

# Healthcare Services Specification Project

## A Project Tour



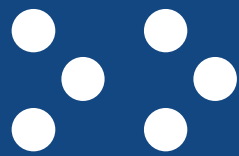
Sydney, Australia  
May 2006

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# Overview

- Part I: Background
  - HSSP Background and Context
- Part III: HSSP Project “Deep Dive”
  - Methodology
  - Active Subgroups



**“How do you know that the [web-] services you’re building are not just the next generation of stovepipes?”**

Janet Martino, LTC, USAF (Retired) to a panel of Healthcare IT Leaders

## ⋮⋮ So, what *is* HSSP?

- An project to create common “service interface specification” standards that are tractable within healthcare IT
- A joint initiative co-sponsored by Health Level 7 (HL7) and the Object Management Group (OMG)
- Its objectives are:
  - To create useful, usable healthcare standards that address functions, semantics and technologies
  - To complement existing work and leverage existing standards
  - To focus on **practical** needs and **not perfection**
  - To capitalize on the best industry talent through open community participation and maximizing each community for its strengths

## ⋮⋮ Why HSSP Was Created

- Several large provider organizations were each facing challenges in integrating current and emerging systems
  - Veterans Health Administration
  - Kaiser-Permanente
  - SerAPI Project (Finland)
- There were a number of shared beliefs among the founding partners...

## ⋮⋮ In each case...

- There was active integration and development work
- There was a shared belief that messaging alone was not the optimal solution
- A services-oriented architecture was the target environment
- There was strong commitment to standards
- There was recognition standard services would further interoperability with partners and products
- *It was recognized that developing “stovepipe” services would not address business challenges*



# HSSP Builds Upon Existing Work

High

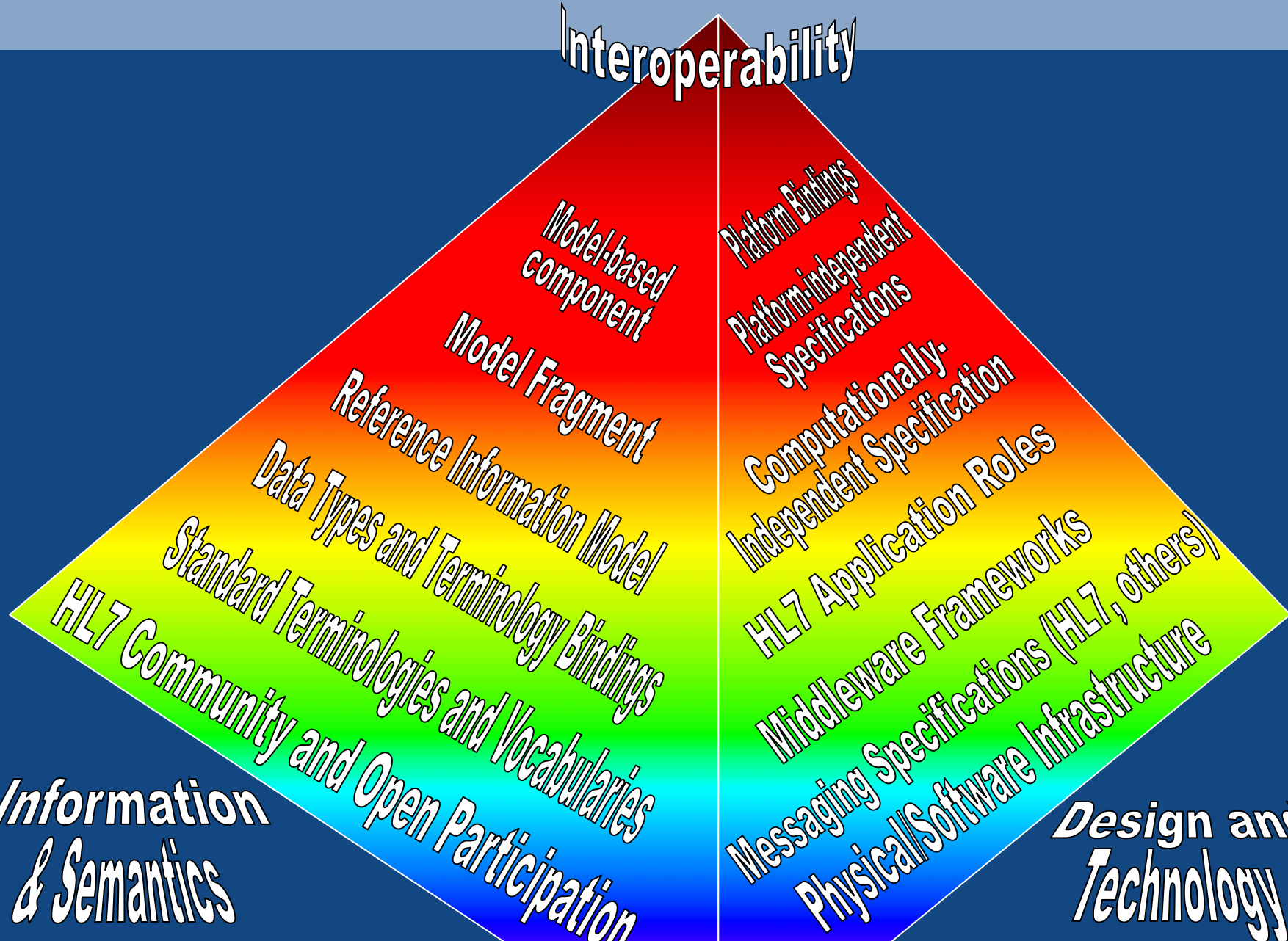
Interoperability

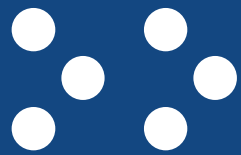
Ability to Interoperate

Low

Information  
& Semantics

Design and  
Technology





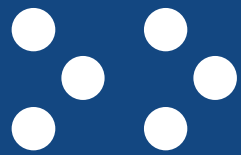
## HL7, OMG, and the Collaboration

## ❖❖❖ Collaboration Rationale – Initial Thoughts...

- HL7 has a world-class functional community
- ...but HL7's strength is not service architecture
- HSSP project needed to leverage talent of a strong architectural community
- OMG has history and demonstrated leadership in service definition and SOA
- OMG provided the ability to interact with multiple vertical domains (pharma, manufacturing, etc.)

