearchEndpointForCoverageArea	Remove a set of CoverageAreaCode(s) from the index for a specific ServD Core endpoint.

5.3.2.1.3 ServDVerifier Service

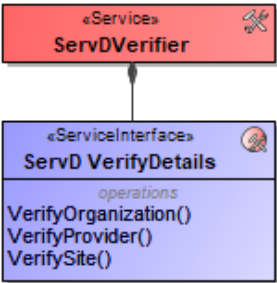





Figure 41 - ServDVerifier Service

A ServD Verifier verifies Attribute updates provided by a Maintenance Application, by invoking a call to an external application (such as a credentialing authority or certification authority). When a ServD Verifier confirms that an Attribute is valid, that Attribute in the ServD repository is marked with the VerificationStatus property Verified and the expiry date is set, if provided.



Figure 42 – ServD Verify Details interface

Name	Documentation
 VerifyOrganization	Verify an Organization Attribute.
 VerifyProvider	Verify a Provider Attribute.
 VerifySite	Verify a Site Attribute.

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5.3.2.1.4 HL7 HCSPD Capabilities to OMG ServD service interface mapping

	ServD Locator	GetReferenceListDetails()	LocateSearchEndpointForCoverageArea()	ServD Locator Maintenance	RegisterSearchEndpointForCoverageArea()	UnregisterSearchEndpointForAllCoverageAreas()	UnregisterSearchEndpointForCoverageArea()	ServD Maintenance	ApproveRecords()	DeleteRecords()	GetRecordsRequiringApproval()	OrganizationAdd()	OrganizationUpdate()	ProviderAdd()	ProviderUpdate()	RejectRecords()	ServiceSiteAdd()	ServiceSiteProviderAdd()	ServiceSiteProviderUpdate()	ServiceSiteUpdate()	SiteAdd()	SiteUpdate()	UploadServiceSiteCertificate()	UploadSiteCertificate()
HCSPD Administrative Functions																								
apd : Add a Provider demographics																								
aod : Add a Provider Organization demographics												<												
up : Update a Provider demographics															<									
uod : Update a Provider Organization demographics													<											
rpdo : Relate a Provider to a Provider Organization																								
dpfo : Disassociate a Provider from a Provider Organization																								
al : Add a Location																								
ul : Update a Location																								
rotl : Relate a Provider Organization to a Location																								
dofl : Disassociate a Provider Organization from a Location																								
rptl : Relate a Provider to a Location																								
dpfl : Disassociate a Provider from a Location																								
ar : Add a Resource																								
ur : Update a Resource																								
rrtl : Relate a Resource to a Location																								
drfl : Disassociate a Resource from a Location																								
do : Delete an Organisation																								
mpi : Mark Provider Inactive																								
dp : Delete a Provider																								
HCSPD Maintenance Functions																								
ara : Add a Resource Allocation																								
rra : Remove a Resource Allocation																								
arc : Add a Resource Calendar																								
urc : Update a Resource Calendar																								
aoc : Add an Organization Calendar																								
uoc : Update an Organization Calendar																								
apc : Add a Provider Calendar																								
apa : Add a Provider Allocation																								
upa : Update a Provider Allocation																								
upc : Update a Provider Calendar																								
HCSPD Query Functions																								
fp : Find a Provider																								
fo : Find an Organization																								
falfp : Find all Locations for a Provider																								
falfo : Find all Locations for an Organization																								
fapfo : Find all Provider for a Location																								
farwa : Find an available Resource within an area																								
falthsr : Find all Locations that have a specified Resource																								
faral : Find all Resource at a Location																								
farawp : Find all Resources associated with a Provider																								
farawo : Find all Resources associated with an Organization																								
rcfsrpsao : Return a Calendar for a specified Resource at a specified Organization																								
rcfsrpsal : Return a Calendar for a specified Provider at a specified Location																								
rcfsraso : Return a Calendar for a specified Provider at a specified Organization																								
rcfsrasl : Return a Calendar for a specified Resource at a specified Location																								
rcfspsao : Return a Calendar for a specified Provider at a specified Organization																								
HCSPD Content Manager Maintenance																								

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	ServD RetrieveDetails	RetrieveOrganizationDetails()	RetrieveProviderDetails()	RetrievePublicKeys()	RetrieveServiceSiteDetails()	RetrieveServiceSiteProviderDetails()	RetrieveSiteDetails()	ServD Search	More Organizations()	More Providers()	More Service Sites()	More Sites()	Search()	ServD VerifyDetails	VerifyOrganization()	VerifyProvider()	VerifySite()
HCSPD Administrative Functions																	
apd : Add a Provider demographics																	
aod : Add a Provider Organization demographics																	
up : Update a Provider demographics																	
uod : Update a Provider Organization demographics																	
rpto : Relate a Provider to a Provider Organization																	
dpfo : Disassociate a Provider from a Provider Organization																	
al : Add a Location																	
ul : Update a Location																	
rotl : Relate a Provider Organization to a Location																	
dofl : Disassociate a Provider Organization from a Location																	
rptl : Relate a Provider to a Location																	
dpfl : Disassociate a Provider from a Location																	
ar : Add a Resource																	
ur : Update a Resource																	
rrtl : Relate a Resource to a Location																	
drfl : Disassociate a Resource from a Location																	
do : Delete an Organisation																	
mpi : Mark Provider Inactive																	
dp : Delete a Provider																	
HCSPD Maintenance Functions																	
ara : Add a Resource Allocation																	
rra : Remove a Resource Allocation																	
arc : Add a Resource Calendar																	
urc : Update a Resource Calendar																	
aoc : Add an Organization Calendar																	
uoc : Update an Organization Calendar																	
apc : Add a Provider Calendar																	
apa : Add a Provider Allocation																	
upa : Update a Provider Allocation																	
upc : Update a Provider Calendar																	
HCSPD Query Functions																	
fp : Find a Provider		<								<			<				
fo : Find an Organization		<							<				<				
falfp : Find all Locations for a Provider					<						<		<				
falfo : Find all Locations for an Organization				<									<				
fapfo : Find all Provider for a Location				<	<								<				
farwa : Find an available Resource within an area													<				
falthsr : Find all Locations that have a specified Resource											<		<				
faral : Find all Resource at a Location												<	<				
farawp : Find all Resources associated with a Provider										<			<				
farawo : Find all Resources associated with an Organization		<							<				<				
rcfsrpa : Return a Calendar for a specified Resource at a specified Organization																	
rcfsrpa : Return a Calendar for a specified Provider at a specified Location																	
rcfsraso : Return a Calendar for a specified Provider at a specified Organization																	
rcfsrasl : Return a Calendar for a specified Resource at a specified Location																	
rcfspaso : Return a Calendar for a specified Provider at a specified Organization																	
HCSPD Content Manager Maintenance																	

5.3.2.2 Healthcare Community Services and Provider Directory service to FHIR projection

The FHIR projection is based on the FHIR Transport.

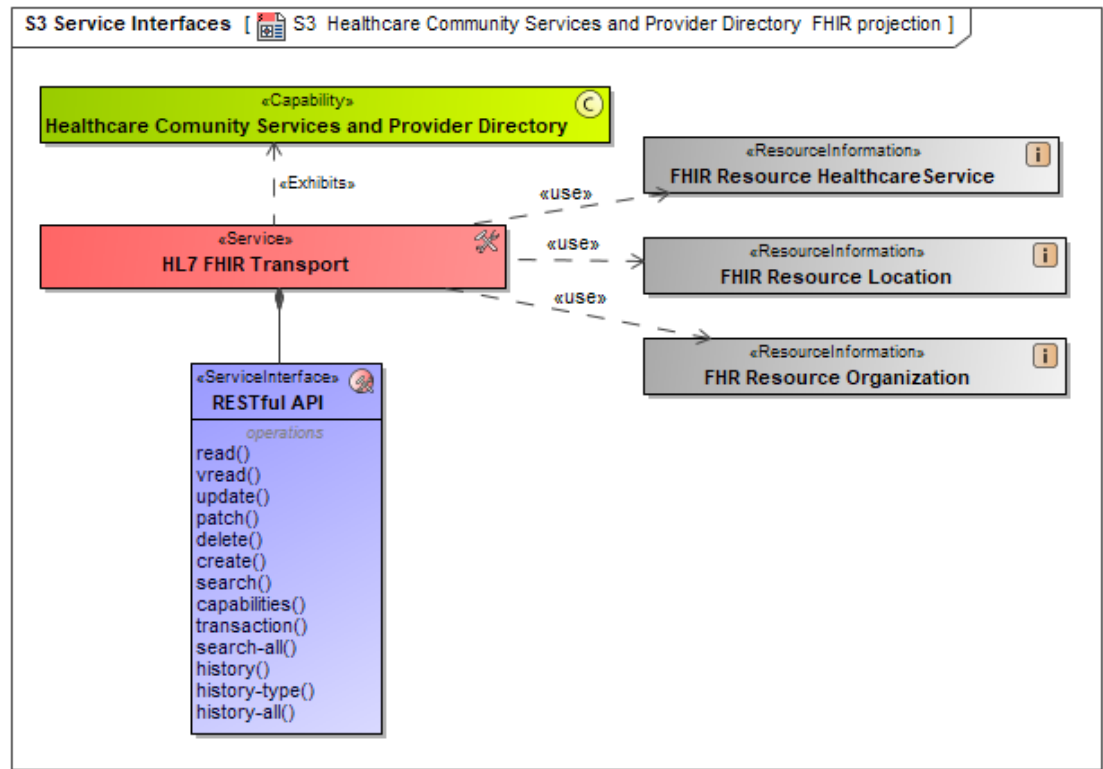


Figure 43 HL7 Healthcare Community Services and Provider Directory to FHIR projection

5.3.2.2.1 FHIR Projection

In this context three FHIR Resources are used:

- Resource Healthcare Service
- Resource Location
- Resource Organization

5.3.2.2.2 HL7 HCSPD Capabilities to FHIR service Mapping

	RESTful API	capabilities()	create()	delete()	history-all()	history-type()	history()	patch()	read()	search-all()	search()	transaction()	update()	vread()
HCSPD Administrative Functions														
al : Add a Location			<											
aod : Add a Provider Organization demographics			<											
apd : Add a Provider demographics			<											
ar : Add a Resource			<											
do : Delete an Organisation				<										
dofl : Disassociate a Provider Organization from a Location				<										
dp : Delete a Provider				<										
dpfl : Disassociate a Provider from a Location				<										
dpfo : Disassociate a Provider from a Provider Organization				<										
drfl : Disassociate a Resource from a Location				<										
mpi : Mark Provider Inactive													<	
rotl : Relate a Provider Organization to a Location													<	
rptl : Relate a Provider to a Location													<	
rptpo : Relate a Provider to a Provider Organization													<	
rrtl : Relate a Resource to a Location													<	
ul : Update a Location													<	
upd : Update a provider Demographics													<	
upod : Update a Provider Organization demographics													<	
ur : Update a Resource													<	
HCSPD Maintenance Functions														
aoc : Add an Organization Calendar			<											
apa : Add a Provider Allocation			<											
apc : Add a Provider Calendar			<											
ara : Add a Resource Allocation			<											
arc : Add a Resource Calendar			<											
rra : Remove a Resource Allocation													<	
uoc : Update an Organization Calendar													<	
upa : Update a Provider Allocation													<	
upc : Update a Provider Calendar													<	
urc : Update a Resource Calendar													<	
HCSPD Query Functions														
falfo : Find all Locations for an Organization										<				
falfp : Find all Locations for a Provider										<				
falthsr : Find all Locations that have a specified Resource										<				
fapfo : Find all Provider for a Location										<				
faral : Find all Resource at a Location										<				
farawo : Find all Resources associated with an Organization										<				
farawp : Find all Resources associated with a Provider										<				
farwa : Find an available Resource within an area										<				
fo : Find an Organization										<				
fp : Find a Provider										<				
rcfspasl : Return a Calendar for a specified Provider at a specified Location														
rcfspaso : Return a Calendar for a specified Provider at a specified Organization									<					
rcfsrasl : Return a Calendar for a specified Resource at a specified Location									<					
rcfsraso : Return a Calendar for a specified Provider at a specified Organization									<					
rcfsrspasl : Return a Calendar for a specified Resource Provider at a specified Location									<					
rcfsrspaso : Return a Calendar for a specified Resource at a specified Organization									<					
HCSPD Content Manager Maintenance														

5.3.2.3 HL7 Healthcare Community Services and Provider Directory to IHE CSD and HPD profiles projection

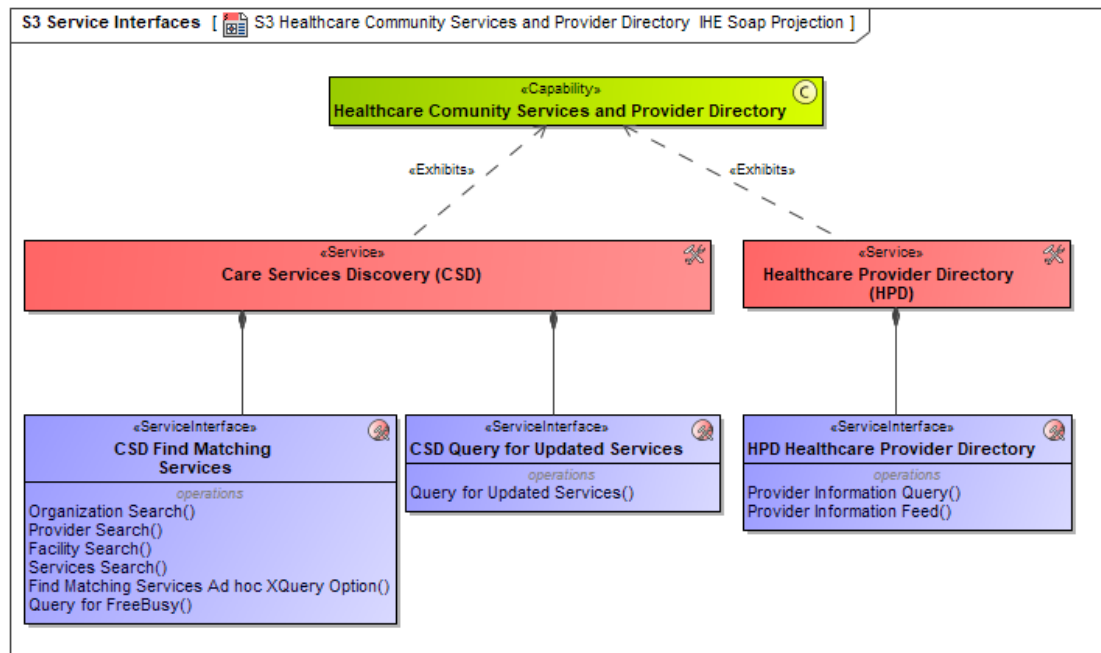


Figure 44 - HL7 Healthcare Community Services and Provider Directory to IHE projection

The HCSPD to IHE projection includes two Profiles:

- Care Service Discovery (CSD)
- Healthcare Provider Directory (HPD)

5.3.2.3.1 IHE Care Service Discovery projection

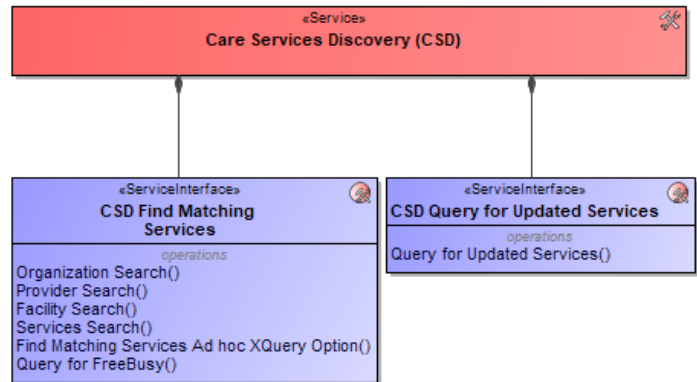


Figure 45 -IHE Care Service Discovery

The CSD Profile supports queries across related directories containing data about: organizations, facilities, services and providers. Queries against an optional “FreeBusy” service are also supported; this FreeBusy information would enable the development of a list of schedulable time slots for providers or services at specific facilities.

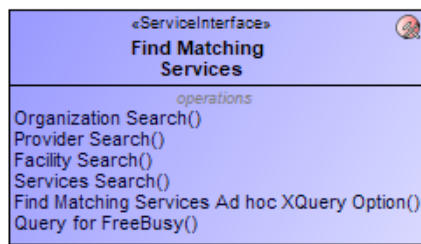








Figure 46 – CSD Find Matching Services search interface

List of CSD operations:

Name	Documentation
 Facility Search	Performs a search for all facilities by name, type, address or ID.
 Find Matching Services Ad hoc XQuery Option	Used when it's necessary where there is not already a suitable stored query for this purpose (optional).
 Organization Search	Performs a search for all organizations by name, type, address or ID.
 Provider Search	Performs a search for all providers by name, type, address or ID.
 Query for FreeBusy	<p>The Query for FreeBusy request shall be constructed as a well-formed CalDAV FreeBusy REPORT request as specified in RFC 4791.</p> <p>FreeBusy queries return “busy” data; therefore, the operating hours will be required in order to calculate the “free” time during an interval of interest. A Service Finder, in order to optionally calculate “free” time, will either have to know ahead of time or obtain via a previous query, the endpoint address for the FreeBusy service and the operating hours of the service.</p>
 Services Search	Performs a search for all services by type or ID.

