

Integrating the Publishing Environment

Trainer IHE Academy & Senior Consultant MedicalPHIT

Actively involved in:

- Regional information exchange networks
- Semantics
- IHE XDW (workflows)
- Business Intelligence

HL7/IHE roles:

- IHE Connectathon manager (Monitor)
- Contributor to European IHE profile development
- IHE Netherlands *technical manager (2010-2012)*



Agenda

- ◆ Necessity of workflows
- ◆ IHE methodology, recap
- ◆ Connectathon
- ◆ Exercise
- ◆ General profiles, XDS
- ◆ General profiles, BPPC
- ◆ EVS-client
- ◆ General profiles, XUA
- ◆ General profiles, ATNA

Workflow related challenges

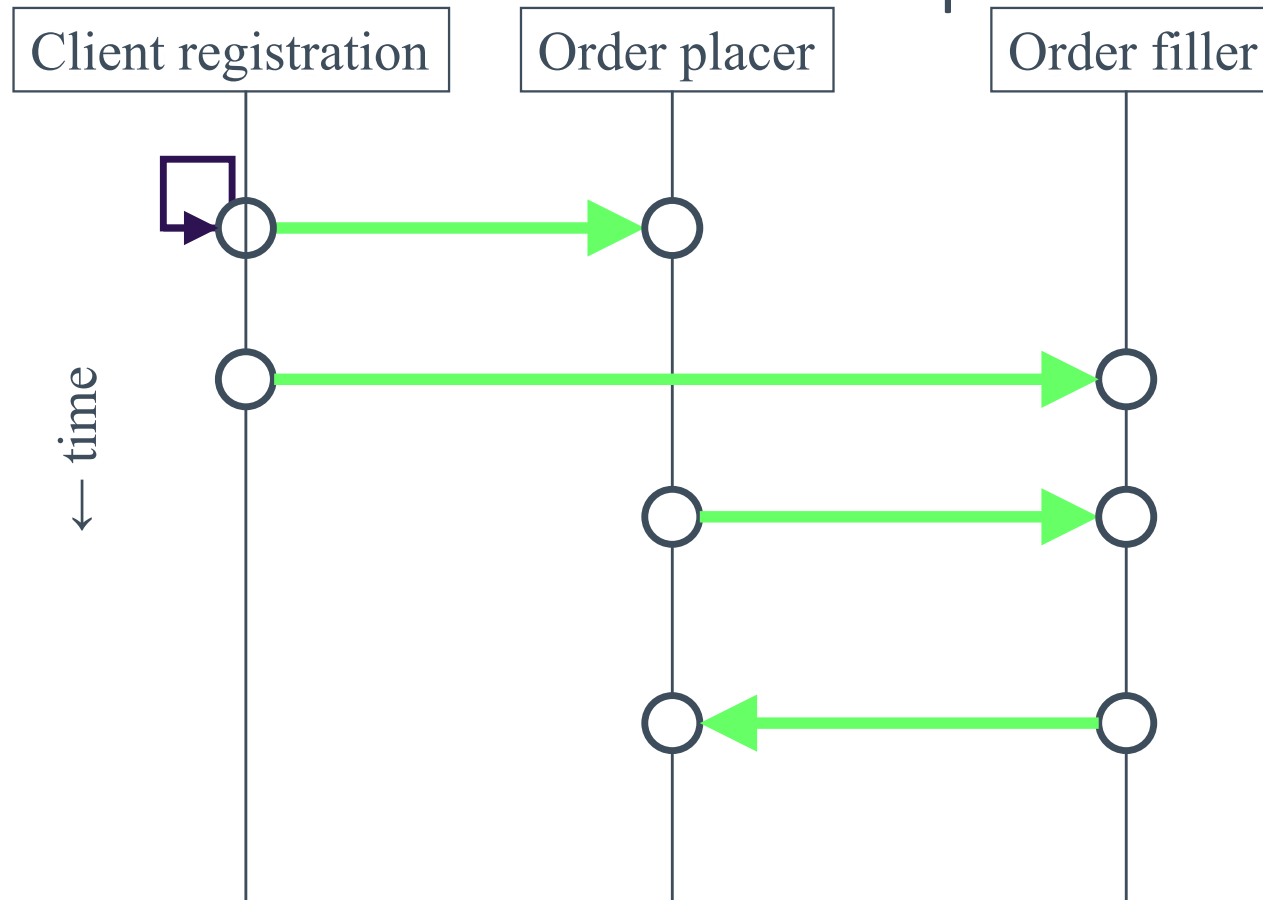
- ◆ Major challenges : application interoperability
 - ◆ Applications contain data needed by other systems
 - ◆ Application interfacing quite often a challenge
- ◆ Consequences
 - ◆ Suboptimal workflows, no workflow management
 - ◆ redundant, inconsistent, or non-available data

Example: a Cath lab



- Multiple re-entry of Patient ID
- Error prone
- Results fragmented across systems
- Results inconsistently time-tagged
- Custom solutions needed for data sharing
- Difficult to manage
- Uncoordinated with Hospital Information System – demographics, orders, billing
- Ad hoc scheduling of labs

Workflow Description



IHE Methodology Recap

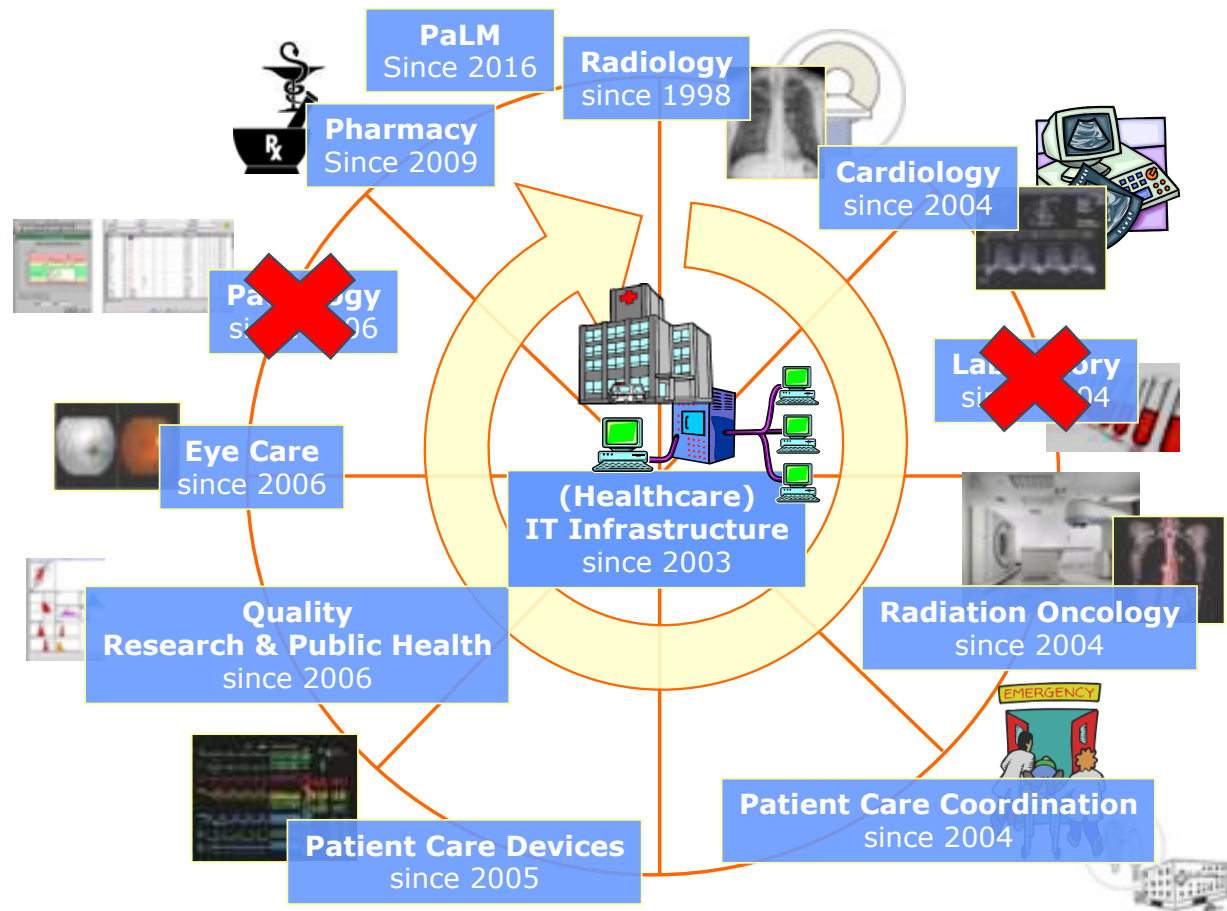
Intro IHE

- ◆ IHE = Integrating the Healthcare Enterprise
- ◆ Based on *existing* standards such as HL7 and DICOM
- ◆ IHE is not a standard; it is a *constraint profile (a.k.a conformance profile)*.