## ⋮⋮⋮ The Result...

- **HL7 brings...**
  - Healthcare semantic interoperability expertise and credibility
  - Rich, extensive international community perspective
  - Diverse membership base
- **OMG brings**
  - distributed systems architecture and modeling excellence
  - Effective, efficient, rapid process
  - Premise that standards *must* be implemented
- **Resulting in...**
  - Services will be identified by the community needing them
  - Improved methodology resultant from functional and architectural merging of the two groups
  - Facilitation of multi-platform implementation and broader implementation community



# Project Operational Concerns

## Project Organisation

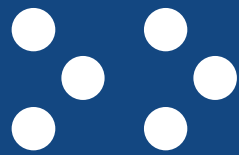
- One overarching project with five subproject efforts
- Overall project
  - Meets at HL7 and OMG meetings
  - Status teleconferences biweekly
  - Owns responsibility for planning, marketing, etc.
- “Infrastructure” Subgroup
  - Developed and maintains methodology
- Subprojects
  - Determine their own deadlines, meeting schedules, etc.
  - May be hosted by other committees
  - Leverage project infrastructure and methodology

## ❖❖❖ 2006 HSSP Project Schedule (major milestones)

<b>Jan:</b> Charter HL7 SOA SIG <i>HL7UK Information Day</i>	<b>Jul:</b> Issue 4 ballots (3 + 1)
<b>Feb:</b> Announce intention to ballot RLUS	<b>Aug:</b> Ballot review
<b>Mar:</b> Issue RLUS Ballot	<b>Sep:</b> <i>HL7 Boca Raton</i> (Reconciliation); <b>RLUS DSTU Adopted!</b> <i>OMG Anaheim</i> (Issue RFPs)
<b>Apr:</b> <i>OMG Meeting St. Louis</i> (RLUS RFP prep)	<b>Oct:</b> Intent to ballot DSS, EIS, CTS2
<b>May:</b> <i>HL7 San Antonio</i> (RLUS ballot reconciliation)	<b>Nov:</b> <i>HL7 Educational Summit</i> Issue DSS, CTS2 Ballots
<b>Jun:</b> Announce intention to ballot (3 committee, 1 membership)	<b>Dec:</b> <i>OMG Washington</i> (Review Initial RFP Submissions)

## ⋮⋮ How the priorities were determined...

- Based on an open selection process
- Brainstorming gave way to successive refinement and downselect
- Priorities determined by business need and resources
- Initial list included Terminology, Entity ID, Record Location, Record Retrieval
- Record Location and Retrieval activities subsequently merged
- Decision Support added later based upon community interest and resources



The Bottom Line...

## Why HSSP?

- Relentless focus on added business value for healthcare and project participants
  - focused on and driven by business-need
  - not an “academic exercise” striving for perfection
  - “Standards must be used to be useful”
  - Emphasis on practical, achievable, & marketplace-relevant
- Without these standards, we’re building “service stovepipes”
- Aggressive timelines encourage progress
- Assembled community of top industry talent
- Project structure promotes targeted participation

## ❖❖❖ HSSP Is Not Just Any Standards Activity

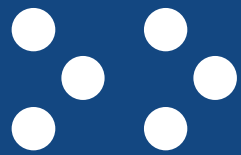
- Active participation from three continents and 15+ organizations
- Significant cross-cutting community involvement
  - **Providers** (Kaiser, VHA, Intermountain Health, Mayo)
  - **Vendors** (CSW Group, IBM, PatientKeeper, Universata)
  - **Value-added Providers** (MedicAlert, Ocean Informatics, Eclipse Foundation, etc.)
  - **Payers** (Blue Cross/Blue Shield, Kaiser)
  - **Integrators** (IBM, EDS)
  - **Governments** (Veterans Health Administration, Canada Health Infoway, HealthConnect (Australia), SerAPI (Finland))
- Managing differences between SDOs in terms of membership, intellectual property, and cost models

## ❖❖❖ HSSP In the “Community”

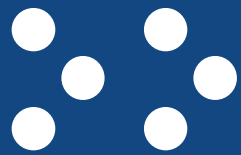
- HSSP is actively seeking to collaborate with other groups
- HSSP specs have a section citing existing work and its relevance
- Working project relationships with:
  - HL7 Clinical Decision Support Technical Committee
  - HL7 Vocabulary Committee
  - Object Management Group Service-oriented Architecture SIG
  - Eclipse Open Healthcare Framework Initiative
- Emerging relationships with:
  - Integrating the Healthcare Enterprise (IHE)
  - Medical Banking Initiative

## Where should I engage?

Interest Area (including representative communities-of-interest)	Venue
Setting functional priorities; selecting priority services <i>(Consumers, Providers, Vendors, Integrators)</i>	HL7
Defining behaviour; service capabilities <i>(Consumers, Providers, Vendors)</i>	HL7
Defining functional conformance/compliance criteria <i>(Consumers, Regulatory)</i>	HL7
Technical specification, interface specification, evaluation criteria <i>(Consumers, Regulatory, Integrators)</i>	OMG
Technical conformance/compliance criteria <i>(Consumers, Regulatory, Integrators)</i>	OMG
Architectural considerations; service interdependencies, SOA <i>(Integrators, Vendors, Implementers)</i>	OMG
Product development; technical standard creation; API definition <i>(Vendors, Implementors)</i>	OMG



## The HSSP “Deep Dive”



# The Service Development Framework (SDF) Methodology

## ❖❖ SDF Methodology Objectives

- Allow the project to operate “as one” across multiple standards groups
- Provide an authoritative, repeatable, documented process
- To “call out” HL7 and OMG processes where appropriate
- Ensure that HSSP takes advantage of the talents of engaging communities
- Establish infrastructure to allow the project to execute with an engineering discipline

# ⋮⋮⋮ Alphabet Soup

- **HSSP** = Healthcare Services Specification Project  
The joint collaboration to produce healthcare middleware standards.
- **HL7** = Health Level Seven  
The healthcare standards community sponsoring the HSSP project, and is known for its Reference Information Model and messaging specifications
- **OMG** = Object Management Group  
The industry consortium comprised of vendors, users, and governments which is known for the Unified Modeling Language (UML) and CORBA specifications.
- **SDF** = Service Development Framework  
The methodology used to identify, functionally specify, and issue technical standards for HSSP
- **SFM** = Service Functional Model  
The elaboration of the function of the service being specified. SFMs will be HL7 balloted artifacts and HL7 standards.
- **DSTU** = Draft Standard for Trial Use  
This type of standard requires 60% affirmative vote to pass, and requires a 90% subsequent vote within 2 years
- **RFP** = Request For Proposal  
The OMG Healthcare Domain Task Force methodology used to identify, functionally specify, and issue technical standards for HSSP



## Part I: Roadmap and Service Inception

- HSSP Roadmap identifies candidate services and establishes context for inter-service relationships
- Emerging priorities are selected based upon inter-dependency and business case
- Sponsoring HL7 committee is identified (may or may not be HSSP)
- Leadership is identified
- Service scope is defined
- Affirmation of use of SDF and HSSP Infrastructure is secured
- “Administrivia” details are sorted (telecons, wiki)

## ❖❖ Part II: The SFM Definition Process

- HSSP Infrastructure group maintains “boilerplate” documents
- Subgroups are expected to author and/or compile the SFM using the SDF methodology
- Where relevant existing work exists, it is cited and leveraged
- Where other groups have pertinent content or expertise, HSSP will collaborate accordingly
- The SDF does not define
- Subgroup operates autonomously
- When ready, an internal peer (quality) review is held
- Upon passing peer review, SFM is ready for ballot