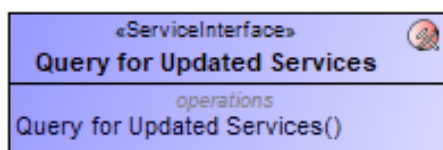

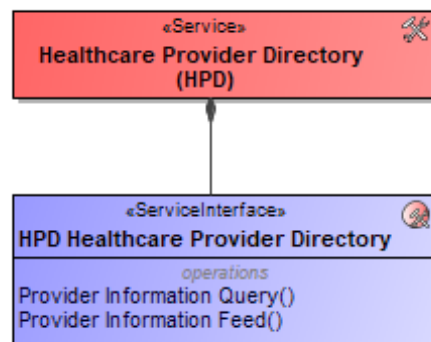


Figure 47 – IHE CSD profile - Query for Updated Services interface

708 CSD Query for Updated Services Interface operations list:

Name	Documentation
 Query for Updated Services	<p>On a periodic basis to be determined by the implementing jurisdiction, a Care Services InfoManager submits a Query for Updated Services to one or more Care Services Directory.</p> <p>The Query for Updated Services is used to obtain all directory document content which has been inserted or updated since the specified timestamp.</p> <p>These are queries against the CSD schema for documents describing these services.</p>



709 **5.3.2.3.2 IHE Healthcare Provider Directory (HPD) profile projection**



710

711 *Figure 48 – IHE Healthcare Provider Directory service interface*

712 List of HPD service operations:

Name	Documentation
 Provider Information Feed	<p>The Provider Information Feed specifies one or more of the following actions:</p> <ul style="list-style-type: none">- An “Add” to add new provider entries- A “Delete” to delete any existing provider entries- An “Update” to modify or update any existing provider entries <p>Two categories of healthcare providers are included in the Provider Information Feed:</p> <ul style="list-style-type: none">- Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist.- Organizational Provider – An organization that provides or supports healthcare services, such as hospitals, Healthcare Information Exchanges (HIEs), Integrated Delivery Networks (IDNs), and Associations.
 Provider Information Query	<p>This transaction supports the ability to lookup information about healthcare providers from a HCSPD directory on the following:</p>

Name	Documentation
	<ul style="list-style-type: none"> - Individual Provider – A person who provides healthcare services, such as a physician, nurse, or pharmacist. - Organizational Provider – An organization that provides or supports healthcare services, such as hospitals, Healthcare Information Exchanges (HIEs), Managed Care, Integrated 975 Delivery Networks (IDNs), and Associations. - Relationship between providers. The scope of this transaction considers one type of relationship; member of. Examples of this relationship are: <ol style="list-style-type: none"> 1. Hospitals, clinics, labs, other organization providers, and physicians are members of an HIE 2. A list of physicians are members of a hospital 3. A physician is a member in a list of organization providers

713 5.3.2.3.3 Capabilities to Services interface mapping

	CSD Find Matching Services Facility Search()	Find Matching Services Ad hoc XQuery Option()	Organization Search()	Provider Search()	Query for FreeBusy()	Services Search()	CSD Query for Updated Services	Query for Updated Services()	HPD Healthcare Provider Directory	Provider Information Feed()	Provider Information Query()
HCSPD Administrative Functions											
al : Add a Location											
aod : Add a Provider Organization Demographics										<	
apd : Add a Provider Demographics										<	
ar : Add a Resource										<	
do : Delete an Organisation										<	
dofl : Disassociate a Provider Organization from a Location											
dp : Delete a Provider										<	
dpfl : Disassociate a Provider from a Location											
dpfo : Disassociate a Provider from a Provider Organization											
drfl : Disassociate a Resource from a Location											
mpi : Mark Provider Inactive											
rotl : Relate a Provider Organization to a Location											
rptl : Relate a Provider to a Location											
rptpo : Relate a Provider to a Provider Organization											
rttl : Relate a Resource to a Location											
ul : Update a Location										<	
upd : Update a Provider Demographics										<	
upod : Update a Provider Organization demographics										<	
ur : Update a Resource											
HCSPD Maintenance Functions											
aoc : Add an Organization Calendar											
apa : Add a Provider Allocation											
apc : Add a Provider Calendar											
ara : Add a Resource Allocation											
arc : Add a Resource Calendar											
rra : Remove a Resource Allocation											
uoc : Update an Organization Calendar											
upa : Update a Provider Allocation											
upc : Update a Provider Calendar											
urc : Update a Resource Calendar											
HCSPD Query Functions											
falfo : Find all Locations for an Organization	<										
falfp : Find all Locations for a Provider	<										
falthsr : Find all Locations that have a specified Resource		<				<					
fapfo : Find all Provider for a Location											
faral : Find all Resource at a Location						<					
farawo : Find all Resources associated with an Organization						<					
farawp : Find all Resources associated with a Provider											
farwa : Find an available Resource within an area											
fo : Find an Organization			<								
fp : Find a Provider				<							<
rcfspasl : Return a Calendar for a specified Provider at a specific											
rcfspaso : Return a Calendar for a specified Provider at a specific											
rcfsrasl : Return a Calendar for a specified Resource at a specific											
rcfsraso : Return a Calendar for a specified Provider at a specific											
rcfsrspasl : Return a Calendar for a specified Resource Provider at a specific											
rcfsrspaso : Return a Calendar for a specified Resource at a specific											
HCSPD Content Manager Maintenance											

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5.4 HL7 Common Terminology Service Release 2 (CTS2)



Figure 49 – HL7 Common Terminology Service (CTS2) Capabilities

The Common Terminology service (CTS2) provides a consistent mechanism for accessing and managing terminology content, independent of the representational format and underlying technology stack. Terminology content represents various resources including code systems, value sets, taxonomies, and formal description logic-based ontologies. The following areas that operate on terminology content areas are considered in scope for CTS2.

- **Administration** operations provide the ability to manage content as part of a terminology service. Administration functions include the ability to export and import terminologies, as well as their management. Whenever engaging in importing and exporting activities, the terminology users shall follow the licensing agreement of the terminologies which is outside the scope of CTS2.
- **Search / Query** operations provide the ability to find concepts based on search criteria. This includes restrictions to specific associations or other attributes of the terminology, including navigation of associations for result sets. This represents the primary utility for using terminology content in a number of application contexts and includes capabilities for searching and querying terminology content as well as representing terminology content in the appropriate formats.
- **Authoring / Maintenance** operations provide the ability to create and maintain terminologies. From a terminology service perspective, this would include the appropriate operations to add, change, or delete concepts and associations and processing change events from various terminology providers.








In addition to the operation categories such as query/search, administration and authoring, the CTS2 operations can also be grouped according to the content that they handle such as associations, value sets, and bindings. CTS2 is intended to allow the look up and management of a wide variety of terminology components, including, but not limited to, Concepts, Associations, and Value Sets.









- **Associations** operations provide the ability to map concepts and the concept's associated attributes from a source terminology to a concept in a target terminology, or create relationships between concepts within a single code system as well as the ability to manage these associations (such as maintaining or removing them).
- **Value Set** operations provide the ability to define, manage, remove and use sets of coded concepts in a terminology-enabled application.
- **Bindings**: operations which provide the ability to resolve content bound to a specific Concept Domain and/or Jurisdictional Domain (Binding Realm). This also includes the ability to query, create, maintain and remove Concept Domains, Jurisdictional Domains, and Usage Contexts.












At the functional level, the service interface explicitly allows the query, definition, publication, and modification of the different terminology components that are required of terminologies and terminology services.











The complete Functional Model specification can be found on:
http://www.hl7.org/implement/standards/product_brief.cfm?product_id=384










5.4.1 HL7 Common Terminology Services (CTS2) capabilities







Name	Definition
 CTS2 Administration Operations	The Administration capabilities are intended to provide the functional operations necessary for terminology administrators to be able to access and make available terminology content obtained from a terminology provider. Terminology administrators are required to interface with terminology provider systems in order to obtain the terminology content, and then load that terminology content on local terminology servers.
 Import Code System	Installs a code system (aka terminology) into the terminology service for subsequent access by other service functions. This operation is used for the initial install of the overall terminology structure itself. This may include the full set of concepts, relationships and so on, or some of these elements may be loaded using the Import Code System Revision operation. The actual contents may be supplied by value or reference, i.e. as a complete set of explicit content or as a reference to a location where the content can be separately obtained for loading.
 Remove Code System	Removes all the code system versions from a terminology service for subsequent access by other service functions. This operation is used by administrators to physically remove a code system from a terminology in cases such as where the users no longer wish to use a certain terminology due to licensing issues.
 Import Code System Version	Installs either an entire new version or the necessary revision updates for an already loaded code system (terminology) into the terminology server repository (content included by value or by reference to a location). Includes indicator as to whether intent is to replace whole code system or just replace some elements (codes, associations etc), see Maintain Concept.
 Remove Code System Version	Removes either an entire version or the necessary terminology elements for an already loaded code system into the terminology server repository (content included by value or by reference to a location). Includes indicator as to whether intent is to remove whole code system or just remove some elements (codes, associations etc), see Maintain Concept.
 Import Value Set Version	Installs a value set version into the terminology service for subsequent access by other service functions. This operation may also be used for the initial installation of the value set. The value set contents may be explicitly provided or may be resolved at run time in the case of intensional value sets (where the value set is defined as a computable expression).
 Remove Value Set	Removes a value set and all its versions from the terminology service for subsequent access by other service functions. This operation is used in case of errors. This is applicable to cases











Name	Definition
	where the value set contents may be explicitly provided or may be resolved at run time in the case of intensional value sets.
 Remove Value Set Version	Removes a value set version from the terminology service for subsequent access by other service functions. This operation is used in case of errors. This is applicable to cases where the value set contents may be explicitly provided or may be resolved at run time in the case of intensional value sets.
 Import Association Version	Installs a set of code system associations (mappings) into the terminology service for subsequent access by other service functions. This operation may be used for the initial installation of a set of associations. This may include the full set of associations between concepts from different code systems. The actual associations may be supplied by value or reference, i.e. as a complete set of explicit association or as a reference to a location where the associations can be separately obtained for loading.
 Export Association	Exports association type instances from a code system applying filter criteria
 Export Code System Content	Exports a code system (terminology), subset criteria (specific set of concepts and/or associations/maps from the Terminology Server by filtering the content and converting to the requested format for export (according to the semantic profile of the deployment jurisdiction).
 Change Code System Status	Changes the state of a code system. (Includes inactivation, activation etc.) This allows a Terminology Administrator to manage the state of a given code system, thus managing the level of availability for access by other terminology service functions.
 CTS2 Code System Search / Access	Search/Access capabilities for Code System
 List Code Systems	List the code systems available on this instance of the CTS2 Service that match entered filter criteria.
 Return Code System Details	Returns the details (metadata) for a given code system available on the terminology service.











Name	Definition
 List Code System Versions	Lists all the available versions for an identified code system available on the terminology service
 Return Code System Version Details	Returns the details (metadata) for a given code system version available on the terminology service
 Return Code System Property Details	Returns the details (metadata) for a given code system property available on the terminology service
 List Code System Concepts	Returns the set of all concepts (and concept codes) in the specified code system, optionally filtered by input criteria, such as state or specific concept property, e.g. values.
 Return Concept Details	Returns the details for the known attributes (metadata) of a coded concept
 List Code System Supplements	List the code systems supplements available on this instance of the CTS2 Service that match entered filter criteria.
 Return Code System Supplement Details	Look up detailed information (metadata) for a given code supplement.
 CTS2 Value Set Search/Access	Search/Access capabilities for Value Set
 List Value Sets	Lists the value sets that are available to the CTS2 service.
 Return Value Set Details	Look up detailed information (metadata) for a given value set.
 List Value Set Versions	Returns all the available versions available for an identified value set on the terminology server.






Name	Definition
 Return Value Set Version Details	Returns the details (metadata) for a given value set version available on the terminology service
 List Value Set Contents	Lists out the contents (entries) of a given value set, filtering based on input criteria. This function is to be used to create the value set expansion.
 Check Value Set Subsumption	Determine whether one of the two supplied value sets subsumes the other
 Check Code System Concept Value Set Membership	Determine whether the supplied coded concept exists in the supplied value set
 CTS2 Concept Domain and Usage Context Search / Access	Search/Access capabilities for Concept Domain
 List Concept Domains	Lists the concept domains that are available to the CTS2 service.
 Return Concept Domain Details	Look up detailed information (metadata) for a given concept domain.
 List Jurisdictional Domains	Lists the jurisdictional domains that are available to the CTS2 service.
 Return Jurisdictional Domain Details	Look up detailed information (metadata) for a given jurisdictional domain.
 List Usage Contexts	Lists the usage contexts that are available to the CTS2 service.

Name	Definition
 Return Usage Context Details	Look up detailed information (metadata) for a given usage context.
 List Concept Domain Bindings	List the value set identifier and metadata for the specified domain bindings. This does not include returning the value set expansion.
 Check Concept to Concept Domain Association	Determine whether the supplied coded concept exists in a code system in use for the specified concept domain, optionally within specific usage contexts. Returns true if a coded concept is an element of a value set expansion bound to the provided concept domain, or bound to both concept domain and usage context
 Check Concept to Usage Context Association	Determine whether the supplied coded concept exists in a code system in use for the specified concept domain, optionally within specific usage contexts. Returns true if a coded concept is an element of a value set expansion bound to the provided concept domain or bound to both concept domain and usage context.
 Association related queries	Search/Access capabilities for an Association
 List Associations	List the Associations available on an instance of the CTS2 Service that match a set of input filter criteria
 List Association Types	List association types that are available on a terminology server that match entered filter criteria (e.g. code system, code system version).
 Return Association Type Details	Returns the details for the known attributes (metadata) of an Association type.
 Determine Transitive Concept Relationship	Determine whether there exists a transitive relationship between two concepts and if it exists, provide the Association path. Determine Transitive Concept Relationship determines if it is possible to get from a given ParentCodeConcept to a given ChildCodedConcept in one or more association transitions.

Name	Definition
 Compute Subsumption Relationship	<p>Subsumption tests whether the parent coded concept subsumes (is implied by) the child. If ParentCodedConcept or ChildCodedConcept are non-compositional and are both drawn from the same code system, subsumption returns true if and only if ChildCodedConcept can be determined to belong to the transitive closure of the hasSubtype relationship graph headed by ParentCodedConcept. No further assertions of the semantics of subsumption can be inferred beyond this one case. If the service supports subsumption involving qualifiers (compositional expressions) and/or subsumption tests across multiple code systems, it must define the appropriate translation semantics. If the service doesn't support subsumption on concepts defined using compositional expression, it should raise the QualifiersNotSupported exception if presented with a parentCode or childCode containing qualifiers. Similarly, if the service doesn't support cross-code system subsumption testing, it should raise SubsumptionNotSupported when supplied with codes with different code systems.</p>
 Return Association Details	<p>Look up detailed information (metadata) for a given Association</p>
 CTS2 Code System Authoring and Curation	<p>Authoring/Curation Operations for Code Systems</p>
 Create Code System	<p>Create a new Code System to contain a set of new coded concepts. The Code System is created by defining the set of metadata properties that describe it.</p>
 Maintain Code System Version	<p>Update Code System metadata properties. This allows for maintenance of a Code Systems properties, including creation and updating of Code System Versions, and assignment of Concepts to a Version.</p>
 Update Code System Version Status	<p>Changes the status of a code system version (suspended, reinstated, canceled, removed).</p>

Name	Definition
 Create Code System Supplement	Create a new Code System Supplement as a container of a set of concepts and concept properties to be appended to a target code system. Does not add the concepts and properties.
 Maintain Code System Supplement	Update Code System Supplement metadata properties and add concepts and properties to code system.
 Create Concept	Create concept to be included in a Code System. The new concept is defined by the set of metadata properties that describe it, which may include its proper placement via association binding within the hierarchy of the Code System.
 Maintain Concept	Update Concept metadata properties.
 Update Concept Status	Changes the status of a code system concept (suspend, reinstate, cancel, remove).
 Create Association Type	Create a new association type (as intended by the association type class of the conceptual model), an instance of which may be used to link two concepts. A list of code system IDs can be supplied if the intent is to restrict use to specific code systems. The default is availability to all code systems present on the server.
 Maintain Association Type	Update or deprecate an association type that may be used to link two concepts.
 CTS2 Value Set Authoring and Curation	Authoring/Curation Operations for Value Sets
 Create Value Set	Create a Value Set (extensional or intensional) that is defined by a computable expression that can be resolved to an exact list of coded concepts at any given point in time.
 Maintain Value Set	Update properties or expression of a value set definition (extensional and intensional value sets).

Name	Definition
 Update Value Set Status	Changes the status of a value set version (suspend, reinstate, cancel, remove).
 CTS2 Concept Domain and Usage Context Authoring and Curation	Authoring/Curation Operations for Concept Domains
 Create Concept Domain	Create a concept domain.
 Maintain Concept Domain	Update properties of a Concept Domain, including bindings to value sets within usage contexts
 Create Jurisdictional Domain	Create a jurisdictional domain.
 Maintain Jurisdictional Domain	Update properties of a Jurisdictional Domain, including bindings to value sets within usage contexts
 Create Usage Context	Create a usage context.
 Maintain Usage Context	Update properties of a Usage Context
 CTS2 Association Authoring Operations	Authoring Operations for Associations
 Update Association Status	Update the status of an association (active, inactive, cancelled etc). This allows a Terminology User to activate or inactivate a given association, thus changing its availability for access by other terminology service functions

Name	Definition
 Create Association	Relates a single specific coded concept within a specified code system (source) to a corresponding single specific coded concept (target) within the same or another code system, including identification of a specified association type.
 Create Lexical Association between Coded Concepts	Relates a set of one or more coded concepts within a specified code system (source) to a corresponding set of one or more coded concepts (target) within that system or another code system using a set of lexical rules (matching algorithms) to generate the Association. The "Source Search Criteria" allows for identification of a subset of the Source Code System to apply the matching algorithm to, if required (this may include limiting the version of the code system).
 Create Rules Based Association between Coded Concepts	Relates a set of zero or more coded concepts within a specified code system (source) to a corresponding set of zero or more coded concepts (target) within that system or another code system using a set of description logic or inference rules that either assert or infer Associations. The "Source Search Criteria" allows for identification of a subset of the Source Code System to apply the matching algorithm too, if required (this may include limiting the version of the code system).
 CTS2 Service Information Operations	The Service Information capabilities expose introspective functionalities of the service.
 Return Service Details	Returns information about the service itself such as the service name, version, description, service provider and service properties.

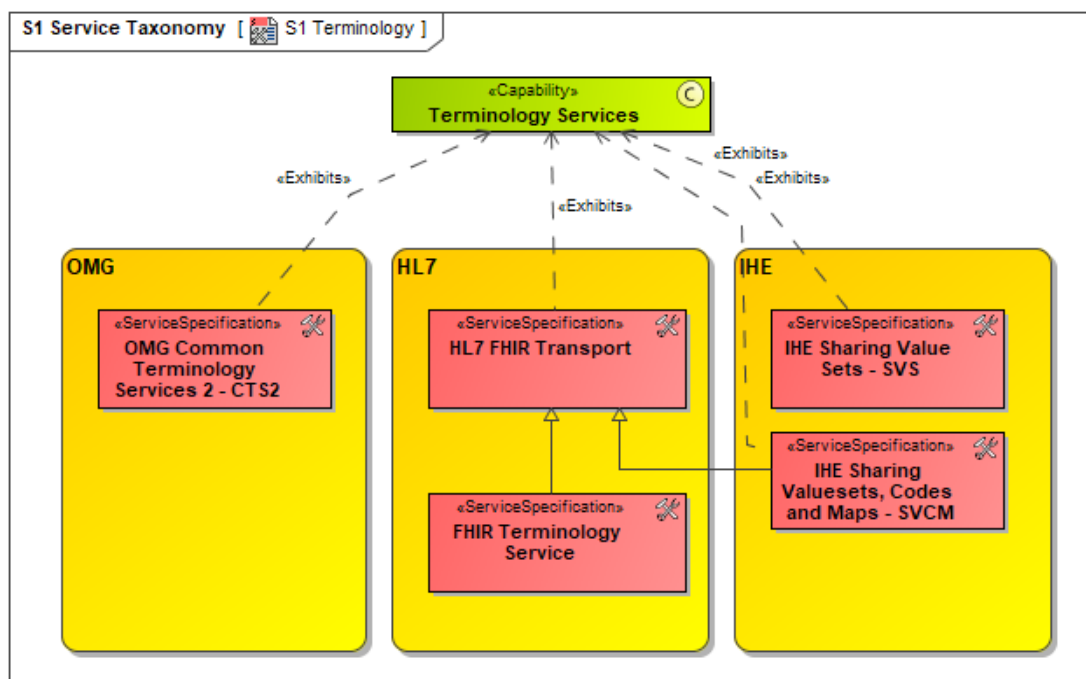


Figure 50 – HL7 CTS2 service projections

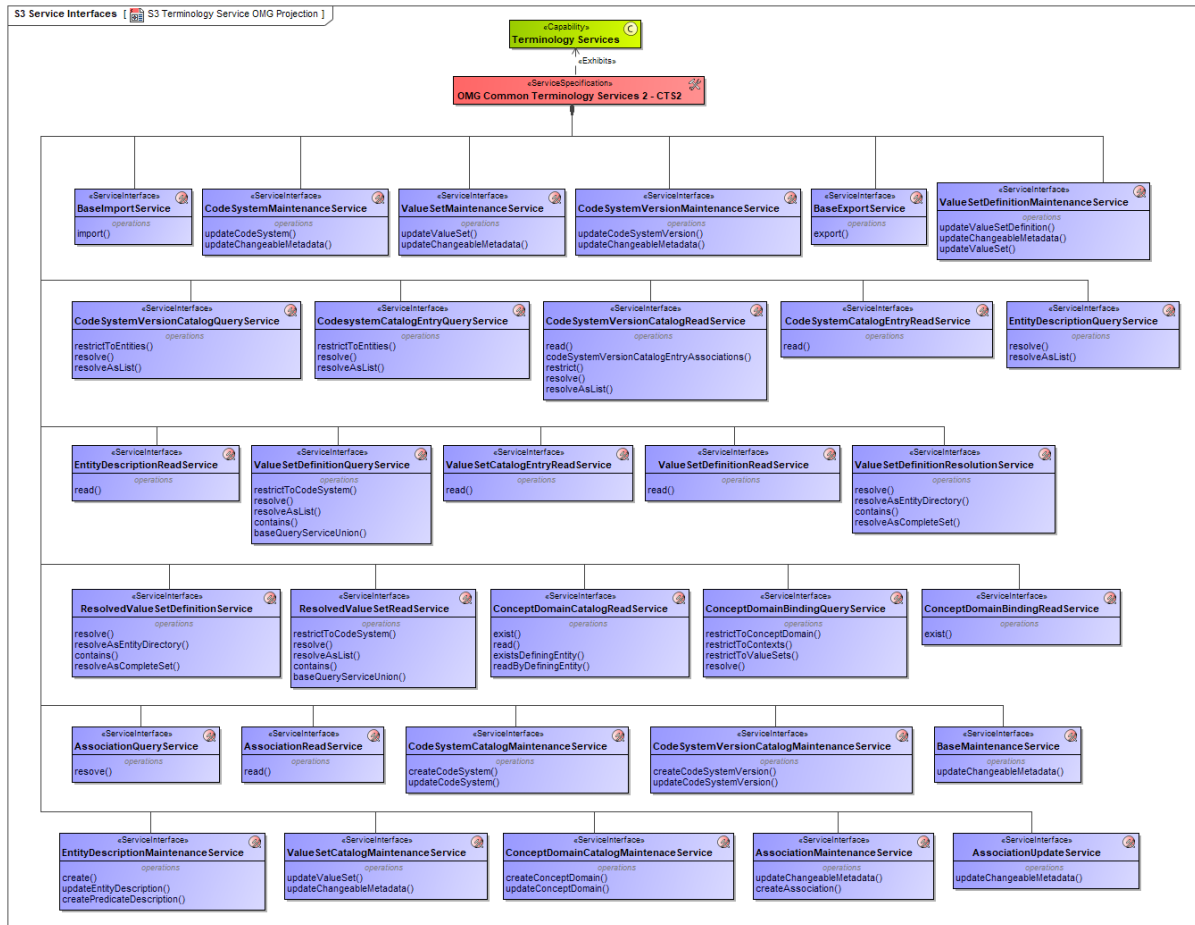
Projections of terminology Service include:

- OMG Common Terminology Services 2 – OMG CTS2 (SOAP and REST)
- HL7 FHIR Terminology Service
- IHE Sharing Valuesets, Codes and Maps – SVCM (FHIR)
- IHE Sharing Value Sets – SVS (SOAP)

5.4.2.1 HL7 Common Terminology Services 2 (CTS2) SOAP and REST projections

The model below is derived from the HL7 CTS2 Service Functional Model (SFM) mapping in Appendix C.