What is IHE?

- ◆ IHE is a global initiative of health care professionals and IT vendors
- ◆ IHE promotes the coordinated use of standards to address the specific health care needs
 - ◆ e.g. DICOM, HL7, ASTM, SNOMED CT, XML, SOAP

IHE Domains

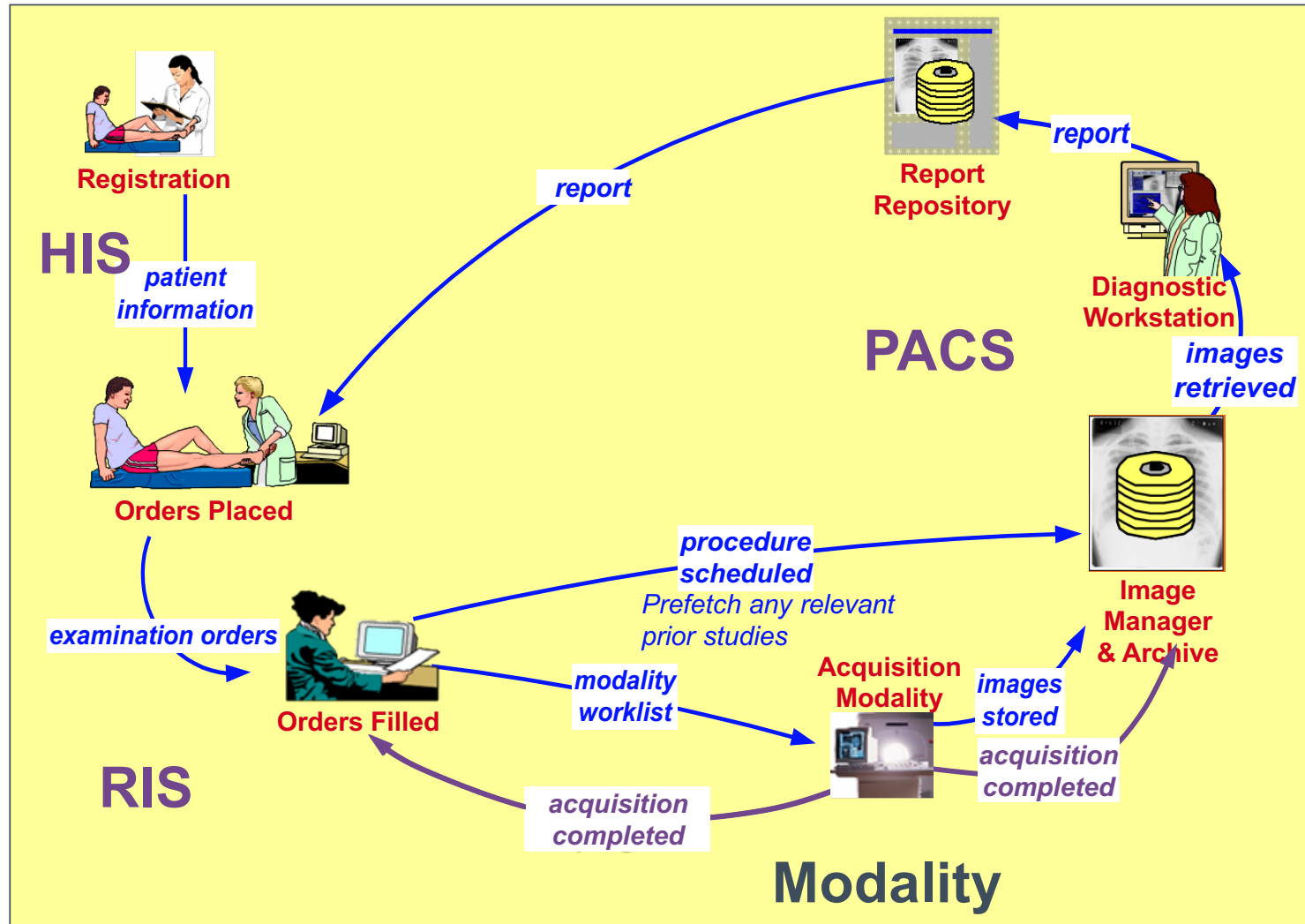


Technical Framework -Contents

- ◆ Introduction to IHE
- ◆ Volume 1: Actors and Transactions
- ◆ Volume 2: Messaging Details

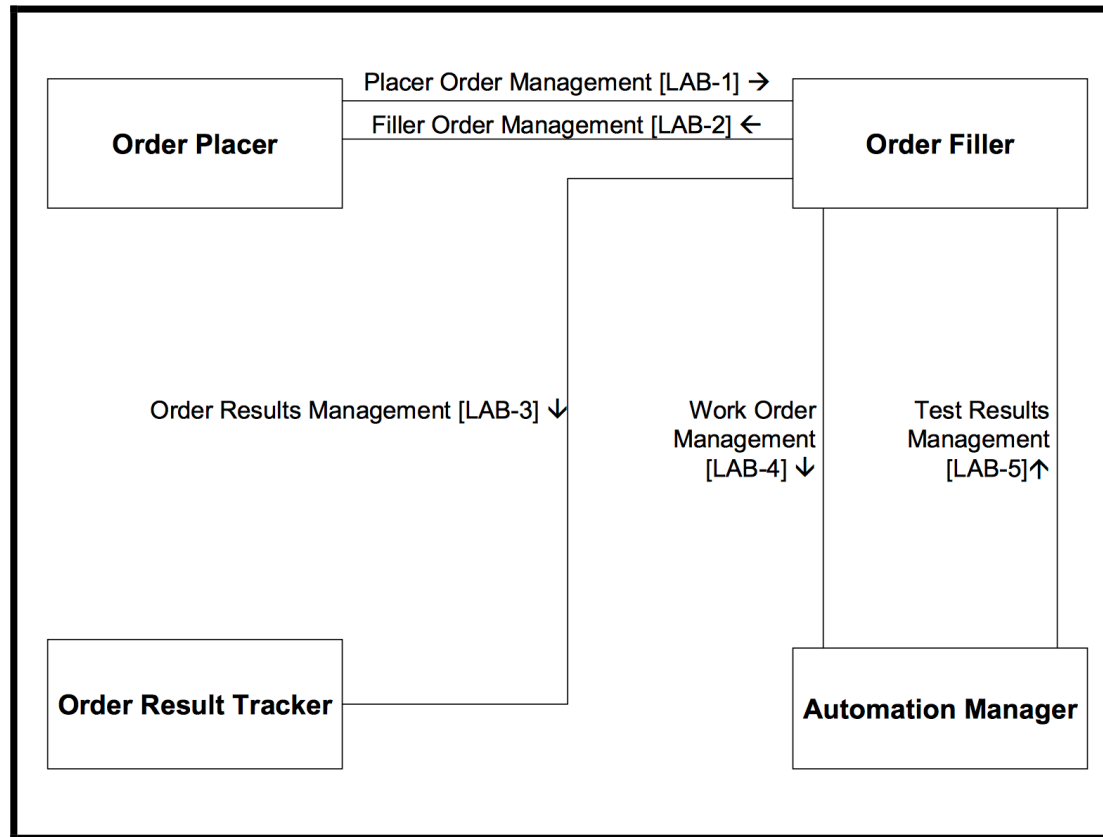
The IHE Technical Framework allows for a better, faster implementation of interfaces, leading to a higher level of management of orders and results.