## ❖❖ Part II: The SFM Itself...

- Is expressed in business terms
- Is not predicated on any technology or platform
- Does not define new HL7 semantic content
- Provides a “profiling” mechanism that will be instrumental for conformance
  - Profiles = Behavioural Profile + Semantic Profile
  - Profiles may be localized
- Cites and leverages relevant existent work
- Does not define new HL7 semantic content

## ❖❖ SFM Highlights

- Core SFM components:
  - Business case and business scenarios
  - Specification of service functionality
  - Specification of service payloads as necessary
  - Conformance profiles
- Aspects not requiring specification by HL7 intentionally left for OMG to specify

## ⋮⋮ Part III: Ballot

- Service Functional Models will undergo two ballots:
  - “Committee” Ballot
  - DSTU Ballot
- DSTU requires 60% affirmative to pass
- Ballot process is open to all members or materially affected parties
- All ballot comments are reviewed and dispensed
- Successful ballot triggers the next phase of SDF

## ❖❖ Part IV: Technical Specifications and RFPs

- Coordinated by Healthcare Domain Task Force (DTF)
- HL7 SFM used as basis for Request for Proposal (RFP)
  - Request for specification of a platform-independent model (PIM) and at least one platform-specific model (PSM) (e.g. SOAP/XML) conforming to SFM requirements
- Letters of intent to specify and implement within 12 mo. → initial specifications → single revised specification based on merged efforts
- Approval by Healthcare DTF → Architectural Board → Technology Committee → Board of Directors
- Specification not adopted unless at least one implementation available commercially

## ••• The Role of the HDTF

- The role of the HDTF is to select RFPs, scope RFPs, and evaluate submissions
- Technical Specifications are not a work product of the OMG. They are a product of the submitters to RFPs
- “Ideal” RFPs contain exactly the specificity needed to be interoperable, and *nothing* more. Superfluous information constrains submitters ability to innovate.
- RFP submitters must commit to developing software based upon their proposed standard within 18 months (no shelfware!)
- The project team may influence four categories:
  - mandatory requirements,
  - optional requirements,
  - evaluation criteria,
  - issues to discuss

## ❖❖❖ Part V: OMG Technology Adoption Process

- Any interested vendor with OMG membership may submit
- No submissions pass on initial submission
- Vendors choose to partner to form joint submissions 95% of the time
- All OMG standards are reviewed by OMG Architecture Board
- The speed of the adoption is driven by marketplace pressure, not the process
- The standards committee may either accept or reject submissions – nothing more
- The approach assures business relevance and promotes rapid timelines and quality
- The OMG Standard is published when software is available

## ❖❖ Part VI: Functional Model Finalisation

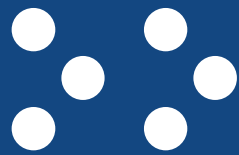
- DSTU is ideally suited to this process
  - Allows two years for “practical experience”
  - OMG Technology adoptions are typically 18 months
- Throughout the process we will collect ‘lessons learned’
- Outcomes of the technology adoption will be incorporated and balloted into the SFM

## ❖❖ Part VII: Continuous Process Improvement

- The HSSP Subgroup is charged with maintaining the SDF Methodology and Boilerplate
  - Ongoing feedback from subgroups encouraged
  - All artifacts are versioned
  - Corrections are ongoing. Subgroups “opt-in” to newer releases at their discretion
- Subgroups encountering significant problems receive highest priority attention

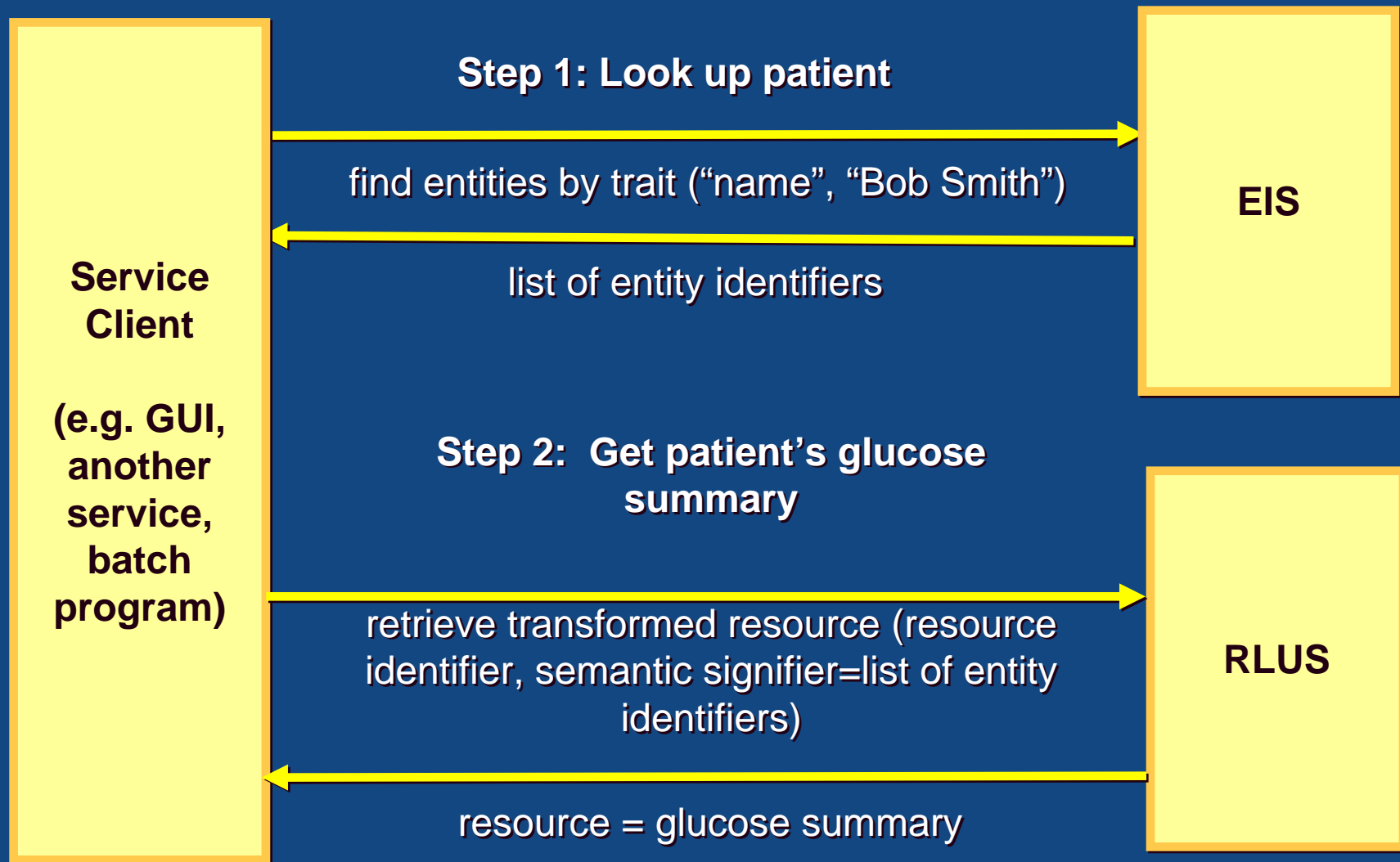
## ❖❖❖ Current Status

- SDF was baselined in January 2006
- Intentionally sparse, with plans for incremental refinement based upon experience
- Currently being used by all HSSP subgroups
- Under evaluation by OMG SOA SIG
- Approach has been reviewed by liaison representatives from the HL7 Board and OMG Architecture Board