See: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=384



The next version of the HSRA will revise the mapping with the functional model due to the complexity and issues of the formal mapping included in the functional model specification.

5.4.2.2 HL7 Common Terminology Service (CTS2) to FHIR Projection

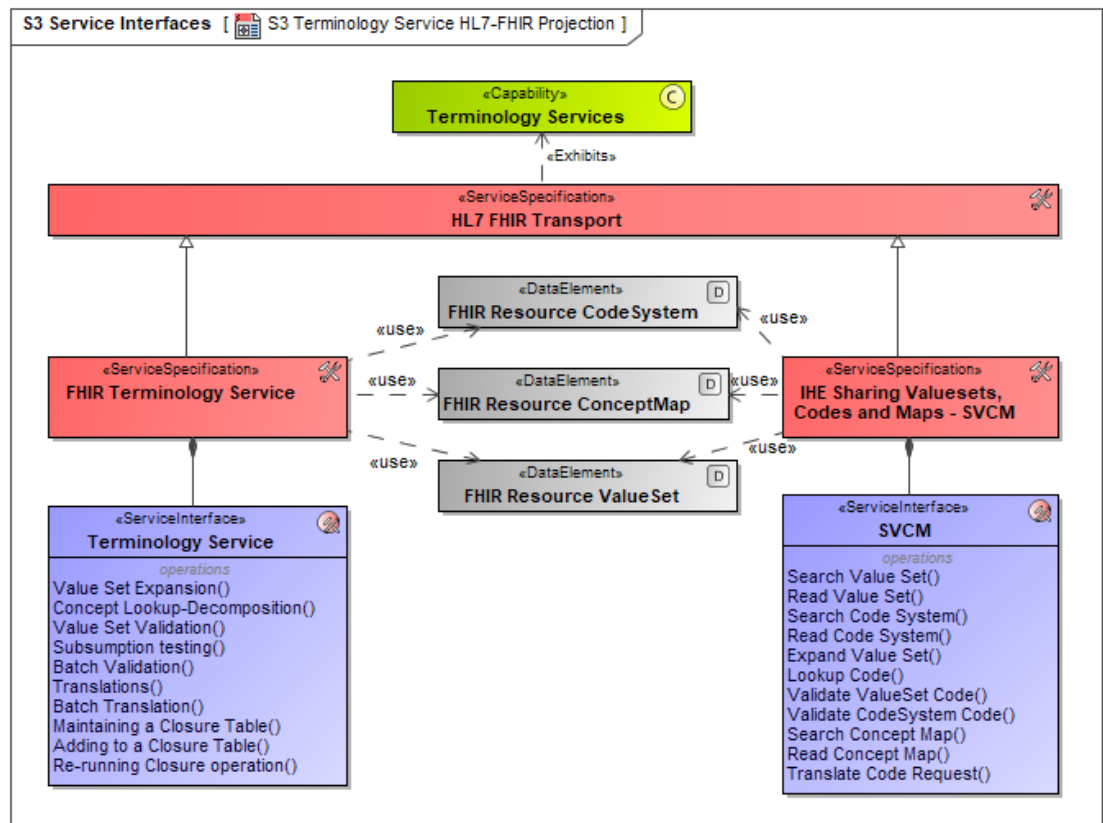


Figure 51 – HL7 Common Terminology Service (CTS2) to FHIR Projection

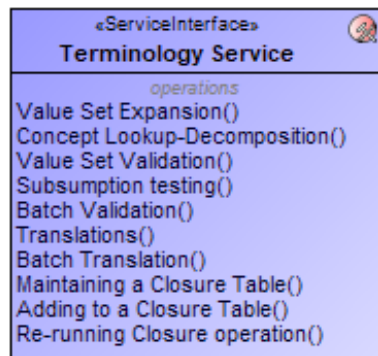
The CTS2 projections Includes two specifications:

- FHIR Terminology Service
- IHE Sharing Valuesets, Codes and Maps – SVCM

The main FHIR Resource involved are:





- FHIR Resource CodeSystem
- FHIR Resource ValueSet
- FHIR Resource ConceptMap





5.4.2.2.1 FHIR Terminology Service interface specification





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792 FHIR Terminology Service operations:

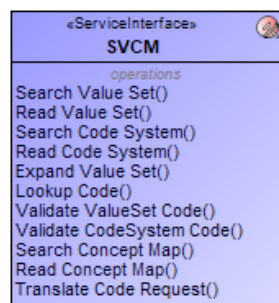
Name	Documentation
 Adding to a Closure Table	<p>When the consumer (client) encounters a new code, it POSTs the following to [base]/ConceptMap/\$closure.</p>
 Batch Translation	<p>It's possible to translate a set of concepts against their relevant value sets by using the \$translate operation in a Batch interaction.</p>
 Batch Validation	<p>It is also possible to validate a set of concepts against their relevant value sets by using the \$validate-code operation in a Batch interaction.</p>
 Concept Lookup- Decomposition	<p>A system can ask a terminology server to return a set of information about a particular system/code combination using the lookup operation. The server returns information for both display and processing purposes. The client passes the server the following information:</p> <ul style="list-style-type: none"> - the code value (either a code, or a Coding data type) - (Optionally) the id or the url of the code system in which the code is being checked - (Optionally) a date at which the code information should be returned (usually, this is the current date/time, but there are circumstances where that is not appropriate) - (Optionally) a set of properties to return about the code <p>The server returns some or all of the following information:</p> <ul style="list-style-type: none"> - a human description of the system - a recommended display for the code - properties of the code (e.g. status) - other designations for the code (a value, optionally with language and/or a use code) - relationships between this code and other codes (parent/child properties, etc.) - Component properties of the specified code (e.g. to support reasoning) (e.g. decomposition) <p>The recommended display for the code is a text representation of the code that the terminology server recommends as the default choice to show to the user, though a client may choose out of the other designations if it has reason to.</p> <p>If the client does not ask for any particular properties to be</p>

Name	Documentation
	<p>returned, it is at the discretion of the server to decide which properties to return (though note that the "version" property is always returned if the code system has a version).</p>
 Maintaining a Closure Table	
 Re-running Closure operation	<p>Given the way that the closure operation functions, it's possible for a client to lose a response from the server before it is committed to safe storage (or the client might not have particularly safe storage). For this reason, when a client is starting up, it should check that there have been no missing operations.</p>
 Subsumption testing	<p>To test the subsumption relationship between code/Coding A and code/Coding B, perform a \$subsumes operation. Subsumption testing is based on the CodeSystem definition of subsumption. The client passes the server the following information:</p> <p>the system that identifies the code system in which subsumption testing is to be performed (either by invoking the operation on the code system directly, or referring to it by its canonical URL) Concepts A and B - either as codes, or Codings (Optionally) the version of the code system to use (mostly, this should not matter)</p> <p>If the client passes Codings, it is allowed to use code system values that are different from the code system in which subsumption testing is to be performed. In this case, the server SHALL return an error unless the relationships between the various code systems is well defined.</p> <p>If the concepts can be compared, then the server returns an outcome code:</p> <ul style="list-style-type: none"> - equivalent Concepts A and B are equivalent - subsumes Concept A subsumes Concept B - subsumed-by Concept A is subsumed by Concept B - not-subsumed Concepts A and B are not related by any subsumption relationship
 Translations	<p>A client can ask a server to translate a concept from one value set to another. Typically, this is used to translate between code systems (e.g. from LOINC to SNOMED CT, or from a HL7 V3 code to a HL7 V2 code). The client calls the translate operation and</p>

Name	Documentation
	<p>passes the following parameters:</p> <ul style="list-style-type: none"> - a code + system, Coding, or CodeableConcept - a Concept Map to use for the translation - the value set for the context of the source - the value set for the destination <p>The client passes either a concept map, or the value sets for the source and destination context. If there is no concept map, then the server may determine the appropriate map to use from context provided in the value sets. If there is no specific context, the appropriate value sets would be the value sets for the entire coding system at question (e.g. from http://snomed.info/sct to http://loinc.org/vs). The server performs the translation as it is able based on the concept maps that it knows about. If no single mapping can be determined, then the server returns an error. Some servers may require a concept map to use for the translation.</p>
 Value Set Expansion	<p>A value set describes a set of rules for what codes or concepts are considered to be in the value set. These rules might be simple (e.g. a direct list of codes from a specified version of a code system), or they might be quite complex (e.g. all codes with a particular property from an unspecified version of a code system).</p> <p>A FHIR-enabled application can simply ask a terminology server to figure out all the details and return a list of the current codes in the value set. This is known as "expanding" the valueset. As a summary, the client passes the server the following information:</p> <ul style="list-style-type: none"> - the value set (either by its URL on the RESTful interface, by its logical identifier (ValueSet.url), or directly as a parameter to the call) - (Optionally) a text filter to use to restrict the codes that are returned (e.g. user input text). It is left to server discretion to choose how to apply the text filter - (Optionally) a date at which the expansion should be evaluated (usually, this is the current date/time, but there are circumstances where that is not appropriate) - (Optionally) which page to retrieve - asking the server to break the expansion into a set of chunks - (Optionally) other parameters that supply additional information about how to perform the expansion <p>The server returns a value set that contains the current list of codes that meet the filter criteria (or an OperationOutcome with</p>





Name	Documentation
	an error if the expansion fails). Note that some value sets expand to many thousands of codes, or even an infinite number, and for these, the server SHOULD return an error code too-costly. In these cases, the client can try again with a more specific text filter to reduce the number of codes returned - this may result in a valid expansion.
 Value Set Validation	Validation of Value Set








793 5.4.2.2.2 IHE Sharing Value sets, Codes and Maps – SVCMM



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Figure 52 – IHE Sharing Valuesets, Codes and Maps – SVCMM Interface

Name	Documentation
 Expand Value Set	<p>The Expand Value Set Request message is a FHIR \$expand operation on the ValueSet Resource.</p> <p>A Terminology Consumer triggers an Expand Value Set Request to a Terminology Repository according to the business rules for the expansion. These business rules are outside the scope of this transaction.</p>
 Lookup Code	The Lookup Code Request message is a FHIR \$lookup operation on the CodeSystem Resource.
 Read Code System	This message represents an HTTP GET from the Terminology Consumer to the Terminology Repository and provides a mechanism for retrieving a single CodeSystem with a known resource id.
 Read Concept Map	This message represents an HTTP GET from the Terminology Consumer to the Terminology Repository and provides a

Name	Documentation
	mechanism for retrieving a single ConceptMap with a known resource id.
 Read Value Set	This message represents an HTTP GET from the Terminology Consumer to the Terminology Repository and provides a mechanism for retrieving a single ValueSet with a known resource id.
 Search Code System	The Search Code System message is a FHIR search interaction on the CodeSystem Resource.
 Search Concept Map	The Search Concept Map message is a FHIR search interaction on the ConceptMap Resource.
 Search Value Set	The Search Value Set message is a FHIR search interaction on the ValueSet Resource.
 Translate Code Request	The Translate Code Request message is a FHIR \$translate operation on the ConceptMap Resource.
 Validate CodeSystem Code	The Validate CodeSystem Code Request message is a FHIR \$validate-code operation on the CodeSystem Resource.
 Validate ValueSet Code	The Validate ValueSet Code Request message is a FHIR \$validate-code operation on the ValueSet Resource

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5.4.2.3 Terminology Service IHE projection

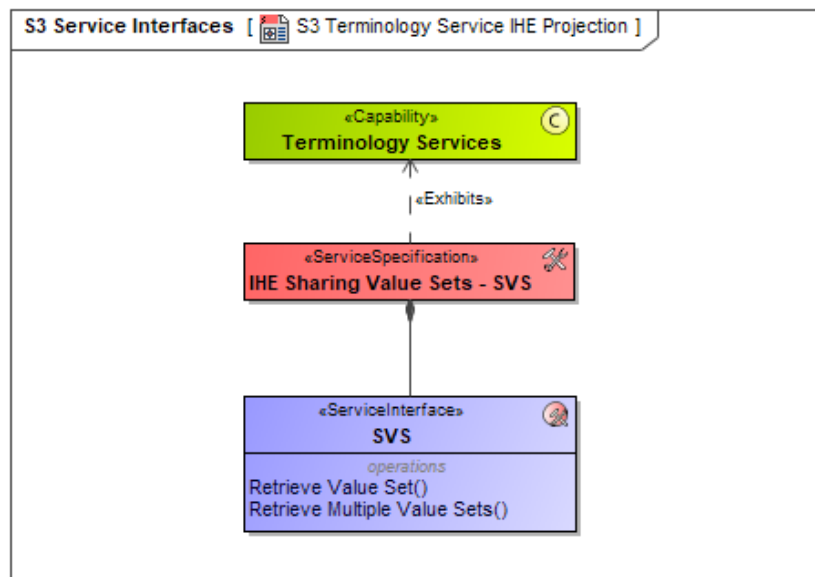


Figure 53 – Terminology Service IHE projection

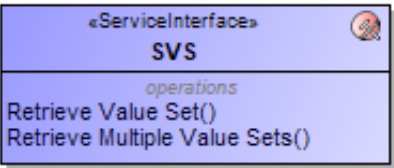
The Sharing Value Sets (SVS) Profile provides a means through which healthcare systems producing clinical or administrative data, such as diagnostic imaging equipment, laboratory reporting systems, primary care physician office EMR systems, or national healthcare record systems, can receive a common, uniform nomenclature managed centrally. Shared nomenclatures are essential to achieving semantic interoperability.

A single Value Set Repository can be accessed by many Value Set Consumers, establishing a domain of consistent and uniform set of nomenclatures. It supports automated loading of Value Sets by Value Set Consumers, reducing the burden of manual configuration. This profile describes two transactions for retrieving Value Sets from a Value Set Repository by a Value Set Consumer.

- A single value set can be retrieved based on an OID value. This is aimed at meeting the needs of systems that are pre-configured to use specific value sets. These systems are often medical devices with strictly controlled functions that should not be modified without careful review. This transaction does not include metadata content, and provides just the value set concept list as uniquely identified in the request.
- Multiple value sets can be retrieved based on metadata about the value sets. This is aimed at meeting the needs of systems and users that will be dynamically selecting value sets, deciding which value sets should be used, and creating new value sets based on the contents of existing value sets. This transaction supports much richer selection criteria and provides metadata descriptions as well as the contents (expanded lists of coded values) of all the value sets that meet those criteria.

Both transactions provide access to centrally managed value sets that have been assigned metadata, including group identification. The ability to identify groups of value sets is essential to achieving semantic interoperability and development of modular structures of electronic health records (EHR). Group identification can be used to identify, for example, all the value sets needed for a given purpose like filling in a particular kind of report.



829 **5.4.2.3.1 Sharing Value Sets – SVS**



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Figure 54 – Sharing Value Sets (SVS) Profile

Name	Documentation
 Retrieve Multiple Value Sets	This transaction is used by the Value Set Consumer to retrieve Value Sets from the Value Set Repository.
 Retrieve Value Set	This transaction is used by the Value Set Consumer to retrieve an Expanded Value Set from the Value Set Repository. The Value Set Consumer has previously obtained the Expanded Value Set OID by means outside of the scope of this transaction.