Radiology Scheduled Workflow



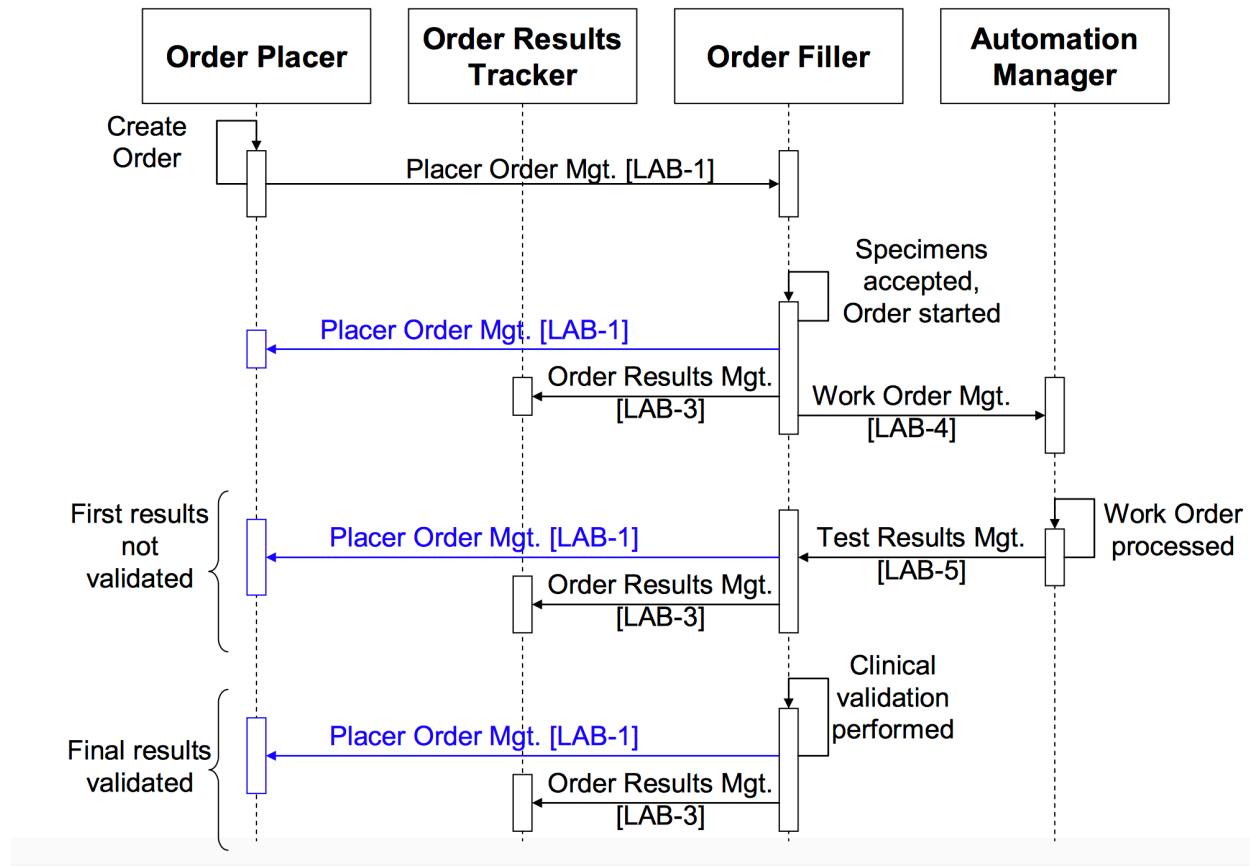
Introduction: Workflow Actor Diagram

Example: Laboratory Testing Workflow

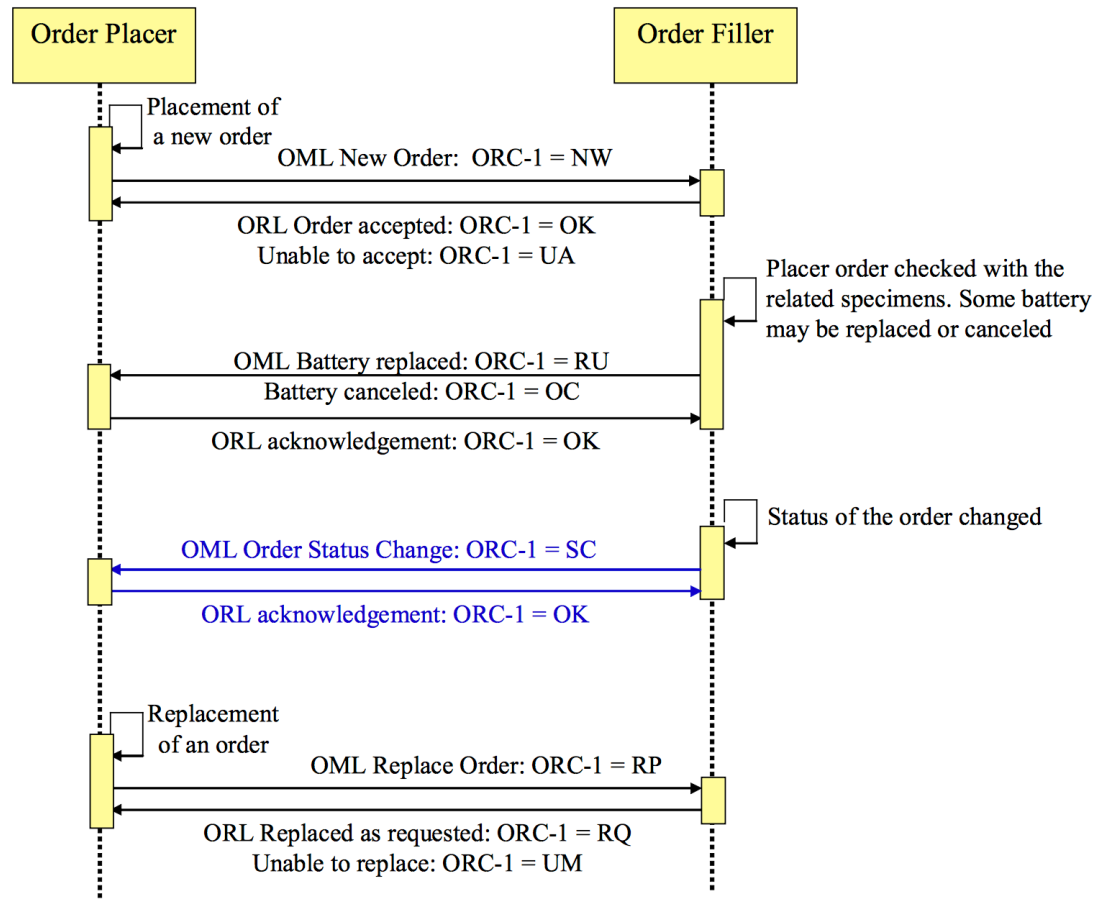


ADT
Order Placer
Order Filler
Automation Manager
Order Result Tracker

Vol.1: Transaction Diagram, Placer Order



Vol.2: Interaction Diagram (LAB-1)