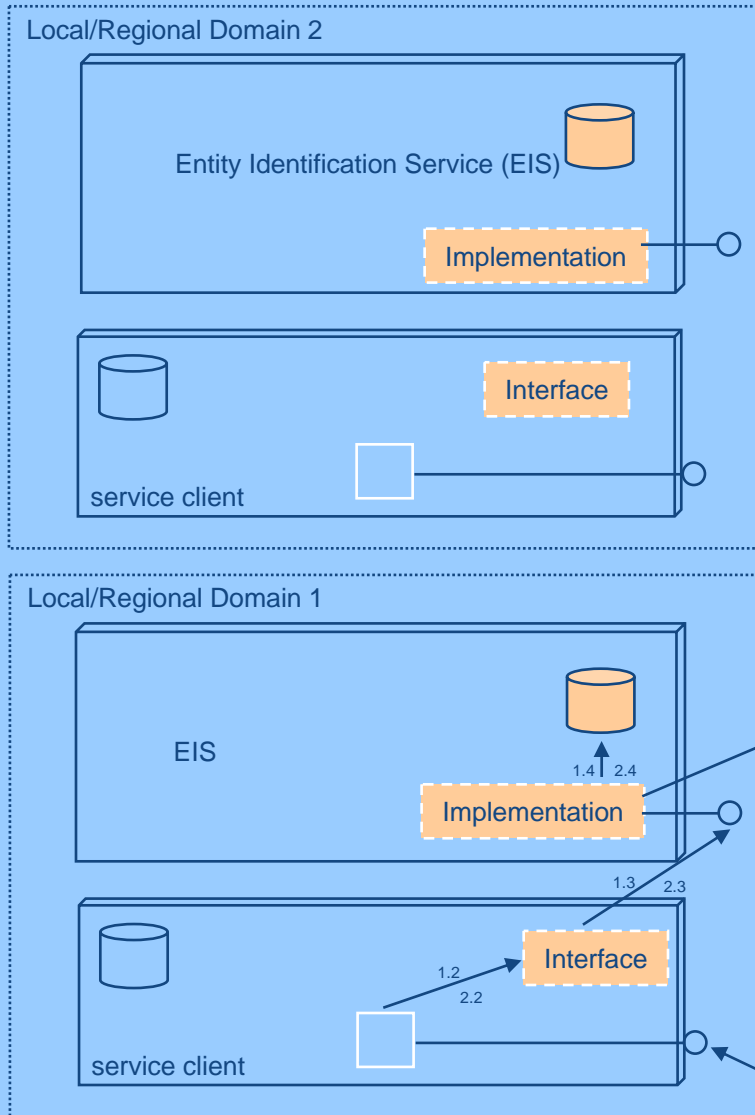
# Service Dynamics

# Use Case: Retrieve patient's glucose summary

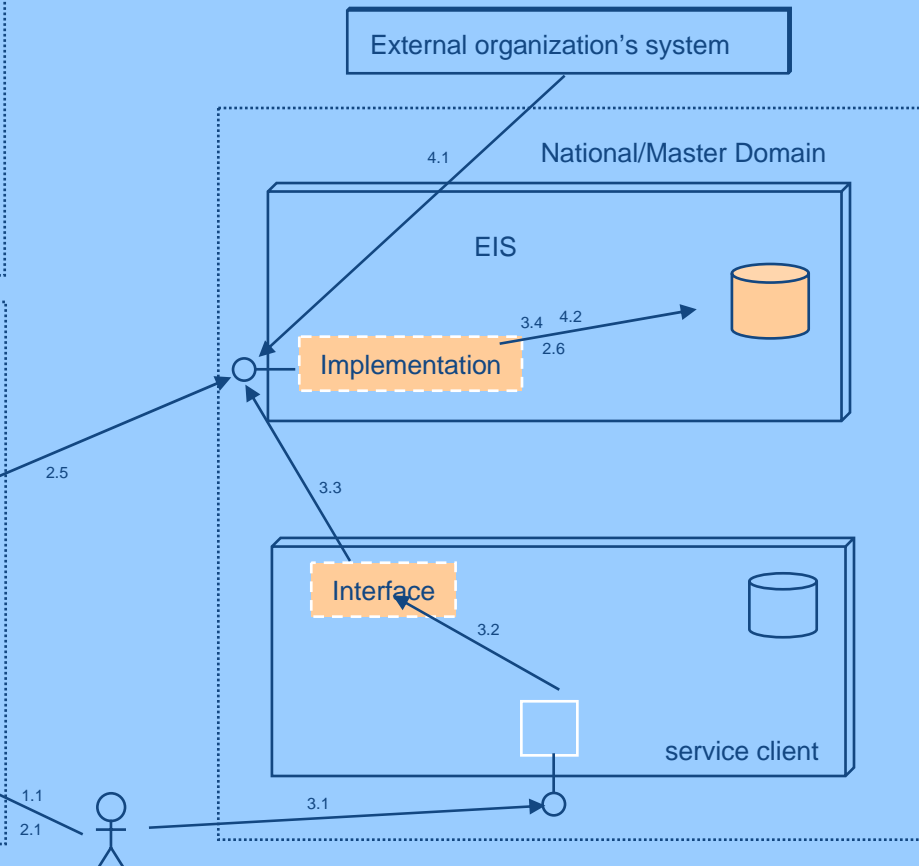




# Step 1: find patient (find entities by trait)

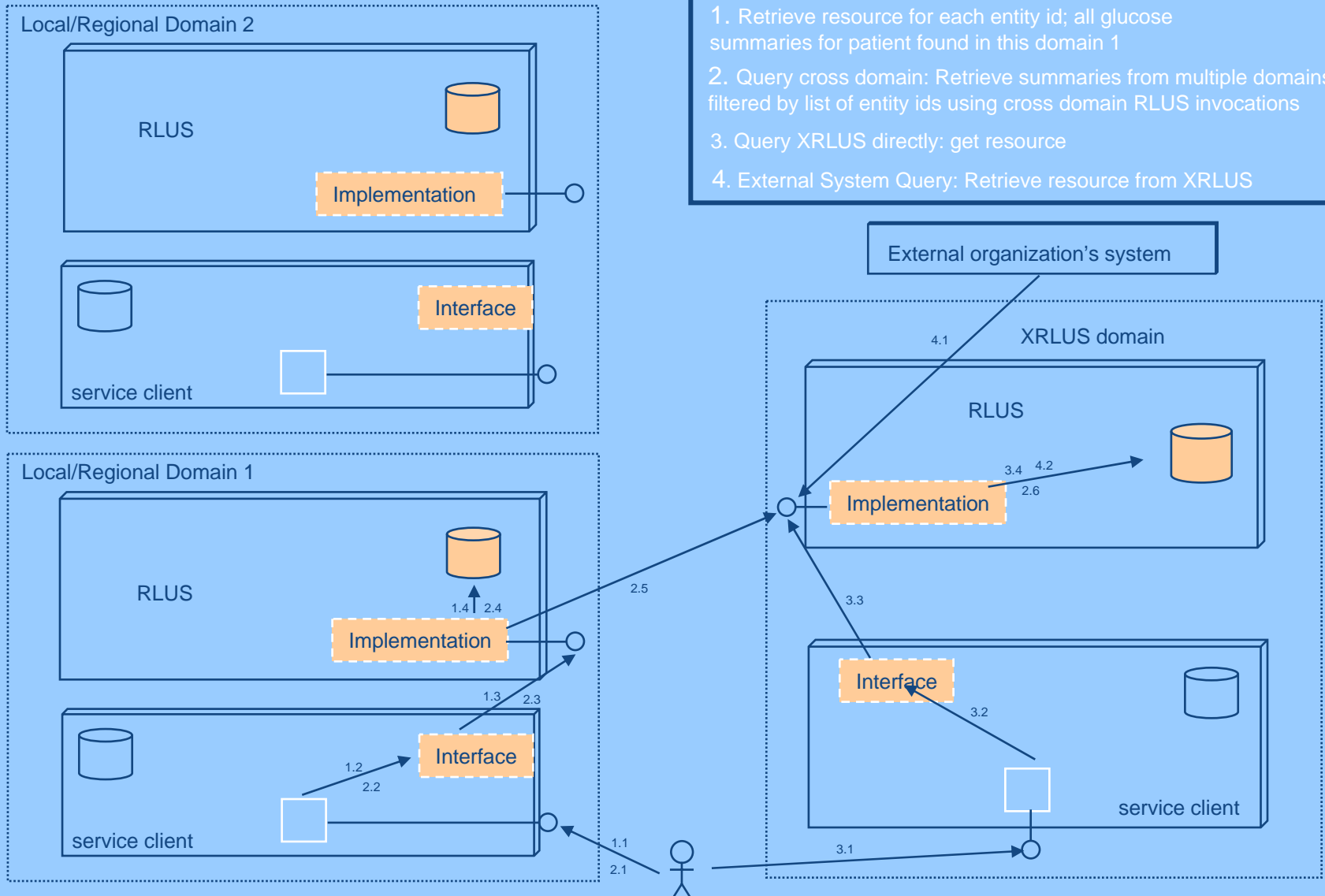


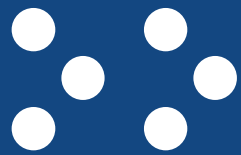
- Scenarios**
1. Query local domain: entity found locally
  2. Query local domain: entity not found locally, retrieve from master domain
  3. Query master domain: retrieve linked entities from master domain
  4. External System Query: Retrieve from master domain





## Step 2: Get patient's glucose summary (retrieve transformed resource)





## Entity Identification Service (EIS)

## Context

- The Entity Identification Service (EIS) SFM provides a set of functional behaviors which enable unique identification of entities (such as patients) within disparate systems, both within a single enterprise and also across a set of collaborating enterprises.
- Classes of entities include the variety of entities in the HL7 RIM, e.g., providers, equipment, payers, even animal subjects in clinical studies.
- Conceptually, the EIS is a superclass of Master Person Index
- Building on the OMG Person Identification Service (PIDS) spec and the IHE PIX/PDQ profiles

## Business Purpose

- In order to be able to provide a lifetime health record and continuity of care across multiple evolving organizations and venues, a robust standard mechanism to identify an individual as being the same person with differing ids at multiple organizations is needed.
- But as important is a common mechanism to be able to manage the identifiers of a patient and determine with high confidence that a person is who they are reported to be across multiple enterprises simultaneously.
- To identify all clinical information relevant to a specific patient requires a service which cross-references between local patient IDs, and maps between demographic information and identifiers.