832 **5.4.2.3.2 Capabilities to service interface mapping**

	SVS	Retrieve Multiple Value Sets()	Retrieve Value Set()
TS Administration Operations			
ics : Import Code System			
icsv : Import Code System Version			
rcs : Remove Code System			
rcsv : Remove Code System Version			
TS Association Authoring Operations			
ca : Create Association			
clabcc : Create Lexical Association between Coded Concepts			
crbabcc : Create Rules Based Association between Coded Concepts			
uas : Update Association Status			
TS Association related queries			
csr : Compute Subsumption Relationship			
dtr : Determine Transitive Concept Relationship			
la : List Associations			
lat : List Association Types			
rad : Return Association Details			
ratd : Return Association Type Details			
TS Code System Authoring/Curation			
cat : Create Association Type			
cc : Create Concept			
ccs : Create Code System			
ccss : Create Code System Supplement			
mat : Maintain Association Type			
mc : Maintain Concept			
mcss : Maintain Code System Supplement			
mcsv : Maintain Code System Version			
ucs : Update Concept Status			
ucsvs : Update Code System Version Status			
TS Code System Search / Access			
lcs : List Code Systems			
lcsc : List Code System Concepts			
lcss : List Code System Supplements			
lcsv : List Code System Versions			
rcd : Return Concept Details			
rcsd : Return Code System Details			
rcspd : Return Code System Property Details			
rcssd : Return Code System Supplement Details			
rcsvd : Return Code System Version Details			
TS Concept Domain and Usage Context Authoring/Curation			
ccd : Create Concept Domain			
cjd : Create Jurisdictional Domain			
cuc : Create Usage Context			
mcd : Maintain Concept Domain			
mjd : Maintain Jurisdictional Domain			
muc : Maintain Usage Context			
TS Concept Domain and Usage Context Search / Access			
cc2cda : Check Concept to Concept Domain Association			
cc2uca : Check Concept to Usage Context Association			
lcd : List Concept Domains			
lcdb : List Concept Domain Bindings			
ljd : List Jurisdictional Domains			
luc : List Usage Contexts			
rcdd : Return Jurisdictional Domain Details			
rjdd : Return Jurisdictional Domain Details			
rucd : Return Usage Context Details			
TS Service Information Operations			
rsd : Return Service Details			
TS Value Set Authoring/Curation			
cvs : Create Value Set			
mvs : Maintain Value Set			
uvss : Update Value Set Status			
TS Value Set Search/Access			
cccvsm : Check Code System Concept Value Set Membership			
cvss : Check Value Set Subsumption			
lvs : List Value Sets		<	
lvsc : List Value Set Contents			<
lvsv : List Value Set Versions			
rvsd : Return Value Set Details			
rvsvd : Return Value Set Version Details			

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5.5 Care Coordination

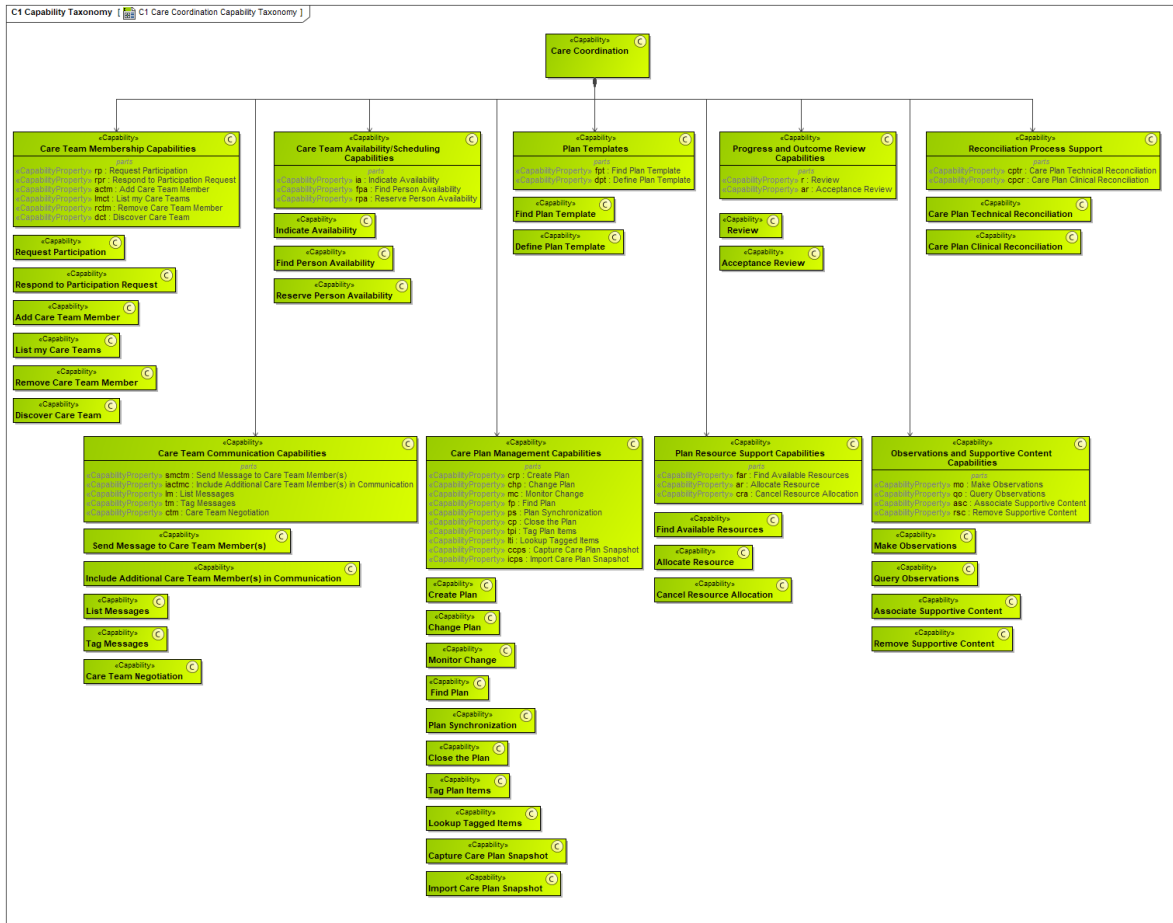


Figure 55 – Care Coordination capabilities

The scope of this specification is to define the functions or capabilities required for effective coordination of care systems. It includes illustrative story boards and care team collaboration illustrative models. The service capabilities define the functions and may not map to a technical service operation with a 1-to-1 relationship.

Development of the HL7 Coordination of Care SFM is guided by the following principles:

- Ongoing coordination of care is a collaborative activity between care team members
- The patient and designated family care givers are members of the Care Team
- Effective coordination of care requires a systems engineering perspective which considers

All the parts of the (eco)system:





- Care Team collaboration
- Goal oriented care planning
- Tracking care activities and interventions
- Continual Assessment and Review
- Clinical domain/specialty and care setting context









The complete specification can be found at:







http://www.hl7.org/implement/standards/product_brief.cfm?product_id=452

856 **5.5.1 Care Coordination capabilities**





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Name	Definition
 Care Team Membership Capabilities	<p>Coordination of Care is an activity of collaborating care teams. Explicitly maintained knowledge of the currently active care team members, their responsibilities, commitments and contribution to the care of the patient are essential for deciding how to harmonize potentially conflicting decisions and actions and incorporating new information into a comprehensive and dynamic care plan.</p>
 Request Participation	<p>This capability supports making a request from one individual to another to participate as a collaborator in coordination of care activities for one patient. This request for participation establishes privileged membership into the circle of care for a single patient. Membership is a pre-condition for subsequent interactions resulting from referrals, transitions of care, consultations, etc. The “request for participation” function assumes the existence of a pre-existing working or social relationship between the participants or organizations involved which enables them to collaborate and coordinate care based on current practice (whether through faxes, phone calls or other means). The issue of which professionals and non-professionals are on the patient’s actual care team (and who can receive requests) is an independent issue, is out of scope for this specification and constrained by country or organization governance and policies.</p>
 Respond to Participation Request	<p>The “Respond to Participation Request” capability supports the ability of individuals to accept, reject or delegate an invitation to join a patient’s care team. An invitation response results in the addition of a new care team participant upon acceptance. The recipient of the invitation may also reject the invitation or delegate to a colleague.</p> <p>Allowed response types are:</p> <ul style="list-style-type: none"> - Accept participation request - Decline request with recommendation - Reject request to participate
 Add Care Team Member	<p>The “Add Care Team Member” capability supports the ability of an authorized user to directly add members to the care team. The capability assumes the existence of an administrative role which has been granted access to plan and assign members of the care team. This capability can help streamline establishment of the care team when the patient is receiving care within a single institution and an initial group of individuals is identified during care planning.</p>







Name	Definition
 List my Care Teams	The "List my Care Teams" capability supports the ability of an individual to list all care teams for which they have an active membership.
 Remove Care Team Member	The "Remove Care Team Member" capability supports the ability of an authorized user to either permanently remove or inactivate an individual from the care team. The capability supports administrative management of the care team. The capability also supports a patient or patient delegate to decide the composition of their active care team and who has access to their plan and progress. Care team members who are permanently removed no longer have access to the care plan. Care team members who are inactivated continue to have access but no longer receive full communication of updates (unless there is an explicit request to re-engage them).
 Discover Care Team	<p>The "Discover Care Team" capability supports the ability of a user to determine who the other members of the care team are in order to engage them in communication, negotiation, harmonization and coordinated execution of the plan (via the other capabilities defined in this specification).</p> <p>This capability also supports computer systems in determining who needs to receive change updates and synchronization of the care plan and other coordination of care context and information.</p> <p>The capability is designed to allow care team individuals to know about each other. In a sense, this capability provides a graph or personal relationships.</p>
 Care Team Availability/Scheduling Capabilities	Support the availability/scheduling information
 Indicate Availability	The "Indicate Availability" capability supports the ability of users to publish open times in their schedule as well as times when they are not available.
 Find Person Availability	The "Find Person Availability" capability supports the ability of users to discover when their peers are available for meetings or new appointments with patients.
 Reserve Person Availability	The "Reserve Person Availability" capability supports the ability of users to reserve a slot in another care team member's schedule based on information determined from the "Find Person Availability" capability.
 Plan Templates	A plan template consists of predefined "standardized" plan elements which are commonly included when addressing a combination of patient health concerns, health risks and











Name	Definition
	<p>health goals. The plan templates could be based on research, clinical evidence or best practices. For example, there could be a plan template to treat patients with diabetes mellitus and cardiovascular disease; these templates could be used by a provider as a starting basis to customize and personalize the care for an individual.</p>
 Find Plan Template	<p>The “Find Plan Template” capability supports the ability of users to locate a predefined “standardized” plan fragment to address a subset of health concerns, health goals and health risks. Users are expected to personalize and tailor the “plan” based on the patient’s needs and preferences. Plan templates are not associated with individual patients but instead capture re-usable plan elements targeting classes of patients sharing health concerns, health risks and health goals.</p>
 Define Plan Template	<p>The “Define Plan Template” capability supports the ability of users to create or update condition specific re-usable plan “fragments”. This capability is similar to creating or changing a plan, except that the plan does not specify a patient or any other member of the care team.</p>
 Progress and Outcome Review Capabilities	<p>The review capabilities enable users to capture their evaluation of whether the plan is progressing as expected based on review of goals and outcomes. Acceptance is also included as a form of review capability which captures shared agreements, authorizations, and acknowledgements to move forward with a planned course of action.</p>
 Review	<p>The “Review” capability supports the ability of users to perform ongoing evaluation of the dynamic care plan as it changes over time based on the contribution, negotiation and harmonization by the care team. A review may apply to the plan as a whole, to an individual goal or to the outcome of a specific intervention. The review may consider the overall consistency, appropriateness, completeness and effectiveness of the plan or selected goals. A review may be captured as a set of qualitative observations or it may capture quantitative measures when computable criteria for the goal or intervention results are available.</p>
 Acceptance Review	<p>The “Acceptance Review” capability supports the ability of users to indicate their agreement (or disagreement), acknowledgment or authorization of an overall plan, individual health goals and proposed activities</p>
 Reconciliation Process Support	<p>These capabilities support the reconciliation process</p>

Name	Definition
 Care Plan Technical Reconciliation	<p>The “Care Plan Technical Reconciliation” capability supports the ability to procure and merge two different care plans. The procurement can be done through queries to external sources (such as clinical information systems or electronic health record) or through inputs of care plans pushed from external sources. This capability includes functions such as validation and highlighting of patient identification details, identification of care plan contents duplicates, overlaps, conflicts and superseded information to facilitate clinical reconciliation</p>
 Care Plan Clinical Reconciliation	<p>The “Care Plan Clinical Reconciliation” capability supports clinical adjudication of discrepancies between two or more care plans from different sources. The adjudication may involve resolving any ambiguities duplications, inconsistencies, contradictions, errors and omissions that may be identified through the technical reconciliation and clinical validation. Clinical reconciliation process may often include communications/negotiations with different stakeholders including the patient</p>
 Care Team Communication Capabilities	<p>Effective care team communication is a key requirement of coordination of care and collaboration. These capabilities support electronic communication between individuals and maintenance of a record of significant coordination of care communications or messages between individuals for future review, understanding and awareness.</p> <p>It is important to note that for communications to be meaningful for coordination of care they must be associated with the specific clinical context which triggered the communication. The HL7 Care Plan domain analysis model defines communications with explicit associations to health goals, health concerns, health risks, care barriers and plan activities or interventions. For example, a question (communication) about a health goal would be linked to the health goal structure defined in the model; sharing of information about an intervention would have a link to the plan activity as defined in the model.</p>
 Send Message to Care Team Member(s)	<p>The “Send Message to Care Team Member(s)” capability supports the ability of a user to send a message to one or more care team members. By default, the conversation is private to the participants involved. Organizational policies and business rules may determine if a conversation is visible beyond the direct participants involved.</p> <p>This capability supports both sending of new messages, as well as responding to previously sent messages.</p> <p>Some characteristics of messages:</p> <ul style="list-style-type: none"> - Messages capture the free form text, natural language expression of business interactions. - Messages may capture structured observations resulting from electronic form question/answers. - Messages link to the semantic structure or context

Name	Definition
	<p>pertaining to driving the interaction. These links put the communication in context.</p> <ul style="list-style-type: none"> - Messages are organized in threads with a common topic. - Messages may contain optional multimedia such as an attached photograph, video clip or document.
 Include Additional Care Team Member(s) in Communication	<p>The "Include Additional Care Team Member(s) in Communication" capability supports the ability of a user to include additional care team members in an existing communication.</p>
 List Messages	<p>The "List Messages" capability supports the ability of users to obtain a listing of messages they have either sent or received as part of their active membership in a given patient's care team. Listing of messages may also include filters based on tags which have been applied to the message by users or tags applied to the message by systems.</p>
 Tag Messages	<p>The "Tag Messages" capability supports the ability of users or systems to tag messages for categorization and organization purposes. Tags are used as filters when listing messages.</p> <p>Three specific tags reserved by systems include: Sent_Messages, Received_Messages and New_Messages.</p>
 Care Team Negotiation	<p>Negotiation is an interaction between two or more parties with the aim to reach agreement. Negotiation is supported in two ways by the coordination of care service functional model.</p> <ol style="list-style-type: none"> 1. As free form "electronic message" communication resulting in care team individuals taking specific actions <ol style="list-style-type: none"> a. This form is not too different from a phone- or email-based negotiation in that the exchange happens as a conversation with a very specific agreed on decision 2. As a structured content contribution to the care plan, which occurs when a care team member adds a health goal, a health concern or a care activity or intervention. Depending on the role and situation, the added goal, concern or intervention may be in a non-finalized proposed state. The proposal could be accepted, rejected or an alternative could be counter-proposed. The flow in this style of negotiation is one where the care team contributes to the same plan shared content; but the plan or its elements are not accepted (via a team acceptance review) until agreement has been reached. <p>The modes of communication during the negotiation processes can be asynchronous or synchronous</p> <p>This capability supports the ability of users to annotate the care plan and its elements as: requested, proposed, accepted, rejected or counter proposed.</p>

Name	Definition
 Care Plan Management Capabilities	<p>The care plan provides guidance for the coordinated effort of the care team. Are care team individuals acting in accordance with the goals established by the patient and her providers? Is everything which was previously planned still the correct course of action upon the identification of new health concerns, risks or barriers? Does the outcome of planning activities by one provider impact the planned course of action agreed upon with a different provider? As time goes on the plan continues to evolve based on contributions from different care team stakeholders and may require harmonization via communication and negotiation. The plan provides direction for the coordinated activities of the care team; breakdown occurs when the plan stops being maintained. In other words, lack of a dynamically maintained plan results in breakdown of coordinated care.</p>
 Create Plan	<p>The “Create Plan” capability supports the ability of a care team member (which includes the patient) to establish a new plan for the patient; or for a patient to create a plan for herself without the need or involvement of other care team members. The capability may not always result in the creation of a complete plan but may simply create the shell of a plan to which one or more care team members in coordinated effort with the patient will contribute information about health goals, health concerns, health risks, care barriers and plan activities or interventions. Completeness of a care plan is a matter of perspective and is something that is continuously evolving with future findings so it is expected that whether the created plan is “complete” or a shell it will still undergo changes through contributions by others.</p>
 Change Plan	<p>The “Change Plan” capability supports the ability of care team members (which includes the patient) to make changes to an existing plan. The changes may include modification to intrinsic plan attributes such as confidentiality, description, display name and discipline or changes (including addition) of related plan elements such as health concerns, health goals, health risks, care barriers and plan activity or interventions. A change could represent the removal of plan elements either because they are no longer pertinent or because they were added due to some error. Changes to the plan may also include status changes such as placing the plan on hold or suspending the plan for a period of time.</p>
 Monitor Change	<p>The “Monitor Change” capability supports the ability of users to indicate their desire to be alerted regarding specific changes to the care plan content such as health concerns, health goals, health risks, care barriers, care preferences and care activities or interventions. As specified by the “Plan Synchronization” capability, the care plan content is already expected to be synchronized across all shared instances. The key distinction of the “Monitor Change” capability and basic synchronization is that</p>

Name	Definition
	synchronization is a passive behavior of the system; whereas "Monitor Change" supports intentional and proactive care team behavior.
 Find Plan	The "Find Plan" capability supports the ability of care team members to discover existing plans for a patient in order to make the plan accessible for reading, reviewing and changing. The resulting plans may be either active or archived. Ideally there is one active plan for a patient as the capabilities do not support coordination of care based on multiple un-reconciled plans.
 Plan Synchronization	The "Plan Synchronization" capability supports system level data synchronization of changes to the care plan for all care team participants who have accessed an earlier version of the plan and who may make mistakes unless they are aware of changes to the plan. The capability supports users by providing an up to date view and awareness of changes to the plan by other care team members. Synchronization of change updates to the coordinating care team raises awareness of potential changes resulting from new findings.
 Close the Plan	The "Close Plan" capability supports the ability of users to indicate a plan is no longer used.
 Tag Plan Items	<p>In the world of paper care plans, one could take a red pen and make "markings" to identify items of interest for planning and discussion. As an example, these markings may indicate to follow up, to correct, to consolidate or reconcile various plan sections or items.</p> <p>The "Tag Plan Items" capability supports the ability of users to make such markings by tagging any object within the plan with a label (which could be a predefined or coded label). The markings could be either system defined or user defined.</p> <p>Markings with the same label or code form groupings of related content for organizational purposes or to highlight them for future action by the care team.</p>
 Lookup Tagged Items	The "Lookup Tagged Items" capability supports users in identifying plan items tagged with a given label. Tag with the same label or code form groupings of related content for organizational purposes or to highlight them for future action by the care team.
 Capture Care Plan Snapshot	<p>The "Capture Care Plan Snapshot" capability supports the ability of users or systems to capture a point in time snapshot of the electronic care plan.</p> <p>This capability was created to support interoperability with systems which may receive document snapshots of the care plan.</p>

Name	Definition
 Import Care Plan Snapshot	The "Import Care Plan Snapshot" capability supports the ability of users to receive an existing electronic care plan snapshot document and import into the system.
 Plan Resource Support Capabilities	Carrying out a plan requires allocation of resources required to support the activities of the care team. Resources include human resources, assets such as room and equipment resources, service resources and consumable material resources such as surgical consumables, medicines and controlled substances. The following capabilities make use of the Resource Allocation class as defined in the care plan domain analysis model. The resource allocation represents a consumable, service or asset allocation, which is inspected, requested or booked by a user.
 Find Available Resources	The "Find Available Resources" capability supports the ability of users to determine specific resources which can be allocated for use in the support of an activity.
 Allocate Resource	The "Allocate Resource" capability supports the ability of users to request booking or directly book resources for use in support of planning and execution.
 Cancel Resource Allocation	The "Cancel Resource Allocation" capability supports the ability of users to indicate they no longer require a resource. The cancel resource allocation capability makes the resource available for use or booking by others.
 Observations and Supportive Content Capabilities	These capabilities support users in capturing and linking historical information as well as information resulting from new interactions.
 Make Observations	The "Make Observations" capability supports the ability of users to capture observations made at any stage of the care process or during interactions.
 Query Observations	The "Query Observations" capability supports the ability of users to query observations captured during coordination of care.
 Associate Supportive Content	The "Associate Supportive Content" capability supports the ability of users to associate relevant historical and evidence-based reference content to an active plan. This historical content may originate from either prior non-active plans or from the patient's care record.
 Remove Supportive Content	The "Remove Supportive Content" capability supports the ability of users to logically remove supportive content which is no longer relevant. As with any removals in health

Name	Definition
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care systems, the information continues to be available for auditing.