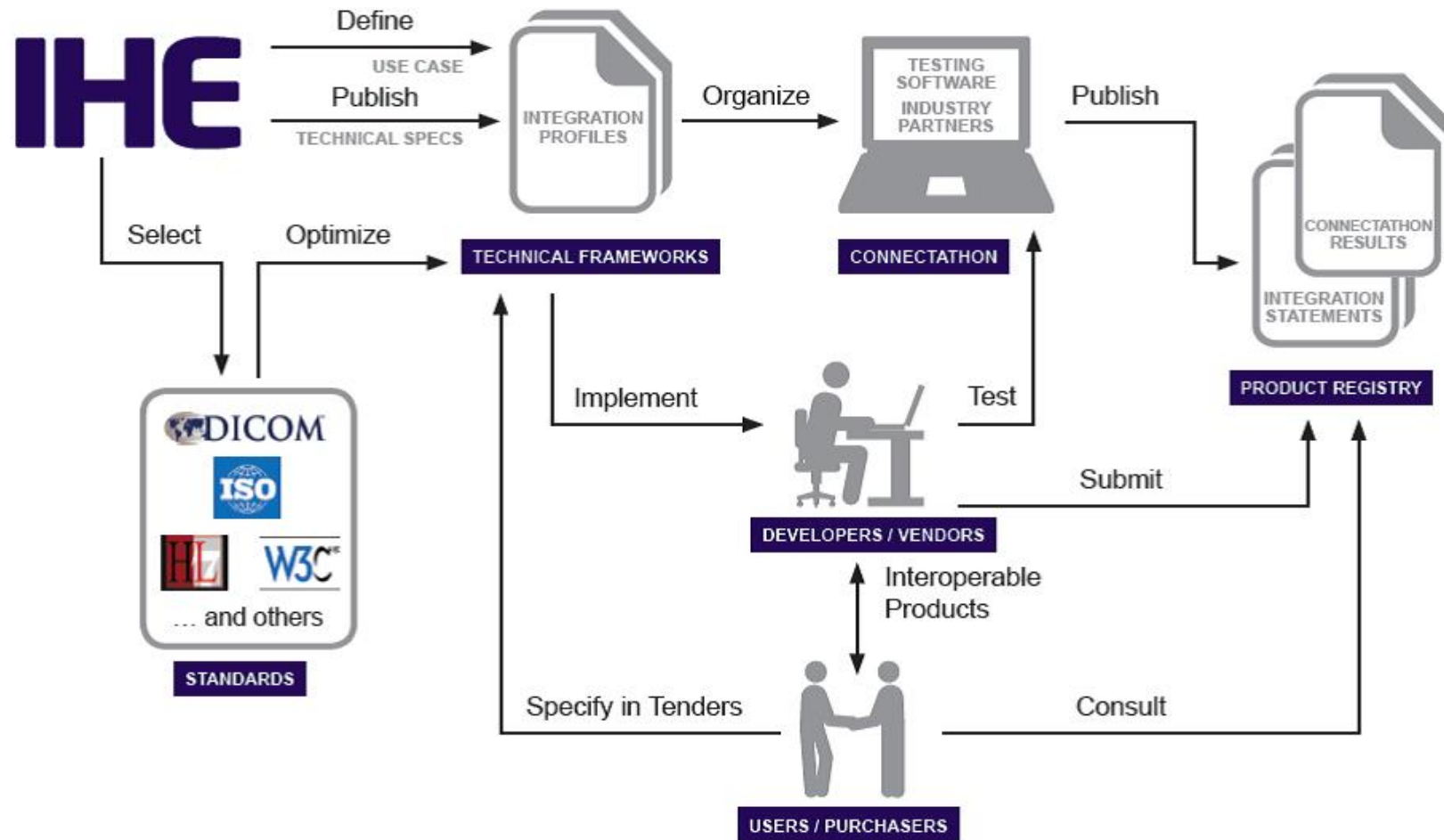


Actors and Transactions

- ◆ Actor (HL7: Application Role, DICOM: Service Class)
 - ◆ Functional grouping of the capability to exchange a specific set of Transactions in order to fulfill part of a workflow.
- ◆ Transaction
 - ◆ (Functional) Information exchange
 - ◆ Abstract concept, could be the equivalent of multiple message exchanges or service calls.

Connectathon

Proven Standards Adoption Process



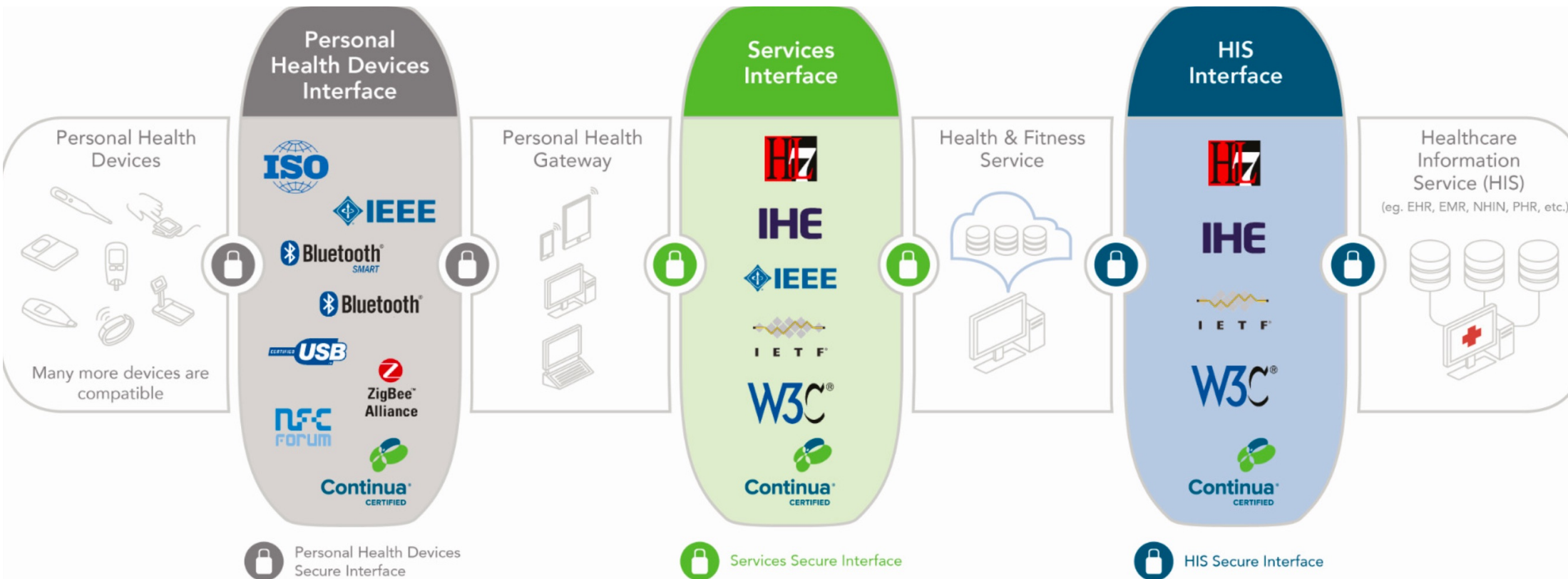
IHE Connectathons



Conformance: IHE Integration Statement

IHE Integration Statement			
Vendor	Product Name	Version	Date (dd/mm/yyyy)
Big Medical Buisness	RIS2003	3.4	15/10/2003
Integration Profiles Implemented	Actors Implemented	Options Implemented	
Scheduled Workflow	Department System Scheduler/Order Filler	None	}
Scheduled Workflow	Performed Procedure Step Manager	None	
Patient Information Reconciliation	Department System Scheduler/Order Filler	None	
Internet address for vendor's IHE information :			
http://www.big-buisness.com			
Links to Standards Conformance Statements for the implementation			
Health Level 7	http://www.big-buisness.com/HL7		
Dicom	http://www.big-buisness.com/DICOM		
Links to general information on IHE			
In North America: http://www.rsna.org/IHE	In Europe: http://www.ihe-europe.org	In Japan: http://www.jira-nct.or.jp/ihe-j	
http://www.rsna.org/IHE In North America:	http://www.ihe-europe.org In Europe:	http://www.jira-nct.or.jp/ihe-j In Japan:	
Links to general information on IHE			
Dicom	http://www.big-buisness.com/DICOM		