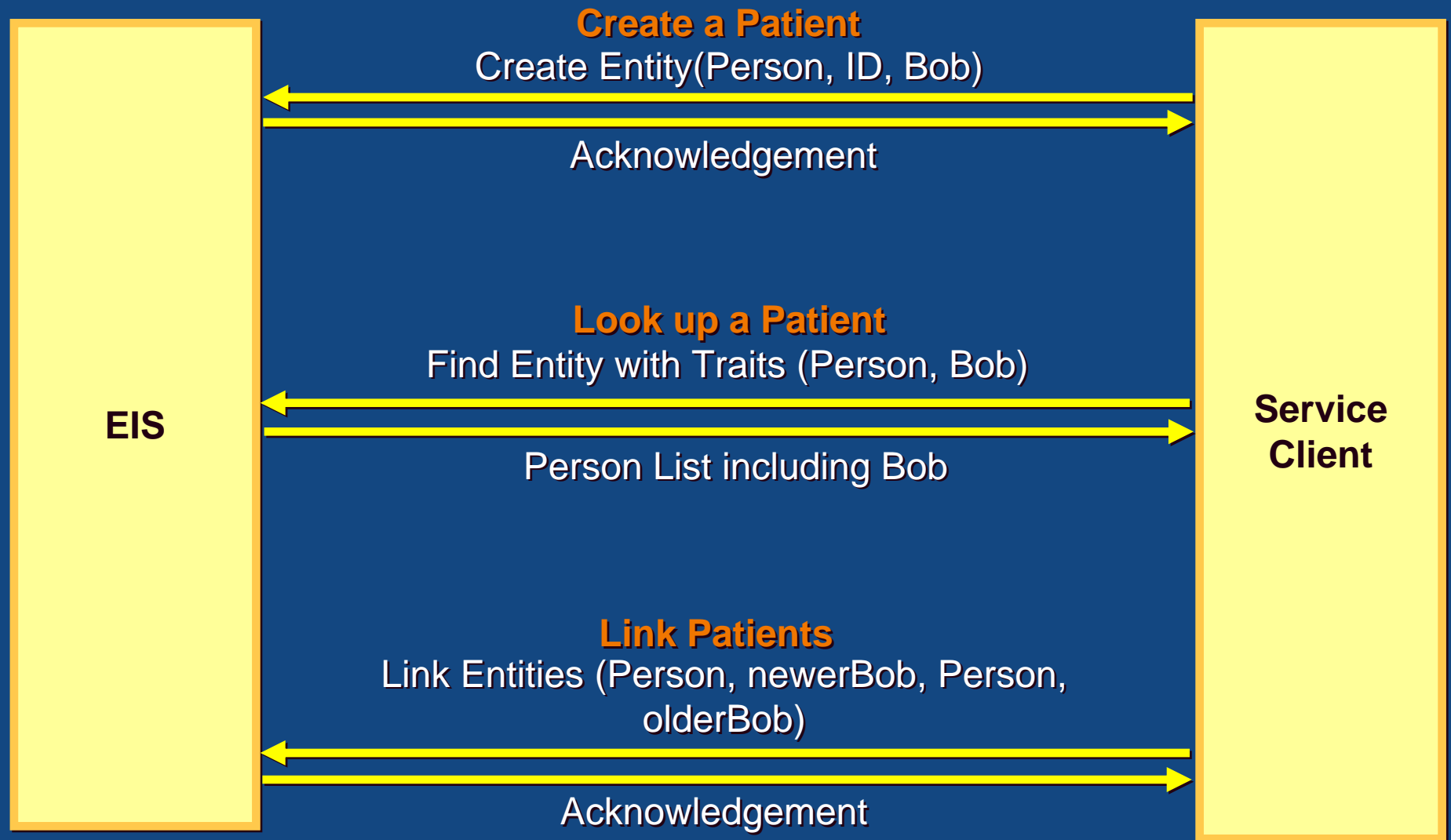
# ⋮⋮⋮ Functional Dimensions

- Interfaces
  - Administration
    - Technical support (start, stop etc.)
  - Service Metadata Management
    - Managing the metadata that an individual instance of EIS supports. (e.g., specifying traits relevant to a Person)
  - Entity Management
    - Manipulation of Entity Identifiers and traits (e.g., create, activate, inactivate, merge, link, update)
  - Query
    - Operations for retrieving entity identifiers and traits.

# Core Service Operations

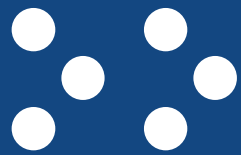
## Functional Interface

Function Call



## ⋮⋮ Scope of Specification Work

- EIS functional specification (HL7)
  - Business Cases and requirements
  - Interface Definitions
  - Conformance Profiles (Interfaces + Semantics)
- EIS technical requirements (OMG)
  - Administrative interfaces
  - Technical requirements (performance, scalability, extensibility)
  - Platform Bindings (WSDL, CORBA, &c.)



## Retrieve, Locate, Update Service (RLUS)

## ❖❖❖ RLUS Context

- The Retrieve, Locate and Update Service (RLUS) SFM provides a set of functional behaviors through which information systems can manage information.
- Many existing technical standards that need unification, healthcare applicability, or semantics
  - IHE XDS, UDDI, ebXML, OMG COAS
- RLUS explicitly occupies the service space
  - “...Independent of but compatible with underlying structures, including local security implementations, data models, or delivery mechanisms.”

## ❖❖❖ RLUS Business Purpose

- Within a mobile society, it is natural to consider that patients be mobile and their medical information be decentralized
- RLUS encompasses common business practices (resource search, resource retrieval, &c.) that are a part of most business scenarios in healthcare
- As a service specification, it complements existing applications and structures.

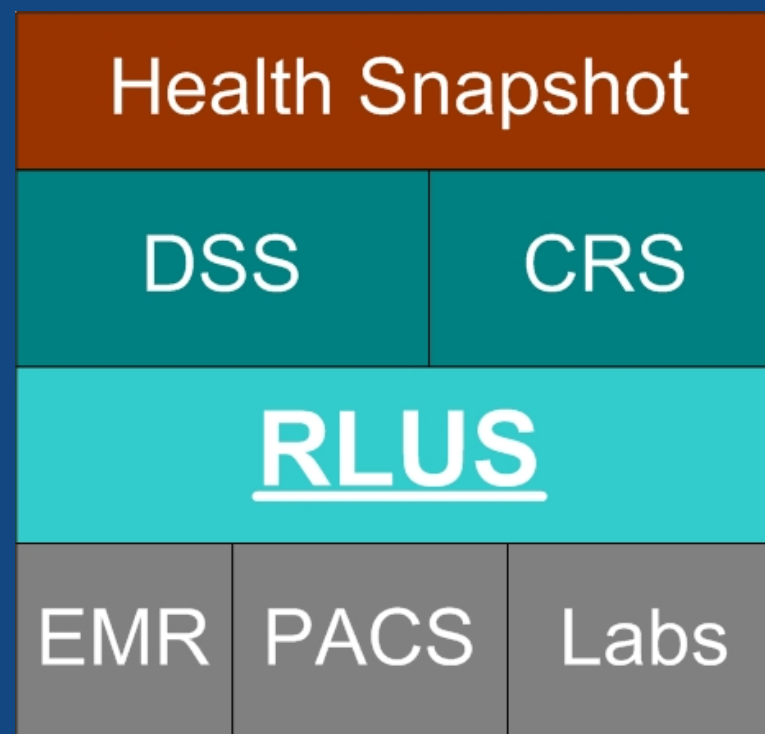


Figure 1: Possible Application Stack including RLUS (Informative only)