5.5.2 Care coordination Service implementation

The model includes three technical (platform specific) specifications (projections):

- HL7 FHIR
- IHE Dynamic Care Planning – DCP (FHIR based)
- IHE Care Management Profile – CM

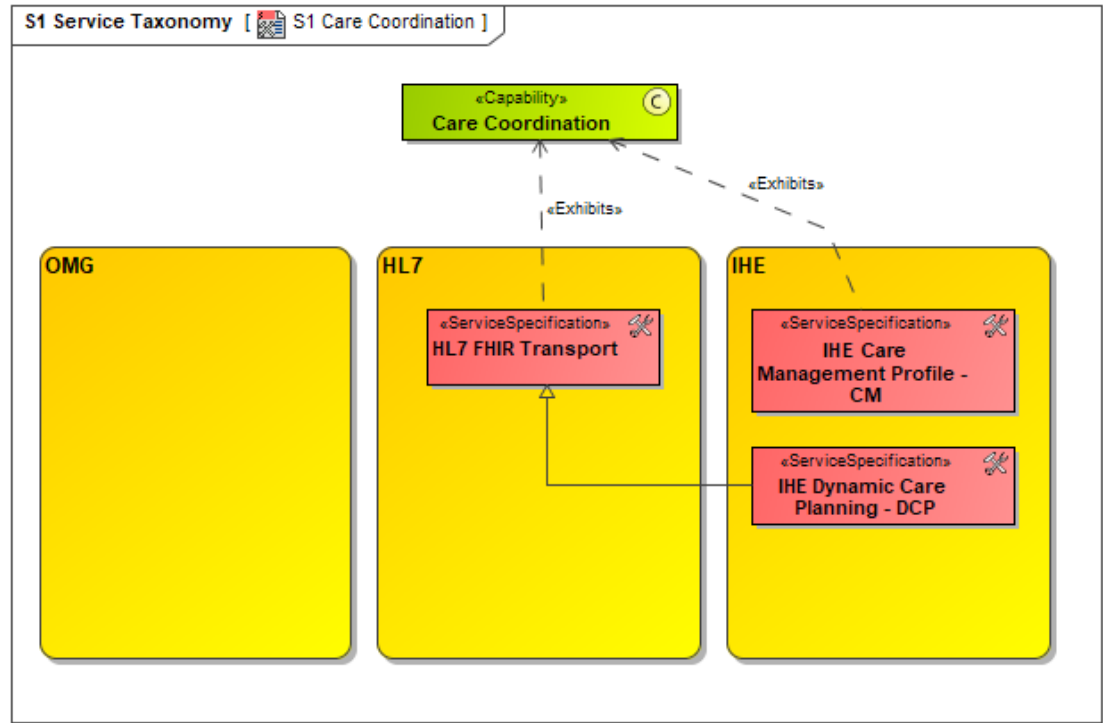


Figure 56 – Care coordination Service implementations

5.5.2.1 Care Coordination Service FHIR Projection

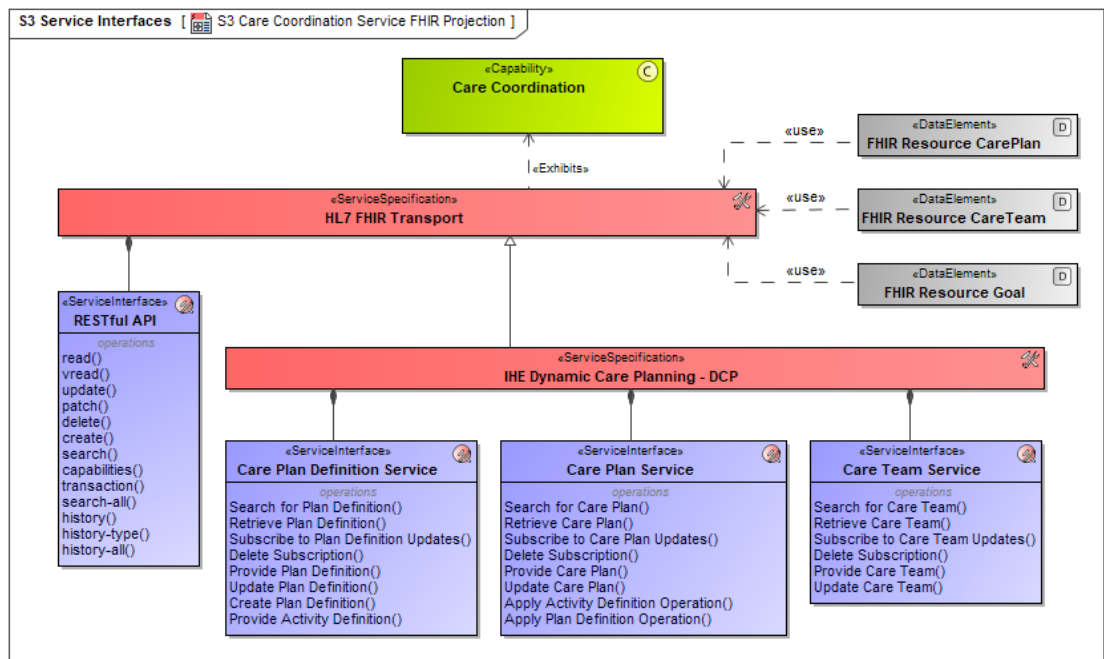


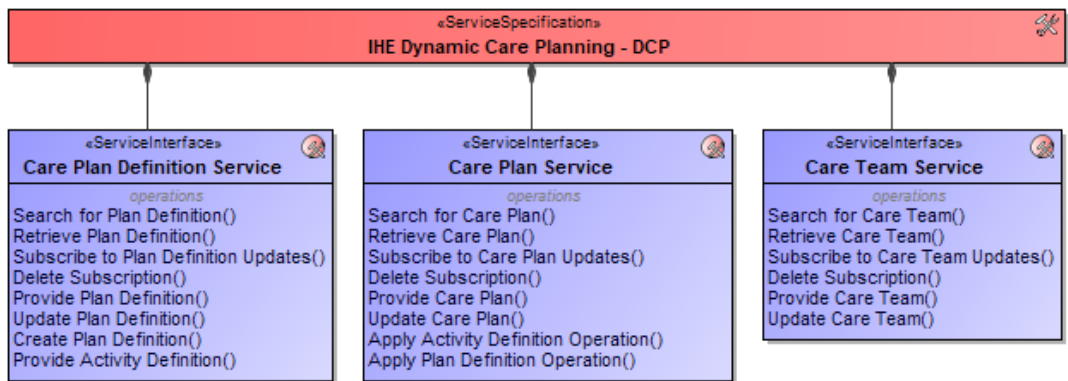
Figure 57 – Care Coordination Service FHIR Projection

5.5.2.1.1 FHIR projection

In this context three main FHIR Resources are used:

- FHIR Resource CarePlan
- FHIR Resource CareTeam
- FHIR Resource Goal

5.5.2.1.2 IHE Dynamic Care Planning (DCP)



The Dynamic Care Planning (DCP) Profile provides the structures and transactions for care planning, creating, updating and sharing Care Plans that meet the needs of many, such as providers, patients and payers. Care Plans can be dynamically updated as the patient interacts with the healthcare system. FHIR® resources and transactions are used by this profile. This profile does not define, nor assume, a single Care Plan for a patient.

See: [https://wiki.ihe.net/index.php/Dynamic_Care_Planning_\(DCP\)](https://wiki.ihe.net/index.php/Dynamic_Care_Planning_(DCP))

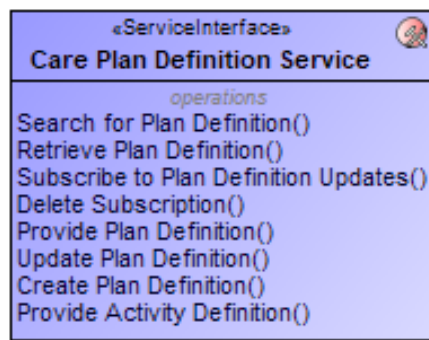








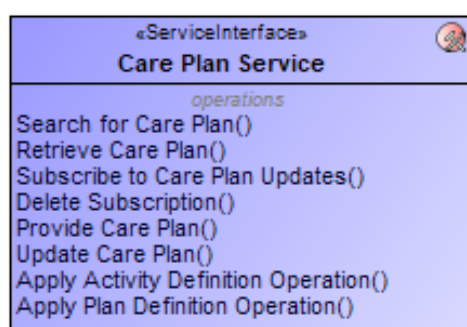


Figure 58 – Care Plan Definition interface

Name	Documentation
 Create Plan Definition	The Care Plan Contributor submits a newly created plan definition to a Care Plan Definition Service.
 Delete Subscription	The Care Plan Definition Service SHALL support RESTful delete of the subscription resource. See: http://hl7.org/fhir/R4/http.html#delete .
 Provide Activity Definition	This transaction is used to provide an updated ActivityDefinition resource to a Care Plan Contributor that has subscribed to updates
 Provide Plan Definition	This transaction is used to provide an updated PlanDefinition resource to a Care Plan Contributor that has subscribed to updates.
 Retrieve Plan Definition	This transaction is used to retrieve a specific Plan Definition using a known FHIR Plan Definition resource id.
 Search for Plan Definition	This transaction is used to find a plan definition. The Care Plan Contributor searches for a plan definition of interest. A plan definition located by search may then be retrieved for viewing or updating.
 Subscribe to Plan Definition Updates	This transaction is used to subscribe to updates made to a Plan Definition.

Name	Documentation
 Update Plan Definition	This transaction is used to update or to create a plan definition. A Plan Definition resource is submitted to a Care Plan Definition Service where the update or creation is handled.






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Figure 59 – Care Plan Service interface

Name	Documentation
 Apply Activity Definition Operation	This transaction is used to generate a Care Plan and subsequent request or task resources. Care Plan Contributor receives Activity Definitions provided by the Care Plan Definition Service. A Care Plan is created. Subsequent request or task resources are generated based on the selected ActivityDefinition to be acted on. This is based on business rules determined by the Care Plan Contributor system.
 Apply Plan Definition Operation	This transaction is used to generate a CarePlan, CareTeam and subsequent request or task resources. System business rules can support the care team members aggregation to make up members for a subsequent Care Team resource. An example workflow should enable the user to select care team participants similar to how activities are selected as part of care planning.
 Provide Care Plan	This transaction is used to provide an updated CarePlan resource to a Care Plan Contributor that has subscribed to updates.
 Retrieve Care Plan	This transaction is used to retrieve a specific care plan using a known FHIR CarePlan resource id.
 Search for Care Plan	This transaction is used to find a care plan. The Care Plan Contributor searches for a care plan of interest. A care plan located by search may then be retrieved for viewing or updating.

Name	Documentation
 Subscribe to Care Plan Updates	This transaction is used to subscribe to updates made to a Care Plan.
 Delete Subscription	The Care Plan Service SHALL support RESTful delete of the subscription resource. See: http://hl7.org/fhir/R4/http.html#delete .
 Update Care Plan	The Care Plan Contributor submits a care plan that has been edited to a Care Plan Service. The Care Plan Service handles the FHIR CarePlan Resource according to FHIR Resource integrity

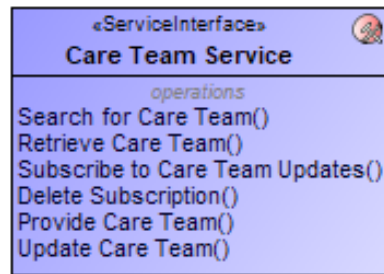







Figure 60 – Care Team Service interface

Name	Documentation
 Delete Subscription	Care Team Service SHALL support RESTful delete of the subscription, as well as the following messages for creating and updating a Subscription. See: http://hl7.org/fhir/subscription.html
 Provide Care Team	The Care Team Service sends a CareTeam resource to the endpoint specified in the Subscription resource.
 Retrieve Care Team	This transaction is used to retrieve a specific CareTeam resource using a known FHIR CareTeam resource id.
 Search for Care Team	The Search for Care Team is implemented through the FHIR search operation using the REST platform constrained to the HTTP or HTTPS GET.
 Subscribe to Care Team Updates	This transaction is used to subscribe to updates made to a CareTeam resource.

Name

Documentation



Update Care Team

This transaction is used to update or to create a CareTeam resource. A CareTeam resource is submitted to a Care Team Service where the update or creation is handled.

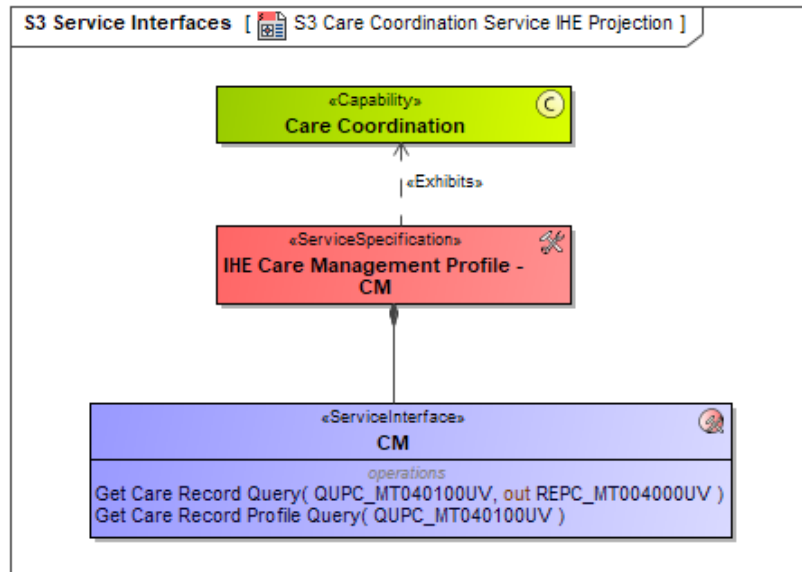
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5.5.2.1.3 Capabilities to service mapping

	Care Plan Definition Service	Create Plan Definition()	Delete Subscription()	Provide Activity Definition()	Provide Plan Definition()	Retrieve Plan Definition()	Search for Plan Definition()	Subscribe to Plan Definition Updates()	Update Plan Definition()	Care Plan Service	Apply Activity Definition Operation()	Apply Plan Definition Operation()	Delete Subscription()	Provide Care Plan()	Retrieve Care Plan()	Search for Care Plan()	Subscribe to Care Plan Updates()	Update Care Plan()	Care Team Service	Delete Subscription()	Provide Care Team()	Retrieve Care Team()	Search for Care Team()	Subscribe to Care Team Updates()	Update Care Team()
Care Plan Management Capabilities																									
ccps : Capture Care Plan Snapshot																									
chp : Change Plan				<																					
cp : Close the Plan																									
crp : Create Plan											<	<													
fp : Find Plan															<	<									
lcps : Import Care Plan Snapshot																									
lti : Lookup Tagged Items																									
mc : Monitor Change																									
ps : Plan Synchronization																									
tpl : Care Plan Management Capabilities																									
Care Team Availability/Scheduling Capabilities																									
fpa : Find Person Availability																									
ia : Indicate Availability																									
rpa : Reserve Person Availability																									
Care Team Communication Capabilities																									
ctm : Care Team Negotiation																									
iactmc : Include Additional Care Team Member(s) in Communication																									
lm : List Messages																									
smctm : Send Message to Care Team Member(s)																									
tm : Tag Messages																									
Care Team Membership Capabilities																									
actm : Add Care Team Member																									
dct : Discover Care Team																							<		
lmct : List my Care Teams																									
rctm : Remove Care Team Member																									
rp : Request Participation																									
rpr : Respond to Participation Request																									
Observations and Supportive Content Capabilities																									
asc : Associate Supportive Content																									
mo : Make Observations																									
qo : Query Observations																									
rsc : Remove Supportive Content																									
Plan Resource Support Capabilities																									
ar : Allocate Resource																									
cra : Cancel Resource Allocation																									
far : Find Available Resources																									
Plan Templates																									
dpt : Define Plan Template		<							<																
fpt : Find Plan Template						<	<																		
Progress and Outcome Review Capabilities																									
ar : Acceptance Review																									
r : Review																									
Reconciliation Process Support																									
cpcl : Care Plan Clinical Reconciliation																									
cptr : Care Plan Technical Reconciliation																									

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5.5.2.2 Care Coordination Service IHE soap projection



The Care Management Profile (CM) supports the exchange of information between HIT systems and applications used to manage care for specific conditions. Examples of these systems include Cancer Registries, Chronic Disease Management Systems, Disease Registries and Immunization Information Systems.

The Care Management Profile is based on SOAP transport and HL7v3 messages for content.

The profile can be found at: https://wiki.ihe.net/index.php/Care_Management_Profile

5.5.2.2.1 IHE Care Management Profile (CM)

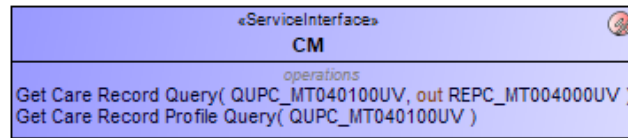


Figure 61 - IHE Care Management Profile (CM) interface

Name	Documentation	Owned Parameter
Get Care Record Profile Query	Requests a collection of clinical data matching the selection criteria from the Clinical Data Repository. Returns clinical data matching the selection criteria supplied by the Care Manager.	in QUPC_MT040100UV
Get Care Record Query	When a Clinical Data Source actor needs to understand the data needed to respond to a query from a Care Manager, or a Care Manager actor needs to refresh its knowledge about a guideline (e.g., to determine how to update a	in QUPC_MT040100UV out REPC_MT004000UV

Name	Documentation	Owned Parameter
	query for a replaced guideline) it will trigger a Get Care Record Query event.	