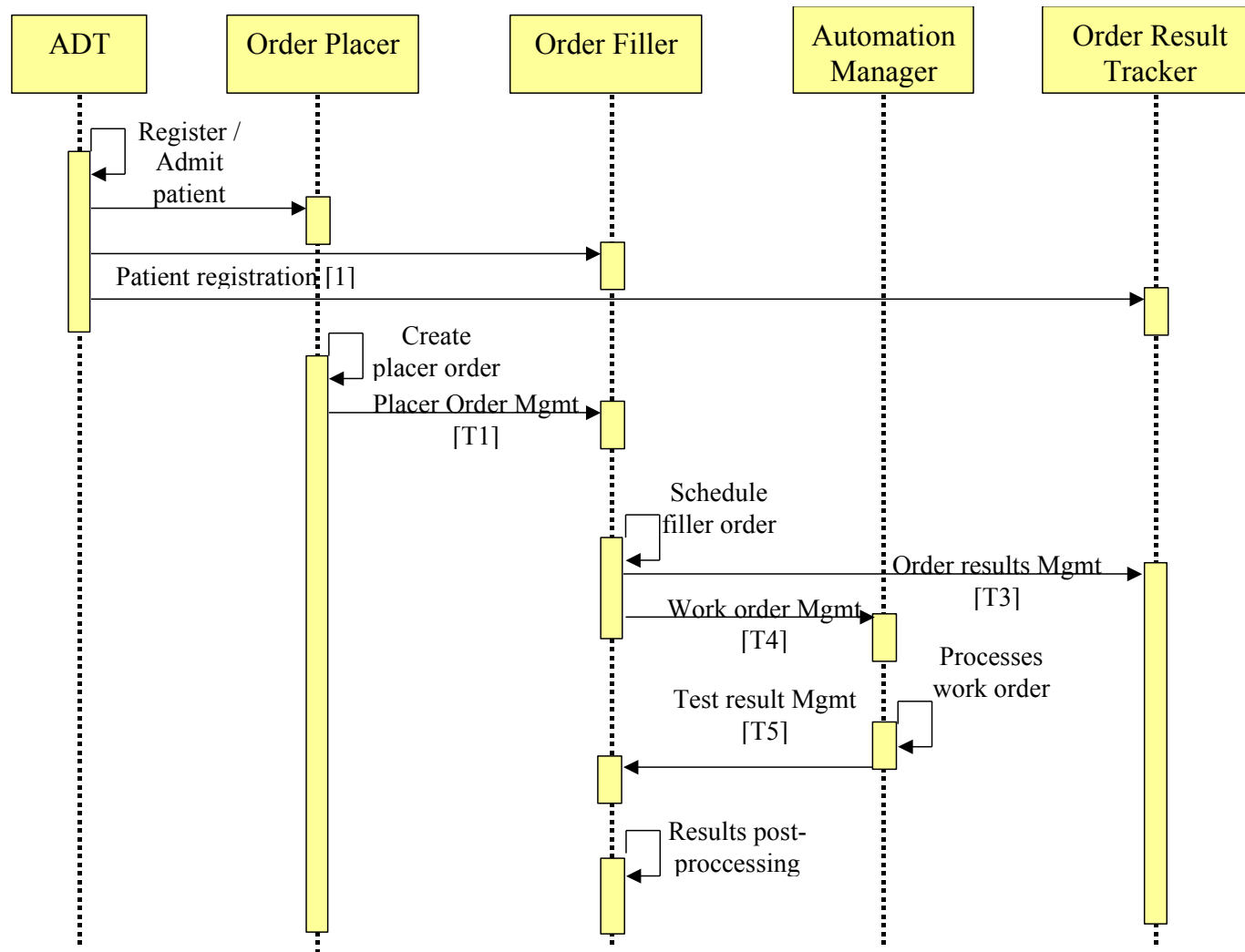
Personal Connected Health Alliance



Personal
Connected
Health
Alliance

IHE
ACADEMY | learn
share
connect

Exercise



European committee

27 IHE profiles suggested by European committee

- (6) Na raadpleging van het Europese multistakeholderplatform inzake ICT-normalisatie dat is opgericht bij Besluit 2011/C 349/04 van de Commissie ⁽¹⁾, aangevuld met andere vormen van raadpleging van deskundigen uit de bedrijfstak, moet het besluit om de ICT-specificaties vast te stellen worden goedgekeurd.
- (7) Op 2 oktober 2014 heeft het Europese multistakeholderplatform inzake ICT-normalisatie 27 profielen op het gebied van „Integrating the Healthcare Enterprise” (IHE) geëvalueerd aan de hand van de voorschriften van bijlage II bij Verordening (EU) nr. 1025/2012 en heeft het een positief advies uitgebracht over de vaststelling daarvan als referentie bij overheidsopdrachten. De evaluatie van de 27 IHE-profielen is vervolgens ter raadpleging voorgelegd aan het e-gezondheidsnetwerk dat is opgericht bij artikel 14 van Richtlijn 2011/24/EU van het Europees Parlement en de Raad ⁽²⁾; dit netwerk heeft het positieve advies over de vaststelling onderschreven.
- (8) IHE ontwikkelt technische ICT-specificaties voor gezondheidszorginformatie. De 27 IHE-profielen zijn gedetailleerde specificaties die in een periode van 15 jaar door de IHE-comités zijn opgesteld ter optimalisatie van de selectie van gevestigde normen waarin de verschillende interoperabiliteitslagen (d.w.z. protocolcommunicatie, technisch, syntactisch, semantisch en applicatieniveau) zijn beschreven, teneinde interoperabiliteitsoplossingen voor de uitwisseling of het delen van medische gegevens te vinden.
- (9) De 27 IHE-profielen kunnen de interoperabiliteit van diensten en applicaties op het gebied van e-gezondheid vergroten in het belang van patiënten en de medische wereld. De 27 IHE-profielen moeten derhalve worden vastgesteld als technische ICT-specificaties waarnaar in overheidsopdrachten kan worden verwezen,

HEEFT HET VOLGENDE BESLUIT VASTGESTELD:

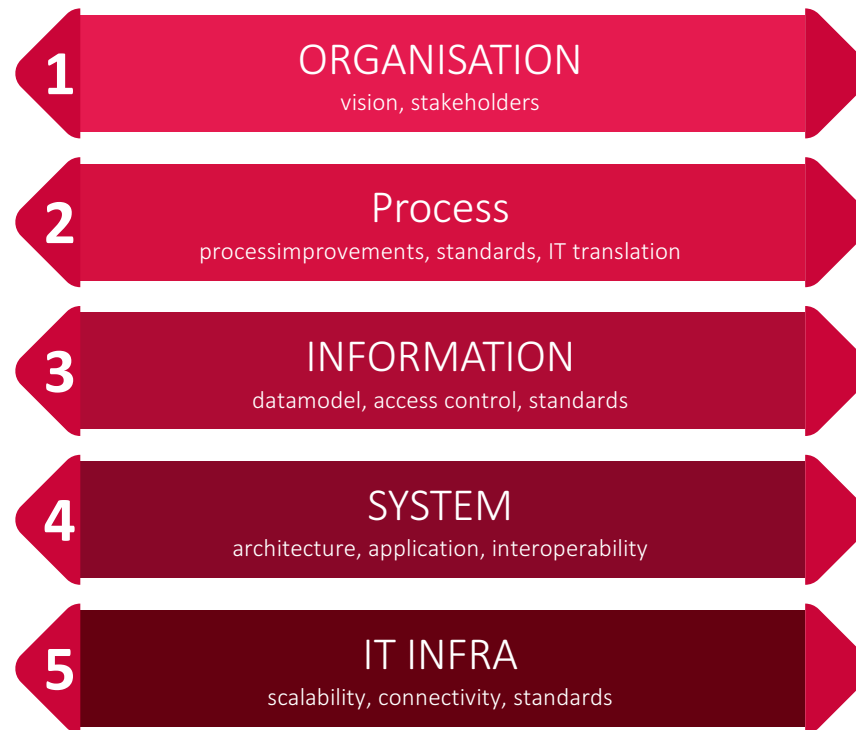
27 public procurement profiles

1. IHE XCPD: Cross-Community Patient Discovery;
2. IHE XCA: Cross-Community Access;
3. IHE XCF: Cross-Community Fetch;
4. IHE XDR: Cross-Enterprise Document Reliable Interchange;
5. IHE CT: Consistent Time;
6. IHE ATNA: Audit Trail and Node Authentication;
7. IHE BPPC: Basic Patient Privacy Consents;
8. IHE XUA: Cross-Enterprise User Assertion;
9. IHE PRE: Pharmacy Prescription;
10. IHE DIS: Pharmacy Dispense;
11. IHE XPHR: Exchange of Personal Health Record Content;
12. IHE XD-MS: Cross-Enterprise Sharing of Medical Summaries Integration Profile;
13. IHE XD-SD: Cross-Enterprise Sharing of Scanned Documents;
14. IHE PIX: Patient Identifier Cross-Referencing;
15. IHE PDQ: Patient Demographics Query;
16. IHE XDS.b: Cross-Enterprise Document Sharing;
17. IHE XDS-I.b: Cross-Enterprise Document Sharing for Imaging;
18. IHE XD-LAB: Laboratory Reports;
19. IHE XDM: Cross-Enterprise Document Media Interchange;
20. IHE SVS: Sharing Value Sets;
21. IHE SWF: Radiology Scheduled Workflow;
22. IHE SWF.b: Radiology Scheduled Workflow;
23. IHE PIR: Patient Information Reconciliation;
24. IHE PAM: Patient Administration Management;
25. IHE LTW: Laboratory Testing Workflow;
26. IHE LCSD: Laboratory Code Sets Distribution;
27. IHE LWA: Laboratory Analytical Workflow.