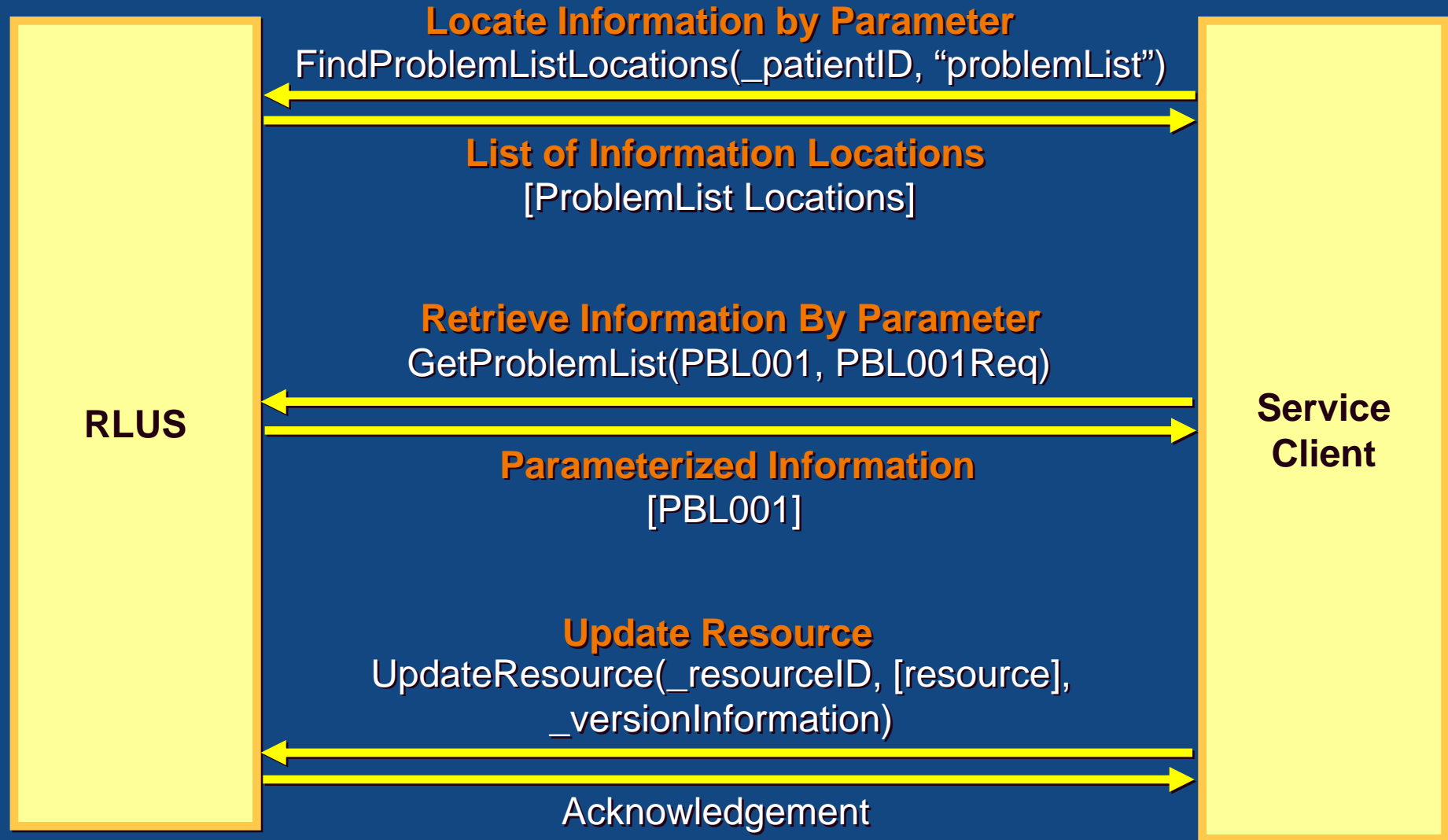
## ⋮⋮ Functional Dimensions

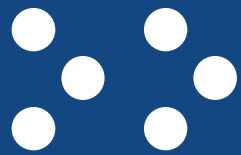
- Interfaces
  - Locate by some parameter
    - $f(\text{patientId}) = [\text{List of EMRs available}]$
  - Locate “nested” information
    - $f(\text{patientId}, [\text{RMIM } x]) = [\text{List of } x \text{ available}]$
  - Retrieve
  - Retrieve and Transform
  - Update

# Core Service Operations

## Functional Interface

Function Call





Decision Support Service (DSS)

## ❖❖❖ DSS History

- Based on Web service approach to clinical decision support developed at Duke University<sup>1</sup>
- Project initiated within HL7 Clinical Decision Support (CDS) Technical Committee (TC) in Sept. 2005
- Joint project between HL7 CDS TC and Healthcare Services Specification Project (HSSP)

<sup>1</sup> Kawamoto K and Lobach DF. Design, implementation, use, and preliminary evaluation of SEBASTIAN, a standards-based Web service for clinical decision support. *Proc AMIA Symp.* 2005:380-384.

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## ❖❖❖ DSS Business Purpose

- Clinical decision support systems (CDSS) have been shown to significantly improve care quality
- However, CDSS use is quite limited, due in part to cost and difficulty of implementing effective CDS capabilities
- CDS capabilities can be more easily implemented using services that provide required functionality, e.g.
  - Record Locate and Update Service → to retrieve required data
  - Decision Support Service → to draw conclusions about patient
  - CIS Action Brokering Service → to translate conclusions into CIS actions
- DSS purpose: to reduce cost and complexity of CDSS design, implementation, and maintenance