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903 5.5.2.2.2 Capabilities to Service mapping

	CM	Get Care Record Profile Query(QUPC_MTO040100UV)	Get Care Record Query(QUPC_MTO040100UV, REPC_MTO040000UV)
Care Plan Management Capabilities			
ccps : Capture Care Plan Snapshot			
chp : Change Plan			
cp : Close the Plan			
crp : Create Plan			
fp : Find Plan			
icps : Import Care Plan Snapshot			
lti : Lookup Tagged Items			
mc : Monitor Change			
ps : Plan Synchronization			
tpi : Care Plan Management Capabilities			
Care Team Availability/Scheduling Capabilities			
fpa : Find Person Availability			
ia : Indicate Availability			
rpa : Reserve Person Availability			
Care Team Communication Capabilities			
ctm : Care Team Negotiation			
iactmc : Include Additional Care Team Member(s) in Communication			
lm : List Messages			
smctm : Send Message to Care Team Member(s)			
tm : Tag Messages			
Care Team Membership Capabilities			
actm : Add Care Team Member			
dct : Discover Care Team			
lmct : List my Care Teams			
rctm : Remove Care Team Member			
rp : Request Participation			
rpr : Respond to Participation Request			
Observations and Supportive Content Capabilities			
asc : Associate Supportive Content			
mo : Make Observations			
qo : Query Observations			
rsc : Remove Supportive Content			
Plan Resource Support Capabilities			
ar : Allocate Resource			
cra : Cancel Resource Allocation			
far : Find Available Resources			
Plan Templates			
dpt : Define Plan Template			
fpt : Find Plan Template		<	<
Progress and Outcome Review Capabilities			
ar : Acceptance Review			
r : Review			
Reconciliation Process Support			
cpcr : Care Plan Clinical Reconciliation			
cptr : Care Plan Technical Reconciliation			

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905 **5.6 Ordering Service**

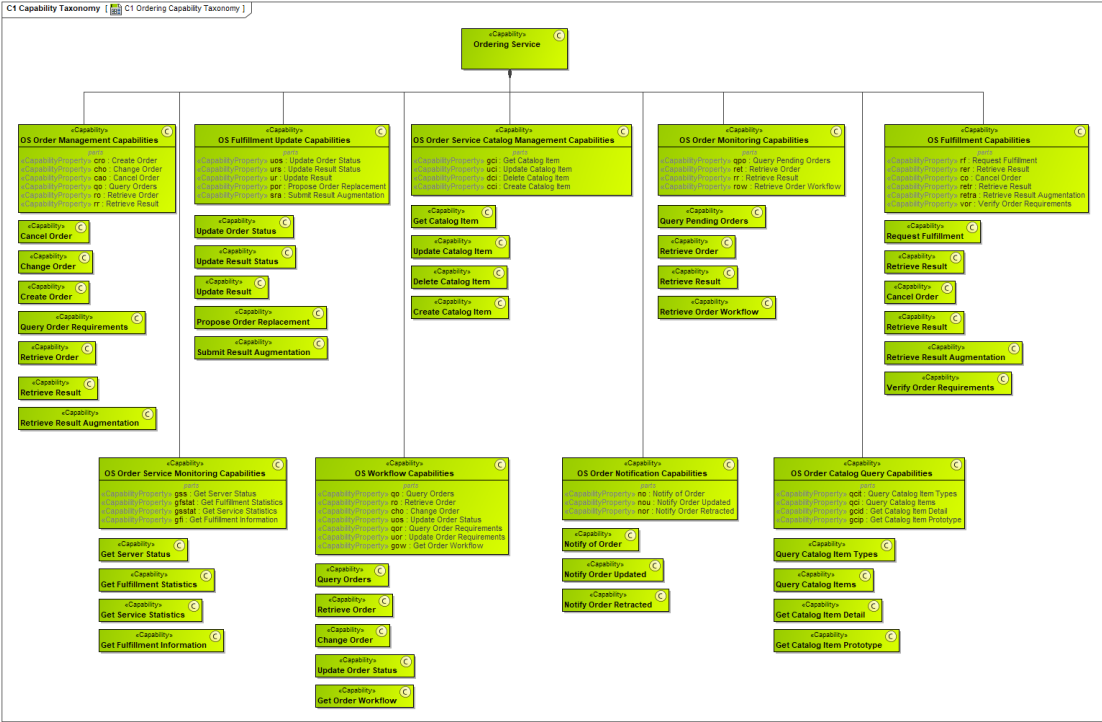




Figure 62 - Ordering capabilities












The ordering behavior of clinicians has significant implications for the quality and cost of patient care. Many organizations are adopting evidence-based knowledge artifacts (order sets and plans of care) and more customized and automated approaches (such as CDS systems) to assist clinicians with point-of-care decision-making. A strong emphasis has also been placed on more consistent and transparent approaches to the management and allocation of health care resources within an increasingly heterogeneous ecosystem of information system technologies. This Ordering service functional model (SFM) seeks to support more effective provider ordering, order management, and order fulfillment.










The complete specification can be found on:











https://www.hl7.org/implement/standards/product_brief.cfm?product_id=389










5.6.1 Ordering Capabilities

Name	Definition
 Order Management Capabilities	The Order Management interface is the primary interface used by consumers systems that wish to place and manage orders. This interface provides the core services required to initiate and track orders and retrieve any results relating to the submitted orders.
 Cancel Order	Used when a requestor (placer) wants a previously requested, and not yet completed, Order, not to be performed.

Name	Definition
 Change Order	Allows the client to submit a change to an existing Order
 Create Order	Allows a client to create an Order of one or more types
 Query Order Requirements	Provides a user the ability to find what requirements an Order has for fulfillment and what the current status is. This information might include such things as the order catalog, order service configuration, and requirements asserted by fulfillment systems
 Retrieve Order	Allows the client to retrieve a specific Order and its full detail, given an Order Identifier.
 Retrieve Result	Allows the Order service to retrieve one or more results from the fulfillment system using a result identifier or the promise identifier.
 Retrieve Result Augmentation	Allows a requestor to retrieve supplemental information about a result.
 Fulfillment Update Capabilities	The Fulfillment Update interface provides a service point for fulfillment systems that wish to push information to the order service. This interface is implemented by the order service as a callback point for fulfillment systems. This includes updating the order status, updating results, providing supplemental result information, and proposing an alternative order.
 Update Order Status	Allows the fulfillment system to communicate a change in Order status (e.g., unsigned, active, reserved, on hold, refused, complete) back to the ordering system
 Update Result Status	Allows the fulfillment system to communicate an updated result status back to the ordering system.
 Update Result	Allows the fulfillment system to send the entire result to the Order Service.
 Propose Order Replacement	Allows the fulfillment system to propose an alternate Order to the Order Service. This proposal may occur after the order has been accepted by the fulfillment system as a result of changes in the fulfillment environment that may have occurred after that time. A fulfillment system may also suggest a more appropriate Order prior to

Name	Definition
	accepting the original Order so as to refine it per organizational policy or due to evidence-based knowledge protocols.
 Submit Result Augmentation	Allows the fulfillment system to send supplemental result information to the Order Service
 Order Service Catalog Management Capabilities	The Order Catalog Query interface provides consumers with visibility into the catalog of items maintained by the Order service.
 Get Catalog Item	Allows a caller to retrieve an item by identifier from a catalog
 Update Catalog Item	Allows a caller to update a catalog item
 Delete Catalog Item	Allows a caller to delete a catalog item
 Create Catalog Item	Allows a caller to add a new resource into the catalog
 Order Monitoring Capabilities	The Order Monitoring interface is a specialization of the order management and workflow interfaces to provide a read-only view into the order service for viewing the state of outstanding orders. Some capabilities are also included in the <i>Order Management Capabilities</i> .
 Query Pending Orders	Used to obtain a list of Orders that are not complete.
 Fulfillment Capabilities	The Fulfillment Interface is a contract for how a general order service can interact with another system that fulfills the order. This interface may be implemented by systems that wish to plug into a generalized order service. A generalized order service uses this interface as the primary means of interacting with a fulfillment service. This interface supports requests for fulfillment, result retrieval, retrieval of result supplements, and updating fulfillment specific workflow requirements. Some capabilities are also included in <i>Order Management Capabilities</i> .

Name	Definition
 Request Fulfillment	Allows the order service to place an order and receive a promise from the fulfillment system.
 Verify Order Requirements	Allows the order service to validate the requirements of an order with a fulfillment system
 Order Service Monitoring Capabilities	The Order Service Monitoring interface is used to review the health of the Order Service.
 Get Server Status	Retrieves the status of the Order Service
 Get Fulfillment Statistics	Fetches fulfillment related statistics
 Get Service Statistics	Gets general statistics relating to the Order Service as a whole
 Get Fulfillment Information	Get information about what fulfillment types as supported by the Order Service and related operational information
 Workflow Capabilities	The Order Workflow interface provides the core services that are required to address Order workflow. This interface is geared toward systems that deal with updating the state and status of an Order. In many ways, this interface is a specialization and extension of the Order Management Interface. This specialization is one of perspective, which is often reflected in different information requirements for invoking the same operation found in the Order Management Interface. As a result, a number of the operations in this interface duplicate those found in Order Management. In this case an Order is discovered and specific requirements that are necessary are updated. Some capabilities are also included in <i>Order Management Capabilities</i> and <i>Fulfillment Update Capabilities</i> .
 Query Orders	Used to obtain a list of Orders relevant to a specific Subject.
 Get Order Workflow	Allows a consumer of the order service to examine the workflow model and state of the order.

Name	Definition
 Order Notification Capabilities	The Order notification interface is used by other Order handling systems to provide visibility to the Order Service of Orders that it is not managing. This interface is provided to support workflow dependencies and federation of order services.
 Notify of Order	Informs the Order Service of an Order that is being managed elsewhere.
 Notify Order Updated	Informs the Order Service of updates to an Order that is being managed elsewhere
 Notify Order Retracted	Invalidates an Order that was previously registered
 Order Catalog Query Capabilities	The Order Catalog Query interface provides consumers with visibility into the catalog of items maintained by the Order service.
 Query Catalog Item Types	An Orderer can query for types of orderable entities.
 Query Catalog Items	A user can navigate/query an Order catalog and locate orderable items.
 Get Catalog Item Detail	Allows a caller to retrieve an item by identifier from a catalog
 Get Catalog Item Prototype	This method returns the Catalog Item Prototype for the given prototype identifier. A Catalog Item Prototype represents an example instance for a type of catalog resource. For instance, it might consist of an example order item for Metoprolol.

5.6.2 Ordering Service Implementation

Ordering can be implemented with HL7 FHIR. IHE has several IHE profiles that include Ordering spanning different use-cases including Radiology, Laboratory, Pharmacy, and others. These profiles are frequently based on simple XDS profile specializations.

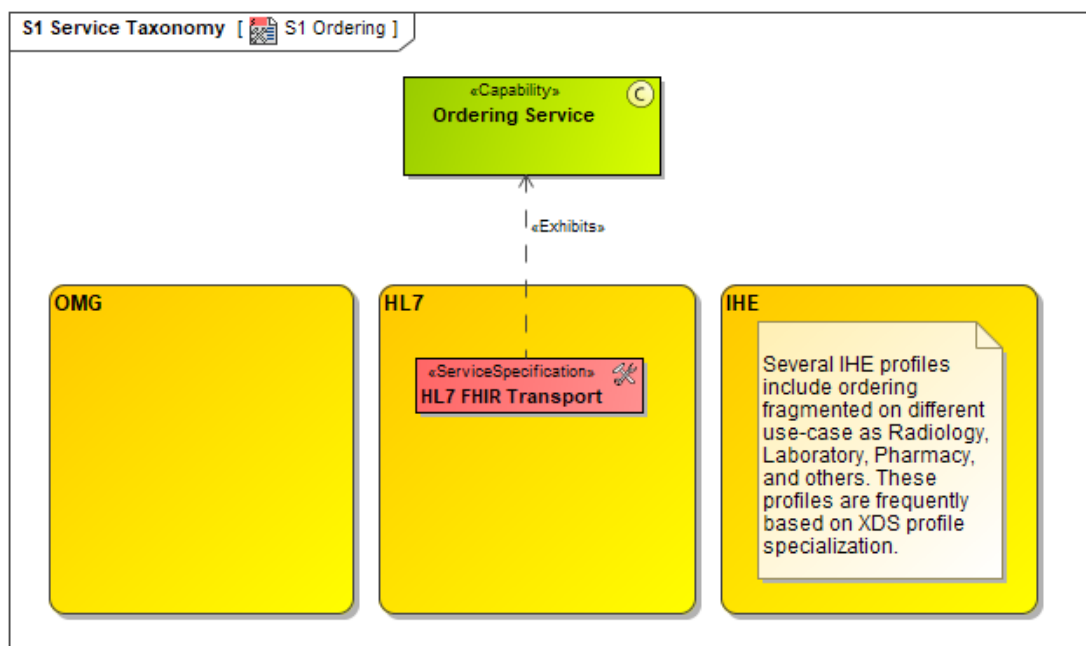


Figure 63 - Ordering service implementation

5.6.2.1 Ordering FHIR projection

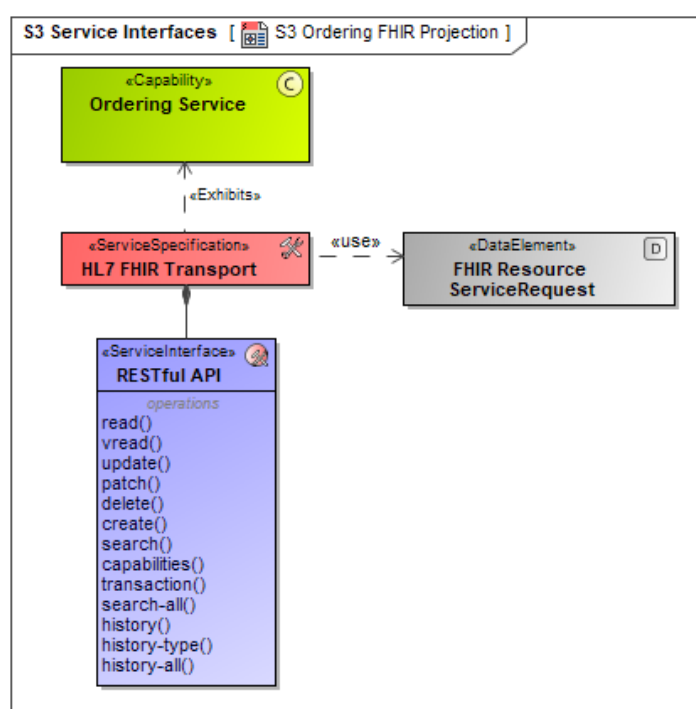


Figure 64 - Ordering FHIR projection

5.6.2.1.1 Ordering IHE

In the next version of the HSRA the fragmented IHE profiles will be organized. It should be emphasized that the IHE fragmentation of ordering capabilities is deliberate and is a consequence of the IHE use-case based approach. The next version of this document will include a reconciliation between the IHE Order capabilities in different contexts and the Ordering Service.

5.6.2.1.2 Capabilities to service interface mapping

	RESTful API	capabilities()	create()	delete()	history-all()	history-type()	history()	patch()	read()	search-all()	search()	transaction()	update()	vread()
OS Fulfillment Capabilities														
co : Cancel Order				<-										
rer : Retrieve Result									<-					
retra : Retrieve Result Augmentation									<-					
rf : Request Fulfillment			<-											
vor : Verify Order Requirements									<-					
OS Fulfillment Update Capabilities														
por : Propose Order Replacement								<-						
sra : Submit Result Augmentation								<-						
uos : Update Order Status													<-	
ur : Update Result													<-	
urs : Update Result Status													<-	
OS Order Catalog Query Capabilities														
gcid : Get Catalog Item Detail									<-					
gcip : Get Catalog Item Prototype									<-					
qci : Query Catalog Items										<-	<-			
qcit : Query Catalog Item Types										<-	<-			
OS Order Management Capabilities														
cao : Cancel Order				<-										
cho : Change Order								<-						
cro : Create Order			<-											
qo : Query Orders										<-	<-			
ro : Retrieve Order									<-					
rr : Retrieve Result									<-					
OS Order Monitoring Capabilities														
qpo : Query Pending Orders										<-	<-			
ret : Retrieve Order									<-					
row : Retrieve Order Workflow									<-					
rr : Retrieve Result														
OS Order Notification Capabilities														
no : Notify of Order			<-											
nor : Notify Order Retracted				<-										
nou : Notify Order Updated													<-	
OS Order Service Catalog Management Capabilities														
cci : Create Catalog Item														
dci : Delete Catalog Item														
gci : Get Catalog Item														
uci : Update Catalog Item														
OS Order Service Monitoring Capabilities														
gfi : Get Fulfillment Information														
gfstat : Get Fulfillment Statistics														
gss : Get Server Status														
gsstat : Get Service Statistics														
OS Workflow Capabilities														
cho : Change Order													<-	
gow : Get Order Workflow									<-					
qo : C1 Ordering::Query Orders										<-	<-			
qor : Query Order Requirements										<-	<-			
ro : Retrieve Order									<-					
uor : Update Order Requirements													<-	
uos : Update Order Status													<-	

5.7 Consent Management Service

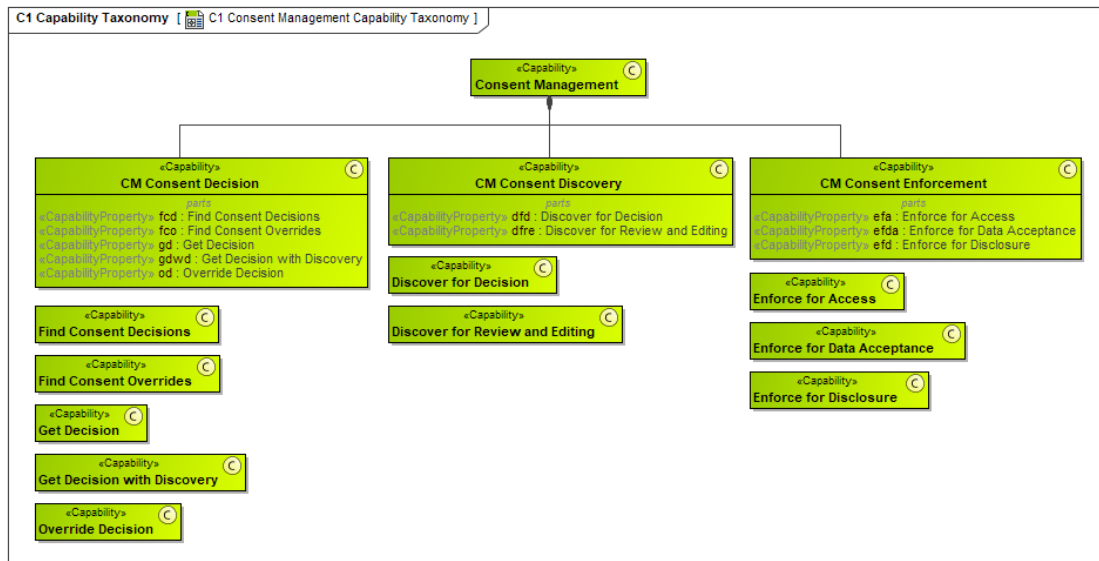


Figure 65 - Consent Management capabilities










The Consent Management Service standardizes the coordination of interoperable tools that discover, manage, and enforce patient consent.

The complete specification can be found on:

http://www.hl7.org/implement/standards/product_brief.cfm?product_id=571

5.7.1 Consent Management capabilities

Name	Definition
Consent management	The Consent Management Service standardizes the development of interoperable tools that discover, manage, and enforce patient consent.
Consent Decision	The Consent Decision capabilities are used to make and override automated consent decisions. This capability is not only used to make decisions, but also to determine what responsibilities the consumer is expected to fulfill if they continue with the requested course of action.
Find Consent Decisions	This capability is used to find the consent decisions made for a patient over a period of time. The capability returns a list of consent decisions. Unknown or unauthorized subjects should return an empty list.
Find Consent Overrides	This capability is used to find the consent overrides for a subject. The capability will return a list of consent overrides for a patient over the requested period. Unknown or unauthorized subjects should return an empty list. The capability will return a consent decision object by value.

Name	Definition
 Get Decision	This capability is used to find consent decisions. The capability will return a consent decision object by value.
 Get Decision with Discovery	This capability builds a consent closure and computes a consent decision. The capability will return a consent decision object by value.
 Override Decision	This capability overrides an existing consent decision. The capability will return an override response object. This object contains both a success flag and the revised consent decision. It may have audit and security side effects.
 Consent Discovery	The "Consent Discovery" Capability is responsible for finding the consent records for a particular subject. The service may be further refined to both narrow the search based on the consent decision requested and to provide redacted consent records when the privacy of the information is of a sensitive nature and the consumer (e.g. Consent Decision Service) is not fully trusted. It is also possible to consider the discovery service providing not just consent records but also references to consent stores, decision services, and additional discovery services that potentially may be engaged in making a consent decision. In a general sense, the service should return a consent closure potentially supplemented by a set of delegations.
 Discover for Decision	The "Discover for Decision" capability will discover consent records based on a provided consent request. The capability will return a list of consent records that match the criteria of the consent request.
 Discover for Review and Editing	The "Discover for Review and Editing" capability will discover consent records based on a provided consent request. The capability will return a list of consent record locations that match the criteria of the consent request.
 Consent Enforcement	The "Consent Enforcement" capability is used to enforce responsibilities on data. In essence this service is used to enforce the consequences of a consent decision to the extent possible. This extent is currently limited to the responsibilities that can be applied to a specific payload (e.g. redaction) and does not at this point deal with more complex workflow-related responsibilities.
 Enforce for Access	The "Enforce for Access" capability uses a consent decision to transform an access request to meet the responsibilities found within the consent decision. The capability will return the transformed access request.
 Enforce for Data Acceptance	The "Enforce for Data Acceptance" capability uses a consent decision to transform the payload to meet the responsibilities found with a consent decision. This operation is intended to

Name	Definition
	transform the payload such that it is suitable for local storage. The capability will return the transformed Payload.
<div> <div></div> <div>Enforce for Disclosure</div> </div>	The “Enforce for Disclosure” capability will return the transformed encoded payload. The enforce for disclosure operation uses a consent decision to transform a payload to meet the responsibilities found with a consent decision. The form of the payload may vary, but includes HL7 V2 Messages, CDA Documents, FHIR Resources, and FHIR Bundles.