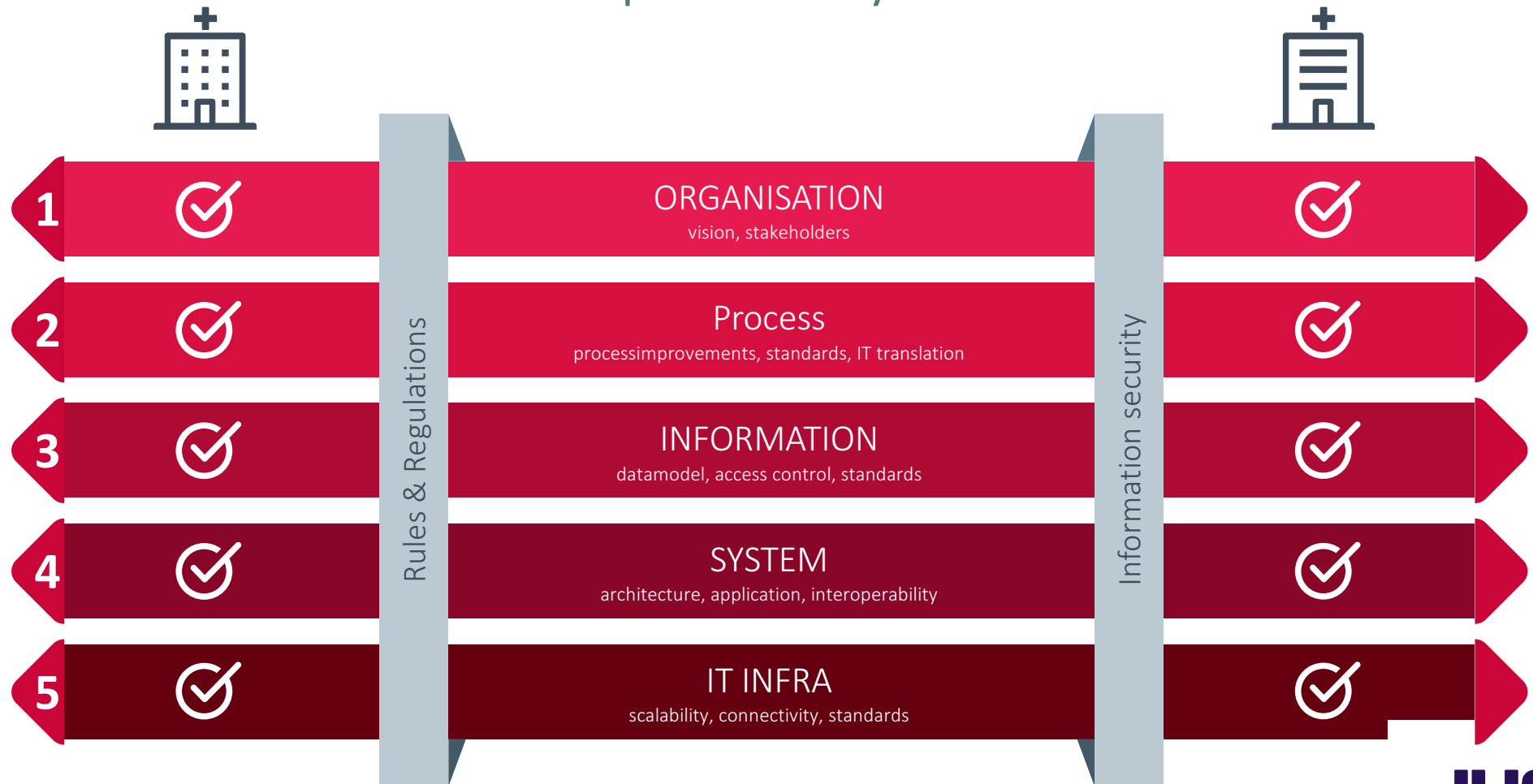
Interoperability model



Interoperability model



Interoperability model



General profiles

Cross-enterprise document sharing (XDS)

Documents

Structured Content



~20% of Enterprise Content

Unstructured Content



~80% of Enterprise Content

Source: Oracle

XDS: Purpose

- ◆ Manage the sharing of documents between healthcare enterprises – healthcare enterprises within a XDS affinity domain.
- ◆ Document content neutral.

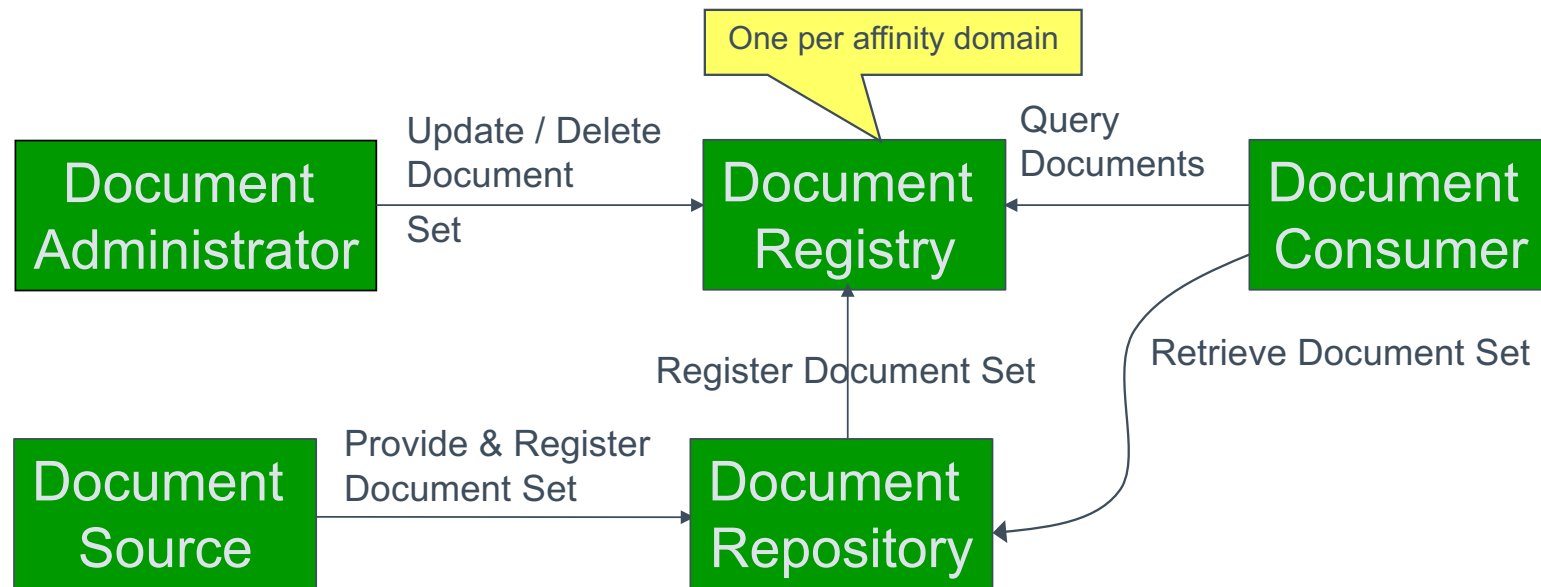
Affinity Domain

- ◆ 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.
 - ◆ Includes patient identification, consent, security, vocabularies, format and representation of clinical data