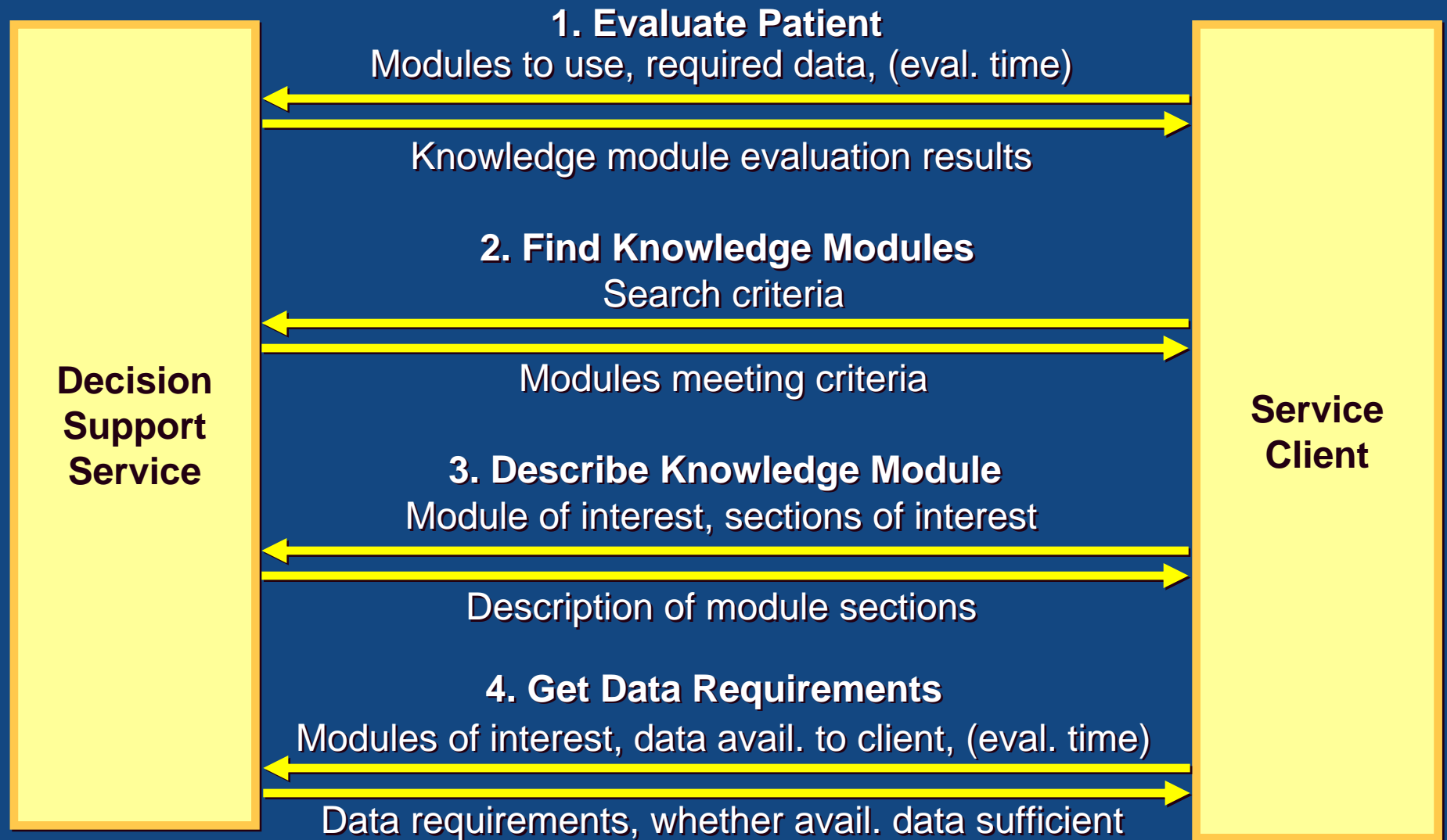
## ❖❖❖ DSS Functional Capabilities

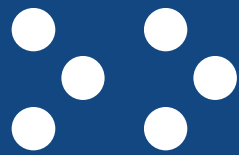
- DSS provider = guardian of CDS knowledge modules
- A DSS evaluates patient data using knowledge modules and returns machine-interpretable conclusions

Sample Evaluation Input	Sample Evaluation Output
Medication ID, age, gender, weight, serum creatinine	Recommended max/min doses, adjusted for renal clearance
Age, gender, co-morbidities, chief complaint	Admission order set in HL7 format
Age, gender, co-morbidities, past care procedures	Recommended health maintenance procedures (e.g. immunizations)
Insurance provider, data relevant to prescription	Prior authorization to prescribe medication

- Operations provided to meet supplemental information needs (e.g. identification of relevant knowledge modules)

# Core Service Operations





SOA4HL7

## ❖❖❖ Problem Statement / The Challenge

- Many organizations (including KP) are adopting SOA as their fundamental architecture for integration.
- Most healthcare organizations use HL7 V2 messaging and will migrate to V3 over time
- Two conceptual viewpoints (both valid)
  - SOA based: Implementing a general SOA framework (common infrastructure, tools and approaches). “HL7 is just another content type”
  - HL7 Messaging based: Implementing an HL7 based messaging architecture that can use different messaging and transports, including web services.
  - The first tends to lead to the conclusion that HL7 should just define content. The second tends to lead to HL7 defining the whole stack
- How do the worlds of SOA and HL7 V3 messaging intersect?
- How can we maximize the benefits of both approaches?
- How do we avoid internal developers and software vendors creating “stovepipe” services, functionally and technically ?

## ⋮⋮⋮ Services and SOA

- Some further comments/clarifications on Services and SOA
  - Services are NOT just “synchronous request-reply”

SOA covers asynchronous and synchronous equally. Both have their place.
  - SOA is NOT just web services or even just technology

Aspects of process, methodology and behavior are more important than technology. However, the unprecedented cooperation and alignment of many IT organizations has provided a uniquely widespread technology underpinning.
  - SOA is NOT just a “fad”

Like messaging, SOA is part of the natural progression or evolution of the IT industry. The specific technologies used today will continue to evolve. It is really the culmination of many best practices that have evolved over the years. Personal view – combined with EDA, BPM and further “Semantic” based concepts, I don’t believe that concepts will actually evolve that much further.

## ⋮⋮ Coupling - SOA, HL7 Messaging (and also EDA)

- Services (SOA) : “Provider - do something and (optionally) let me know the result”
- HL7 Messaging: “Receiver - This happened, here is the information, and I expect you to do this in this interaction pattern”
- Events (EDA): “Anyone - This happened - do what you will about it”

Coupling Type	SOA	HL7 Messaging	EDA
Business Function	Tight	Tight	Loose
Business Process	Loose	Tight	Loose
Technology (Middleware)	Loose	Varies	Varies
Technology (Endpoint)	Loose	Loose	Loose

# SOA and HL7 Messaging

- HL7 WS Profile
  - Is good work, and enables HL7 messages to be transported using SOAP
  - Does not provide a real SOA solution, it is messaging using some of the web service protocols.
    - The methodology is focused on message development
    - HL7 Transmission wrappers overlap with generic SOA capabilities (security, reliable delivery, message identification, correlation etc. are not HL7 specific concerns)
- SOA is a paradigm shift.
  - For example, use of dynamic process orchestration, service composition and policy based intermediary actions.
- SOA and Messaging both have their place, Not an either/or
- The choice of SOA and Messaging is basically orthogonal to semantic data issues (although granularity of payloads may vary)
- Many vendors are doing SOA anyway, so are providers and payers
- Applications may be “HL7 Applications” or not, i.e. care about the full HL7 stack or not, or may just be compatible or even transformable to the RIM

# SOA4HL7 Charter

## •Mission

- Support the HL7 mission to promote and create standards by defining a SOA approach for HL7. The aim is to provide a means to define and implement services in a consistent, interoperable fashion.

## •Work Products / Deliverables

- Architecture Requirements - to ensure SOA benefits can be realized and interoperability maximized
- SOA Framework - leverage existing IT standards to enable services to be consistently identified, described and used in healthcare environments. This should also provide a consistent technical context for HSSP OMG RFP submissions. If possible, include both a “generic” SOA approach and a specific approach for web services.
- Methodology - extensions to the HSSP SDF methodology for creating service definitions and implementations. This should offer a consistent way to define and implement “interim” Services for HL7 V3 (and other healthcare as appropriate) content.  
NOT a replacement for HSSP Services
- V3 Infrastructure Mapping - Define a mapping of current V3 artifacts to the SOA framework.

## •Relationships with Other Groups

- All work will be presented to, and discussed with the Infrastructure and Messaging (INM) TC. As necessary, relationships may be formed with specific HL7 domain committees.

## Progress to date

- The following progress has been made to date
  - Initial discussions within INM and HSSP (through 2005).
  - Agreed with INM co-chairs that SOA SIG would produce proposals and also discuss at this meeting
  - Invited participation from interested parties
  - Several teleconferences have taken place
  - Project materials added to HSSP Wiki (<http://hssp.wikispaces.com/>)
  - Defined and agreed project charter and principles
  - Started main deliverables - requirements , methodology and architecture
  - Reviewed approach in OMG HDTF / HSSP meeting at OMG St Louis

## Plan

- Current outline plan, subject to discussion in INM Out of Cycle meeting
  - Complete current planned deliverables – requirements, methodology, architecture (aim for end July)
  - Review within SOA SIG (Aug)
  - Bring to INM to get agreement on basic approach and discuss the way to bake into HL7 V3 standard (separate ITS or other mechanism?) (Sep WG)
  - May ballot as “Informative” document (timing TBD)
  - Where appropriate, review with other HL7 groups and IHE representatives
  - Then produce appropriate standards material for HL7 ballot

## References

- HSSP Wiki
  - <http://hssp.wikispaces.com>
- HL7 Website:
  - <http://www.hl7.org>
- OMG Website:
  - <http://www.omg.org>

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⋮⋮⋮ Thank you!

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