5.7.2 Consent Management Service Implementation

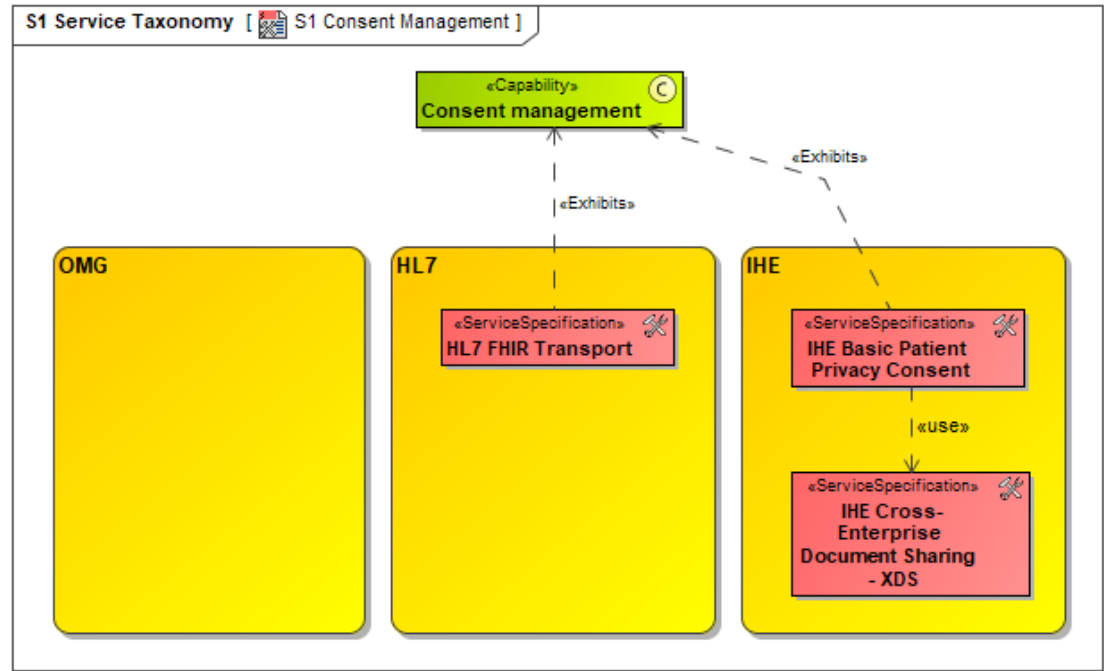


Figure 66 – Consent Management Service Implementation

The model includes two platform specific specifications:

- HL7 FHIR Transport
- IHE Basic Patient Privacy Consent (based on XDS)

5.7.2.1 Consent Management FHIR projection

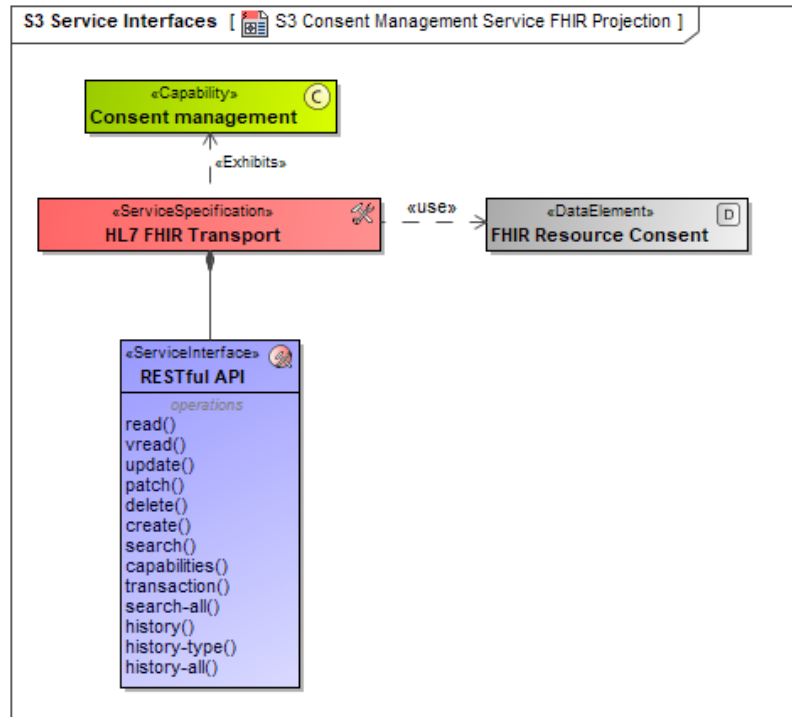


Figure 67 – Consent Management FHIR projection

The main FHIR Resource used in this context is: Consent

5.7.2.1.1 Capabilities to service interface mapping

	RESTful API	capabilities()	create()	delete()	history-all()	history-type()	history()	patch()	read()	search-all()	search()	transaction()	update()	vread()
CM Consent Decision														
fcd : Find Consent Decisions										<	<			
fco : Concepts::C1 HIRA Capabilities::C1 Comp										<	<			
gd : Get Decision									<					
gdwd : Get Decision with Discovery									<					
od : Override Decision								<						
CM Consent Discovery														
dfd : Discover for Decision									<	<				
dfre : Discover for Review and Editing									<	<				
CM Consent Enforcement														
efa : Enforce for Access								<						
efd : Enforce for Disclosure								<						
efda : Enforce for Data Acceptance								<						

5.7.2.2 Consent Management IHE projection

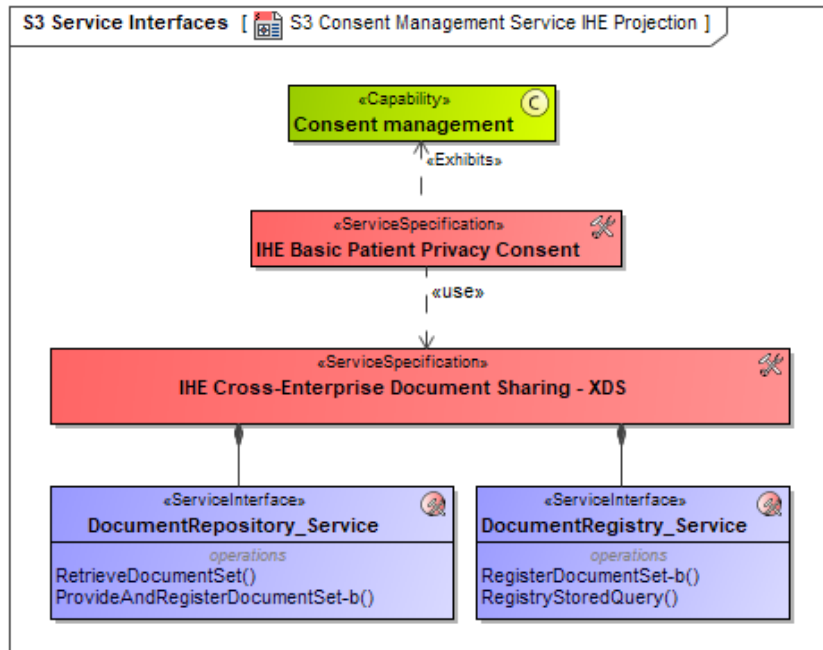


Figure 68 - Consent Management IHE projection

The document sharing infrastructure provided by XD* allows for the publication and use of clinical documents associated with a patient. This profile allows for a Patient Privacy Policy Domain (e.g., an XDS Affinity Domain to have several Patient Privacy Policies that can be acknowledged (aka consent). This allows for more flexibility to support some patient concerns, while providing an important and useful dataset to the healthcare provider. Without BPPC, the XDS Profile requires that the administrators of an XDS Affinity Domain create and agree to a single document publication and use policy. Such a single XDS Affinity Domain Policy is enforced in a distributed way through the inherent access controls of the systems involved in the XDS Affinity Domain.

This profile uses terms consistent with ISO 22600 - Privilege Management and Access Control (PMAC) but is not restricted to systems that implement PMAC. This profile uses the term "Patient" to refer to the human-subject of health-related data. In this context "Patient" is not to imply only those subjects under current treatment, this is sometimes referred to as "consumer". This profile uses the term "Consent" to mean acknowledgement of a privacy policy, also known as an information access policy. In this context the privacy policy may include constraints and obligations. The systems involved in XDS are expected to support sufficient Access Controls to carry out the Policy of the XDS Affinity Domain.

5.8 Event Publish & Subscribe Service (EPS)

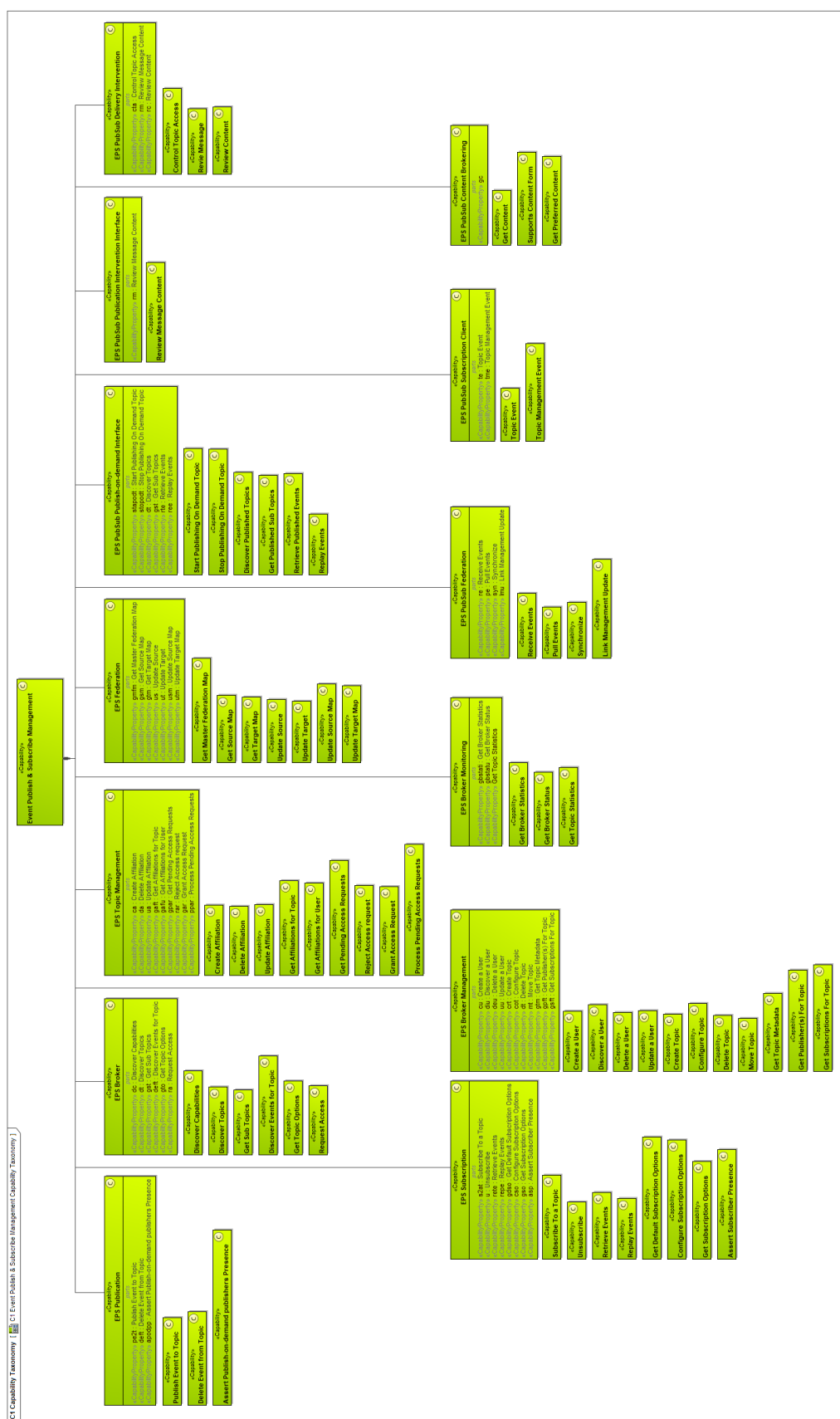


Figure 69 – Event Publish & Subscribe Management capabilities

In many Services Oriented Architecture (SOA) environments, clinical messages generated by systems or components on the network are sent to individual consumers who must a) periodically request their data, and b) manage interfaces with numerous producers. Because exchange participants do not necessarily share common, standardized messaging formats, requestors are often responsible for the complex task of collecting, parsing, and normalizing each message prior to subsequent analysis.

Managing data distribution using polling techniques and non-standard point-to-point interfaces is inherently inefficient and non-scalable. Costs associated with establishing and maintaining tightly coupled, custom interfaces can be significant. There are also opportunity costs and patient safety concerns when clinical data cannot be consumed and acted on in near-real time - inpatient scenarios where acuity and risk are significantly elevated have little tolerance for latency.



The Event Publish and Subscribe Service (EPS) is a type of notifier/observer service intended to address these concerns. It does so by consolidating messaging regarding clinical events, allowing different systems to subscribe and listen to specific types of events or “topics” of interest, and allowing event publishers to publish events to these topics when they occur. The service provides a foundation for a wide variety of responsive, dynamic applications, including new result feeds, content syndication, subscriber and publisher presence related behavior (see Section 5.5.3), and clinical workflow systems. Indeed, any application that requires event notifications to operate and perform efficiently stands to benefit. In general, EPS offers event publisher and consumers the following:



- Architectural flexibility, enabling event subscribers to be easily added, managed, and notified of clinical events using standardized messaging and interfaces
- Consumer empowerment, allowing stakeholders to manage their own data requirements and subscriptions more efficiently and dynamically
- More efficient resource utilization, resulting from the need to forward messages only to interested parties with the right privileges to access this information
- Parallel processing to enhance performance and scalability.













The complete specification can be found on:

http://www.hl7.org/implement/standards/product_brief.cfm?product_id=390














5.8.1 Event Publish & Subscribe Service capabilities

Name	Definition
 Event Publish & Subscribe Management	The Event Publish and Subscribe Service (EPS) is a type of notifier/observer service intended to address these concerns. It does so by consolidating messaging regarding clinical events, allowing different systems to subscribe and listen to specific types of events or “topics” of interest, and allowing event publishers to publish events to these topics when they occur. The service provides a foundation for a wide variety of responsive, dynamic applications, including new result feeds, content syndication, subscriber and publisher presence related behavior, and clinical workflow systems. Indeed, any application that requires event notifications to operate and perform efficiently stands to benefit.
 EPS Publication	Capabilities used by publishers to publish information and events.











Name	Definition
 Publish Event to Topic	This capability allows a publisher to publish an event to an already defined topic. The publisher in question must have legal access to publish on the specific topic matter. More than one publisher might have privileges to publish on a specific topic. Publisher makes an event publicly available. This operation is asynchronous with regard to the subscriber to the topic receiving the event.
 Delete Event from Topic	This capability allows a publisher to remove a previously published event from a topic. Depending on the topic configuration, this action may not be allowed. Subscribers may be notified of the deletion depending on the nature of their subscription and the configuration of the topic. Removes an event from the topic. Clients with a Push subscription that includes the notification of management events will be informed. The removal of the event will cause the topic's active event stream not to show the event; however, the event may still be retained by the broker for auditing purposes. When an event is cross-posted to more than one topic, it is only removed from the selected topic.
 Assert Publish-on-demand publishers Presence	Assert presence allows Publish-on-demand publishers to update their presence statuses.
 EPS Subscription	Capabilities used by subscribers to manage subscription and enquiries into publications.
 Subscribe To a Topic	This capability allows a subscriber to subscribe to a specific topic or topics depending on the capability of the broker. Some brokers may support wildcard and filter-based subscriptions. The nature of the subscription is also specified in this call. This call may fail for several reasons including security, bad addressing, and capabilities requested that the broker is not capable of honoring. It may automatically make an access request.
 Unsubscribe	This capability allows a subscriber to remove an existing subscription from the EPS service. The events queue for this subscription is deleted
 Retrieve Events	This capability allows a client or broker, who always is responsible for retrieving content in a pull contract, to request "list" vs. "detail." The service defaults to maintaining each client's "history" and delivering content that has not yet been transmitted. Client should have option of overriding this default and requesting a defined range. By its very nature, either the topic has to be fully durable, or the publisher has to support temporal on demand publishing.
 Replay Events	Given a time range, all events on a given topic will be redelivered or retrieved based on the type of subscription and the nature of the topic. This is a specialized form of retrieval that is most useful in



Name	Definition
	modeling. By its very nature, either the topic has to be fully durable or the publisher has to support temporal on demand publishing.
 Get Default Subscription Options	The capability allows a subscriber to get the default subscription options for a topic. This is most useful when subscribing to a new topic.
 Configure Subscription Options	This capability allows a subscriber to change the options associated with a specific subscription.
 Get Subscription Options	This capability allows a subscriber to determine their options associated with a specific subscription.
 Assert Subscriber Presence	This capability allows subscribers to update their presence statuses.
 EPS Broker	This is an interface for requesting information from the event broker, including its capabilities, available event topics, and requesting access. This interface is intended for the general service consumer.
 Discover Capabilities	The services provide information about the general capabilities of the broker. This includes the type of contracts the broker is capable of and which optional features are available.
 Discover Topics	This capability is used to search for available topics on the Event Publish & Subscribe system. In the simplest case, this operation is used to get the root of the topic tree.
 Get Sub Topics	This capability is used to view the topic tree from a known parent topic. It will return the direct children of the topic.
 Discover Events for Topic	This capability is used to get a “directory” of the events that have been published to a topic.
 Get Topic Options	Get the options that are used to configure topics on this broker. One common use of this capability is to prepopulate the configuration of a new topic being defined.
 Request Access	This capability is used to submit a user profile for the Event Publish & Subscribe system requesting access.
 EPS Broker Management	The broker management capabilities provide the core services for basic broker management, including topics, users, and access requests.

Name	Definition
 Create a User	Register a user with the broker. This capability is used to establish a user, the user configuration information, privileges, and access to topics including role.
 Discover a User	This capability is used to find users and all basic information about the users.
 Delete a User	This capability will remove a user from the system. This operation will also remove all subscriptions contracts, publish-on-demand contracts, and affiliations for the user. The effect on content is directly related to the retention policies of topics to which the user has published content and the Remove Content Flag for this operation.
 Update a User	Update the information associated with a user. This would include privileges, options, and authentication information for the user.
 Create Topic	Create a new topic or subtopic. This capability is independent of a specific publisher and would include options and metadata relating to a topic.
 Configure Topic	Update the configuration and/or metadata relating to a topic. For example, additional retention policies for the topic might be changed or the topic could be disabled.
 Delete Topic	This capability allows a topic to be removed from the broker. All events relating to the topic are also removed. Removing a high-level topic will also remove all subtopics. Depending on the configuration of the topics in question, the subscribers and publishers may be notified.
 Move Topic	This capability allows a topic to be moved to a different location in the topic tree. All events, subscriptions, and publication contracts remain in place. Depending on the configuration of the topics in question, the subscribers and publishers may be notified.
 Get Topic Metadata	Get Metadata information about a particular topic. The Metadata returned may include such information as topic durability, events available in the topic, available media formats, copyright information, temporal scope, etc.
 Get Publisher(s) For Topic	This capability will retrieve all publishers for a particular topic. The visibility of the publishers may be limited by the caller's privileges. At a minimum, a publisher will always see themselves.
 Get Subscriptions For Topic	This capability will retrieve all subscriptions for a particular topic. Visibility of the subscriptions may be limited by the caller's privileges. At a minimum, a caller's own subscriptions will be included.