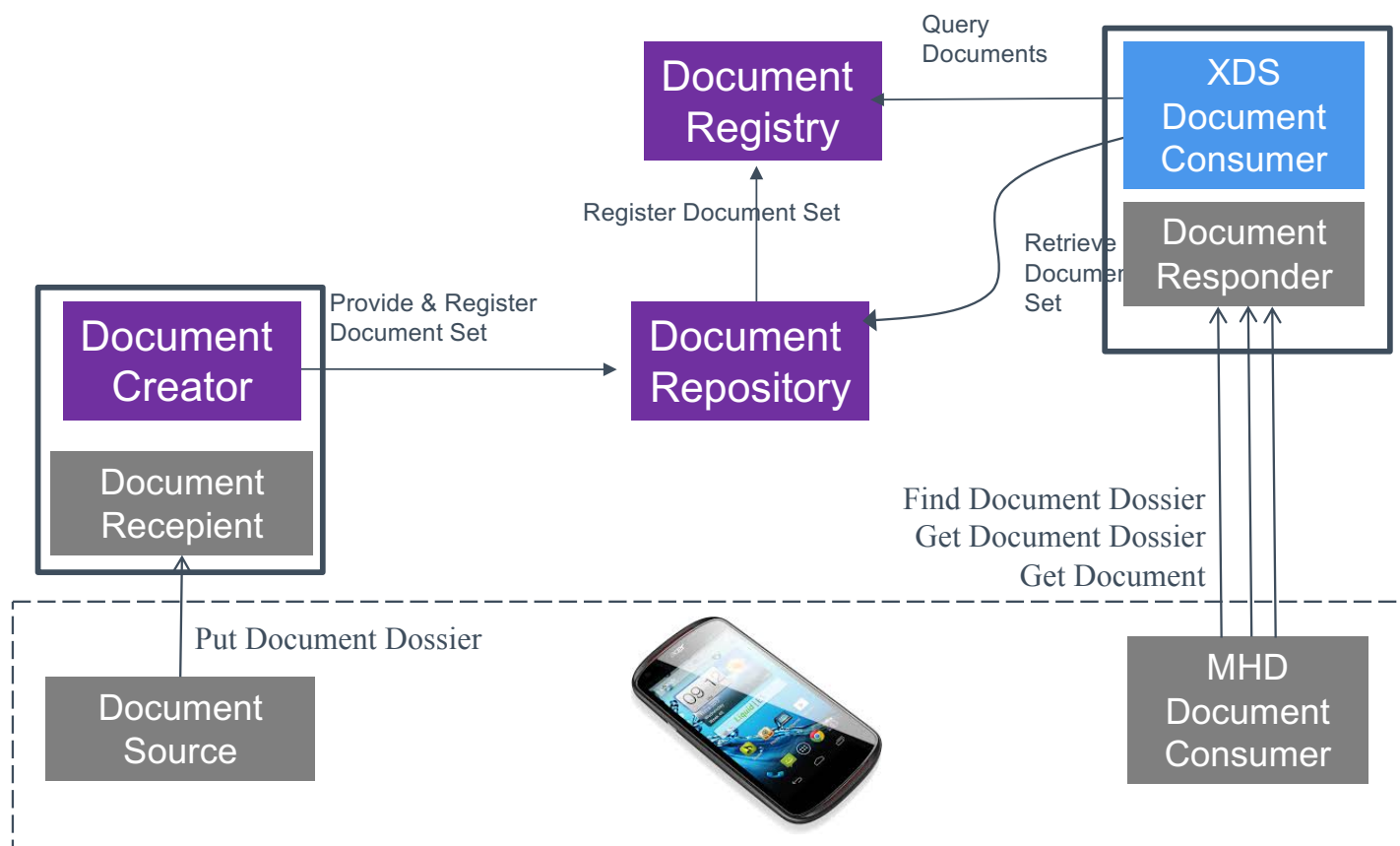
Establish a community

- ◆ Introduction.
- ◆ Glossary
- ◆ Reference Documents
- ◆ Organizational Rules
- ◆ Operational Rules
- ◆ Membership Rules
- ◆ Connectivity to the XDS Affinity Domain from External Systems
- ◆ System Architecture
- ◆ Terminology and Content
- ◆ Patient Privacy and Consent
- ◆ Technical Security

XDS Profile

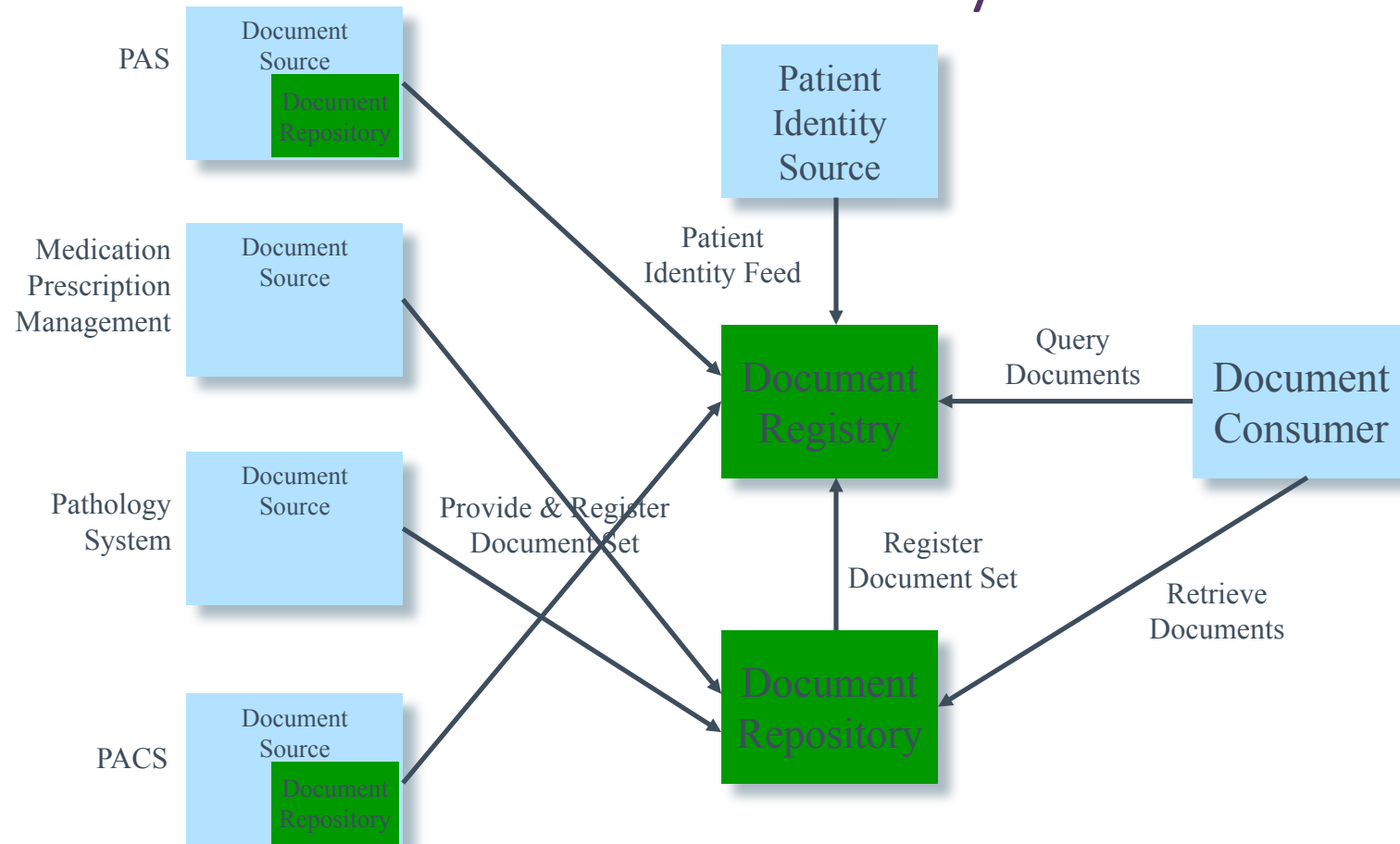


IHE XDS/MHD Profiles (API and JSON)