Name	Definition
 EPS Topic Management	This is a set of capabilities for managing access to topics. It is intended for use by topic owners and administrators to allow them to control access and privileges granted to users of a topic.
 Create Affiliation	This capability creates an affiliation between a user and a topic. This affiliation will grant the user specific privileges on the topic. The granting of an affiliation might result in the automatic revocation of prior affiliations.
 Delete Affiliation	This operation removes an affiliation between a user and a topic.
 Update Affiliation	Update the affiliations for a specific user on a topic.
 Get Affiliations for Topic	Get the affiliations for a topic. Used to determine which users have what access to the topic. Results may be filtered based on the access level of the calling user.
 Get Affiliations for User	Find all the affiliations for a user including the topics to which they relate.
 Get Pending Access Requests	Finds pending subscription access requests for a topic.
 Reject Access request	This is used to mark a pending access request as being denied.
 Grant Access Request	This capability marks an access request as granted.
 Process Pending Access Requests	This capability causes all access requests for a topic that have been granted or denied, to take effect.
 EPS Broker Monitoring	These capabilities provide basic monitoring of the state and behavior of the broker.
 Get Broker Statistics	This capability is used to find basic statistics about the broker. The scope and nature of the statistics returned is not detailed by this specification.
 Get Broker Status	This capability determines the current status of the broker. This can be used as a general health-monitoring tool. The scope and nature of the status information returned is not detailed by this specification.

Name	Definition
 Get Topic Statistics	This capability is used to get basic operational statics about a topic. This would include information about the message in various states, subscribers, publishers, etc. The scope and nature of the statistics returned is not detailed by this specification.
 EPS Federation	These capabilities provide the services used to control federation on the Event Publish & Subscribe broker.
 Get Master Federation Map	This capability retrieves a map of all federation relationships for this broker. The map is detailed to the topic level.
 Get Source Map	This capability retrieves a map of all federation relationships from a specific source.
 Get Target Map	This capability retrieves a map of all federation relationships to a specific target.
 Update Source	This capability allows a particular federation source definition to be modified. The scope of the update may be constrained by operational constraints and might be limited to updates such as credentials or state.
 Update Target	This capability allows a particular federation target definition to be modified. The scope of the update may be constrained by operational constraints and might be limited to updates such as credentials or state.
 Update Source Map	This capability updates the mapping between a particular source and the local and remote topic trees.
 Update Target Map	This capability updates the mapping between a particular target and the local and remote topic trees.
 EPS PubSub Federation	These capabilities set provides the interface whereby one federated broker is called by another broker. The federation interface includes support for both push and pull dynamics and may include some management information. It may also support synchronization operations for relationships that use a store and forward federation pattern.
 Receive Events	This capability is used to receive a set of push events from a federated system. It is called by another broker to deliver events in bulk.
 Pull Events	This capability provides a mechanism to retrieve a set of events.
 Synchronize	This capability provides a mechanism for a federation partner to receive a synchronization message. Synchronization messages are

Name	Definition
	exchanged between federation partners to coordinate their federation state.
 Link Management Update	This capability is used to inform the federation partner of management information relating to the link between the partners. For example, this might be used to inform a partner that information on the link will not be available.
 EPS PubSub Publish-on-demand Interface	This capability enables a publisher to publish content only when there are subscribers or for those publishers that provide dynamic topics.
 Start Publishing On Demand Topic	Requests that a publisher start publishing events on a topic.
 Stop Publishing On Demand Topic	This capability instructs a publisher to stop publishing on a topic.
 Discover Published Topics	Returns the available topics for a specific publish-on-demand topic.
 Get Published Sub-Topics	Returns the available sub-topics for a specific publish-on-demand topic.
 Retrieve Published Events	This capability allows a broker to contact an on-demand-publisher and use a pull contract to request events. This request may be for response in a "list" (aka summary) or "detail" form (aka list of events).
 EPS PubSub Subscription Client	Capabilities used to push events to a subscriber.
 Topic Event	Receives an event
 Topic Management Event	This capability is used by "push" subscribers to be informed of operational events of a topic.
 EPS PubSub Publication Intervention Interface	The PubSub Publication Intervention capabilities are used by the EPS broker to allow third parties to reject or transform message content prior to publication. This provides an essential service contract intervention point for such activities as virus scanning, redaction, content tagging, content modification, message metadata updates, and policy compliance.

Name	Definition
 Review Message Content	Call to all content reviewers to alter, scan and reject content. This capability provides the ability to alter and filter the messages and contents received by a subscriber.
 EPS PubSub Content Brokering	These capabilities are used by content consumers to negotiate content form with a content provider. The interface is generally implemented by a content provider. An EPS broker may also directly implement this interface to either directly provide content or act as an intermediary between the original content provider and the consumer.
 Get Content	Fetch the content in the best matching form based on the requester's desire.
 Supports Content Form	This capability is used to determine if a set of specific content forms is supported on a content item.
 Get Preferred Content	This capability will return the content in the form that is preferred by the content provider.
 EPS PubSub Delivery Intervention	These capabilities are used by the EPS service to provide a point to intervene on message delivery and topic access based on the consumer (subscriber).
 Control Topic Access	Allows a plug-in engine to accept or reject a subscription to a topic.
 Review Message	This capability provides the ability to alter and filter the messages and content received by a subscriber.
 Review Content	This capability provides the ability to alter and filter content as part of the content negotiation process. This operation is invoked by Event Publish & Subscribes systems that provide content negotiation.

5.8.2 Event Publish & Subscribe Service implementation

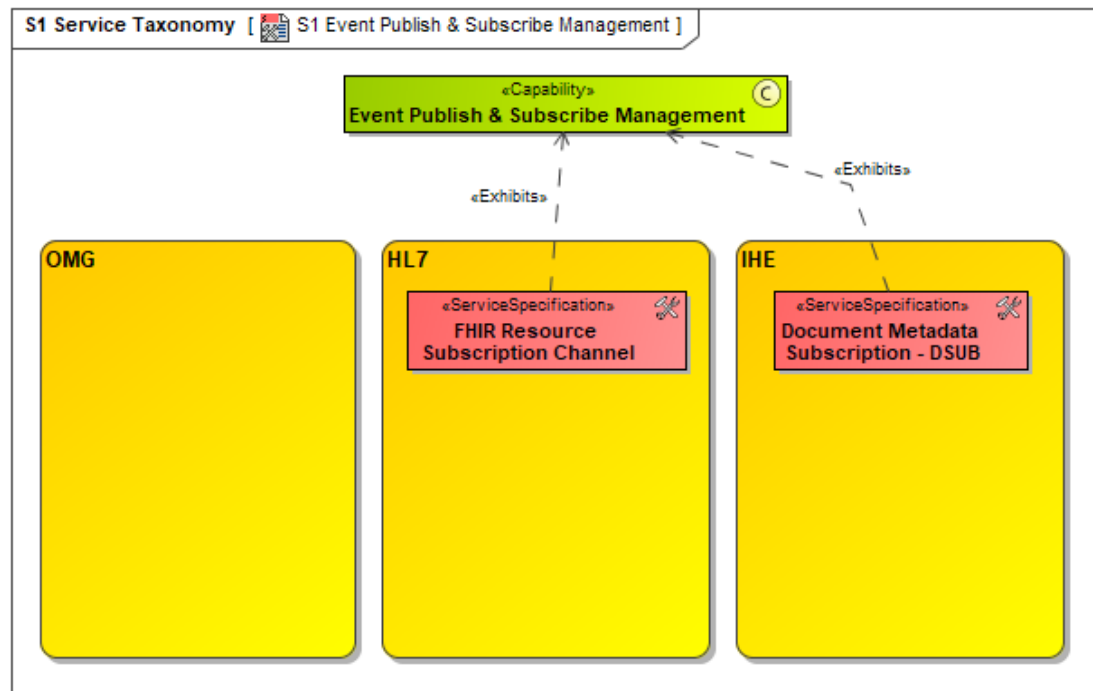


Figure 70 - Event Publish & Subscribe Management service implementation

The existing platform specific Standards have only a partial coverage of the EPS model and include only the basic operations.

Current relevant partial platform specific implementations (projections) include:

- FHIR Resource Subscription with the specification of the behavior in the Channel section
- IHE Document metadata Subscription (DSUB)

5.8.2.1 Event Publish & Subscribe Management FHIR projection

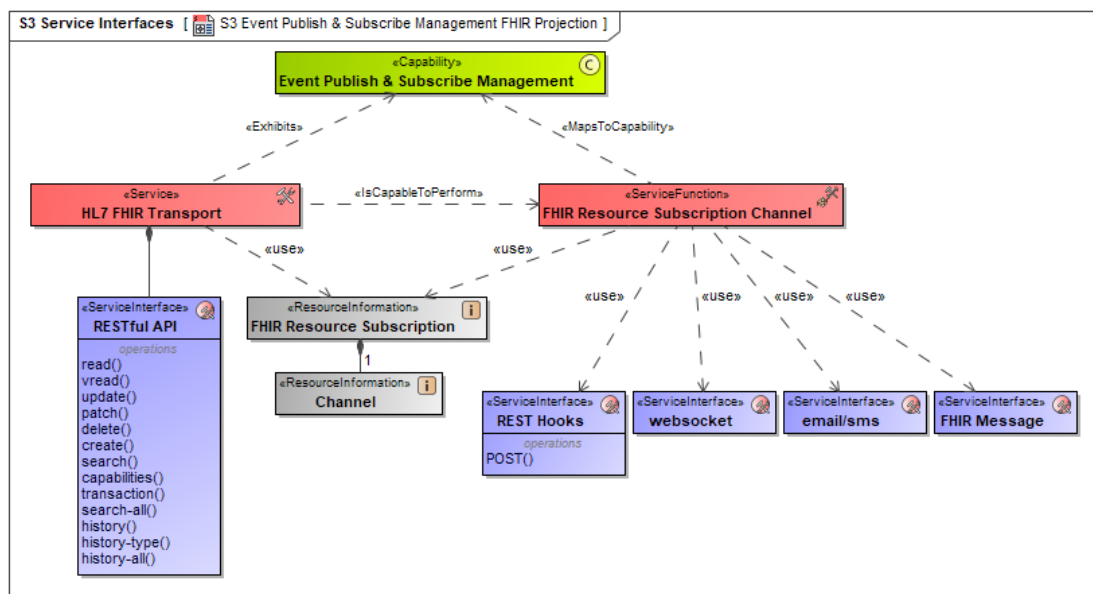


Figure 71 – Event Publish & Subscribe Service FHIR projection

The subscription resource is used to define a push-based subscription from a server to another system. Once a subscription is registered with the server, the server checks every resource that is created or updated, and if the resource matches the given criteria, it sends a message on the defined "channel" so that another system can take an appropriate action.

Once a subscription is created, any newly created or updated resources that meet the criteria in the resource cause a notification to be sent using the provided channel. The criteria are Search strings that have the same interpretation as if they were appended to the base URL and submitted using the REST API. Note that the search criteria are applied to the new value of the resource. The consequence of this is that there is no notification when a resource is deleted, or when a resource is updated so that it no longer meets the criteria.

The server is able to send notifications without any information about the matching resource, or with the entire resource.

Several different types of channels are supported:

- **rest-hook:** A post is made to the URL identified in the Subscription resource. If the subscription requests that the whole resource is included, the URL is interpreted as the service base.
- **websocket:** A PING message is sent to the designated URI
- **email/sms:** A notification is sent to the nominated email address or SMS number
- **message:** The resource is sent to the application identified in the URI as a message

The complete specification can be found at:

<https://www.hl7.org/fhir/subscription.html>

5.8.2.2 Event Publish & Subscribe Service IHE projection

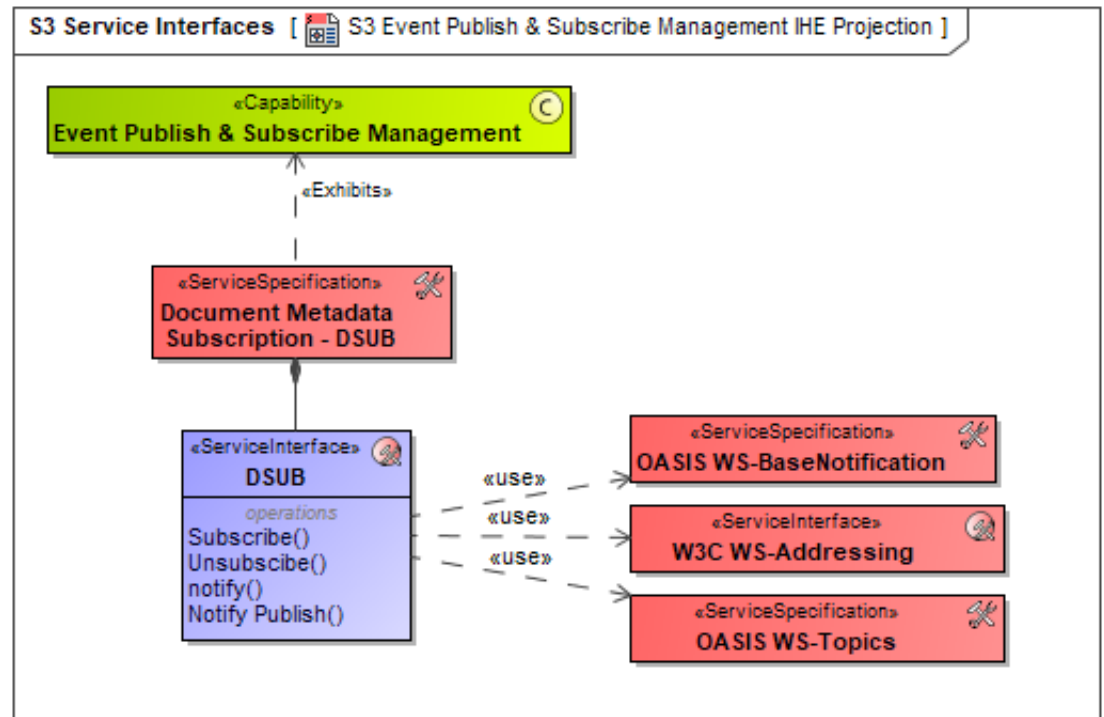
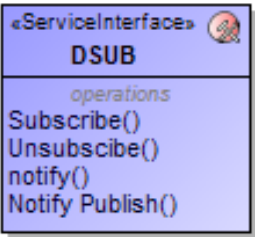


Figure 72 - Event Publish & Subscribe Service IHE projection





1050 This profile describes the use of subscription and notification mechanisms within an XDS
 1051 Affinity Domain and across communities. The subscription allows for the matching of
 1052 metadata during the publication of a new document for a given patient and results in the
 1053 delivery of a notification.

1054 This profile is based on the OASIS WS-BaseNotification standard and defines a “Push-style”
 1055 method for notification. Using a “Push-style” method of notification, the Document
 1056 Metadata Subscriber may subscribe on behalf of the Document Metadata Notification
 1057 Recipient to receive notifications about the availability of documents based on specific
 1058 criteria. A Document Metadata Notification Broker keeps track of the subscriptions and
 1059 sends the appropriate notifications based on the registration of objects in an XDS Document
 1060 Registry. Subscriptions exist for a certain period of time and can be cancelled.



1061
 1062

Figure 73 - Document Metadata Subscription interface

Name	Documentation
 Notify Publish	When an event occurs for which a subscription may exist, the Document Metadata Publisher will trigger a Notification message to the Document Metadata Notification Broker. Events that could trigger a notification are publication of, or update to, a DocumentEntry or SubmissionSet.
 notify	This transaction delivers a notification from the Document Metadata Notification Broker to the Document Metadata Notification Recipient about an event which matches an existing subscription.
 Subscribe	A Document Metadata Notification Recipient's need to initiate a subscription will cause the Document Metadata Subscriber to trigger a Subscribe Request message.
 Unsubscribe	When a subscription is no longer needed, a Document Metadata Subscriber will trigger an Unsubscribe Request message.

1063

6 Architectural Patterns catalog (informative)

The service inventory will be the basis for a library of common health architectural patterns. As already mentioned, the patterns catalog is an ongoing work that will be integrated in the next versions of HSRA.

The Catalog will be conceptually based on the OMG Structured Patterns Metamodel Standard (SPMS)⁵

The SPMS specification defines a common standard for defining and describing patterns as used in architecting, designing, and implementing software systems, working with software faults or security issues, and any situation where a pattern is appropriately applied.

HSRA will use SPMS as a guide to the definition of architectural patterns

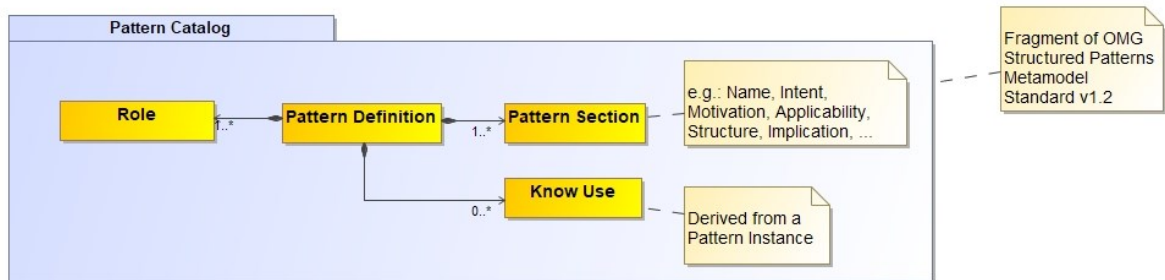


Figure 74 – fragment of Structured Patterns Metamodel Standard

⁵ OMG, *Structured Patterns Metamodel Standard (SPMS)*, v1.2, 2017.

7 Related Standard and Project

HSRA is methodologically agnostic. As a map between the capabilities of Functional models and different standard service interface projections, do not include any methodology choice.

The use of UAF and NAF in HSRA is strictly limited to the modeling language and does not include any methodology implication.

HSRA can, and should be, used as a support with different Enterprise Architecture frameworks such as:

- ISO 23903:2021 Interoperability and Integration Reference Architecture – Model and Framework, 2021
- NATO Architecture Framework, Version 4, 2020
- OMG, UAF 1.2 - Appendix C: Enterprise Architecture Guide for UAF, 2022
- OpenGroup, Open Agile Architecture (O-AA), 2022
- OpenGroup, TOGAF Standard 10th Edition,
- Veterans Health Administration, i-VA Blueprint (ongoing project)

The relationships to these and eventually other frameworks will be discussed in subsequent releases.

8 Reference

- Blobel B, Oemig F. The Importance of Architectures for Interoperability. Stud. Health Technol. Inform. 211;2015:18-56.
- Blobel B. Architectural approach to eHealth for enabling paradigm changes in health. Methods Inf Med 2010; 49,2: 123-134.
- ISO 13606-1 Annex C, Cross Domain Interoperability
- ISO 13606-1:2019, Health informatics — Electronic health record communication — Part 1: Reference model
- ISO 23903:2021 Interoperability and Integration Reference Architecture – Model and Framework, 2021
- NATO, NATO Architecture Framework, Version 4 (NAF4), 2020
- OMG, Unified Architecture Framework, Version 1.2, 2022
- OpenGroup, Healthcare Enterprise Reference Architecture (HERA), snapshot, 2018
- OpenGroup, Open Agile Architecture (O-AA), 2022
- OpenGroup, TOGAF Standard 10th Edition,