RESTful services; XML/JSON Resource-like objects
Intent is to harmonize with HL7 FHIR

XDS Flexibility



XDS DocumentEntry meta-data

- ◆ *Patient*: Affinity domain id, demographics (id, name, birth date...) « as viewed by the source »
- ◆ *Origin*: author, institution, legal authenticator
- ◆ *Identification*: unique id, dates of creation and start /end of medical act, title, parent document, unique id of the repository
- ◆ *Classification*: class, type, format, MIME type, type and specialty of institution and author, medical codes, confidentiality level, language
 - ◆ Required, If known, Recommended

Example Issue #1

Documents & Images are not found

Echo onderbuik
- versus -
US Abdomen

Patients Birt...	Patient Sex	Modality	Series Description
12-04-1956	M	US	Echo Onderbuik
19-09-1992	M	SR	
11-09-1962	M	KO	XDS
19-05-1983	F		
27-01-1948	M		
25-06-1968	M		
26-06-1954	M		
16-03-1953	M		
12-04-1956	M		
06-03-1985	M		
06-03-1985	M		
01-10-1955	M		
02-02-1948	M		

Study Description	Diagnose	Content Time	Instance Num
US Abdomen	✓ Diagn	15:24:19	9
US Abdomen	✓ Diagn	15:54:14	1
		15:54:31	999

Example: Image Source

Information doesn't make sense

IP Address,
Department name,
Patient Id

Source	
AMC-ERADIOLOGIE	
194.171.114.1	
194.171.114.1	
AMC-ERADIOLOGIE	
AMC-ERADIOLOGIE	
194.171.114.1	
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AMC-ERADIOLOGIE	
pait188-83	
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pait188-83	
194.171.114.1	
AMC-ERADIOLOGIE	

General profiles

Basic Patient Privacy Consent (BPPC)

Policies

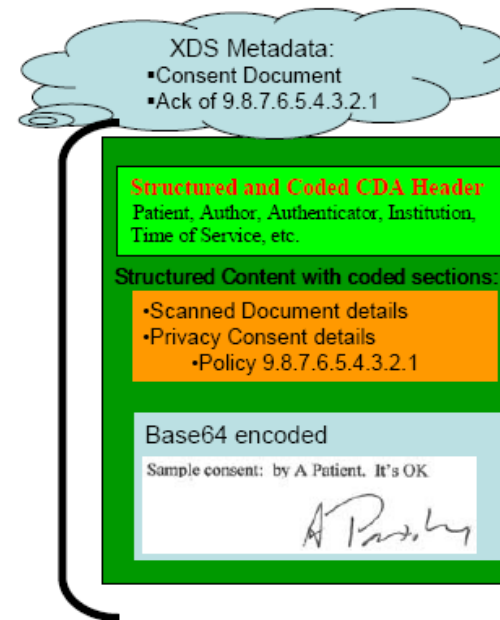
- ◆ An Affinity Domain can
 - ◆ develop privacy policies,
 - ◆ and implement them with role-based or other access control mechanisms supported by EHR systems.
- ◆ Trend towards
 - ◆ Policy Based Access Control (PBAC)
 - ◆ A default RBAC Policy
 - ◆ Individual policies as defined by patient

BPPC: Purpose

- ◆ The Basic Patient Privacy Consents (BPPC) profile provide mechanisms to:
 - ◆ Record the patient privacy consent(s) as document
 - ◆ Published those documents to XDS (within an affinity domain) jointly with the patient privacy consent that was used to authorize the publication,
 - ◆ Enforce the privacy consent appropriate to the use.

Workflow: Capturing Patient Consent

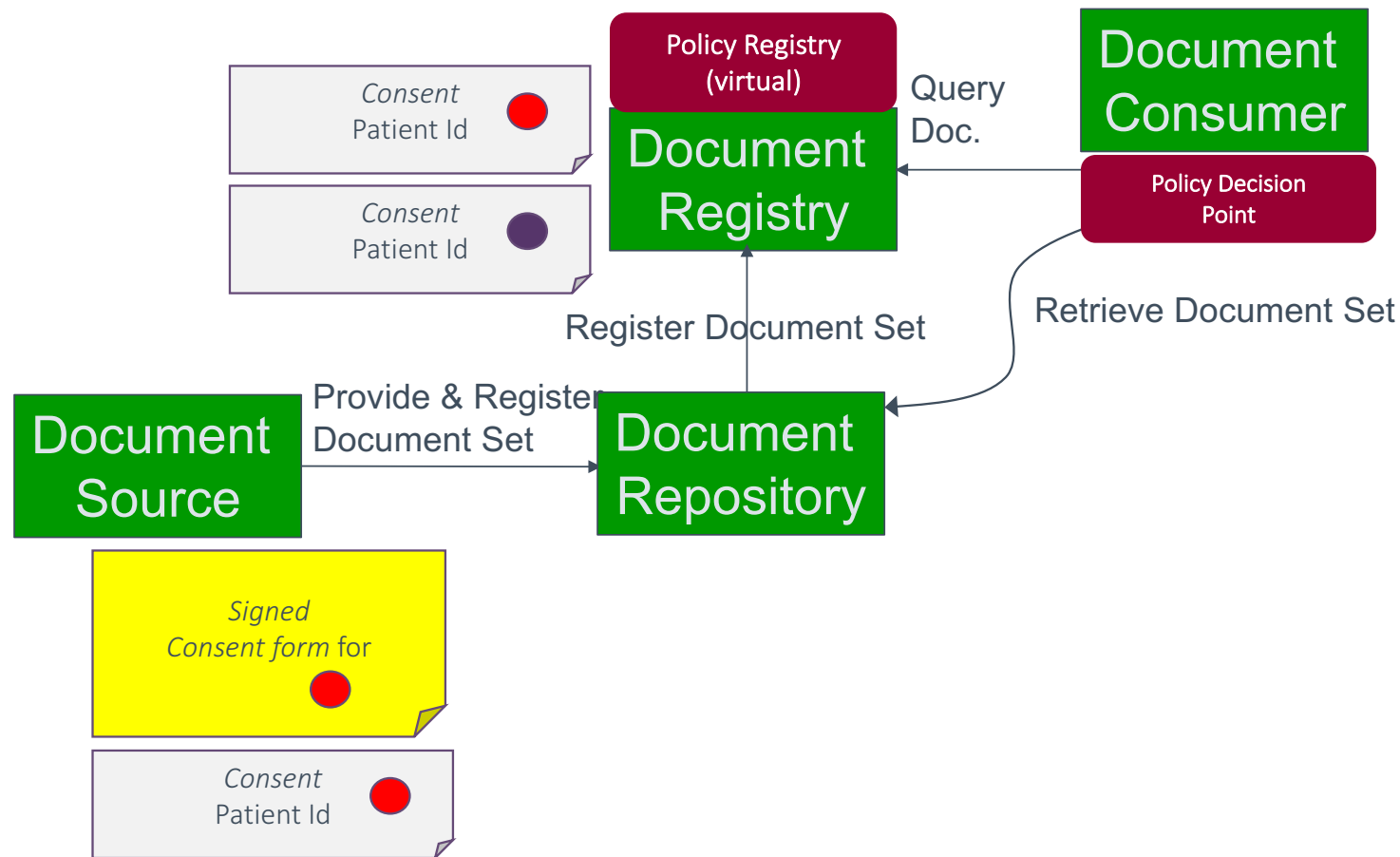
- Store human readable consent as a CDA R2 document in the XDS Repository.
- Identifies the specific policy or policies.
- eventCodeList in metadata: the list of the identifiers of the policies (e.g. 9.8.7.6.5.4.3.2.1) ●



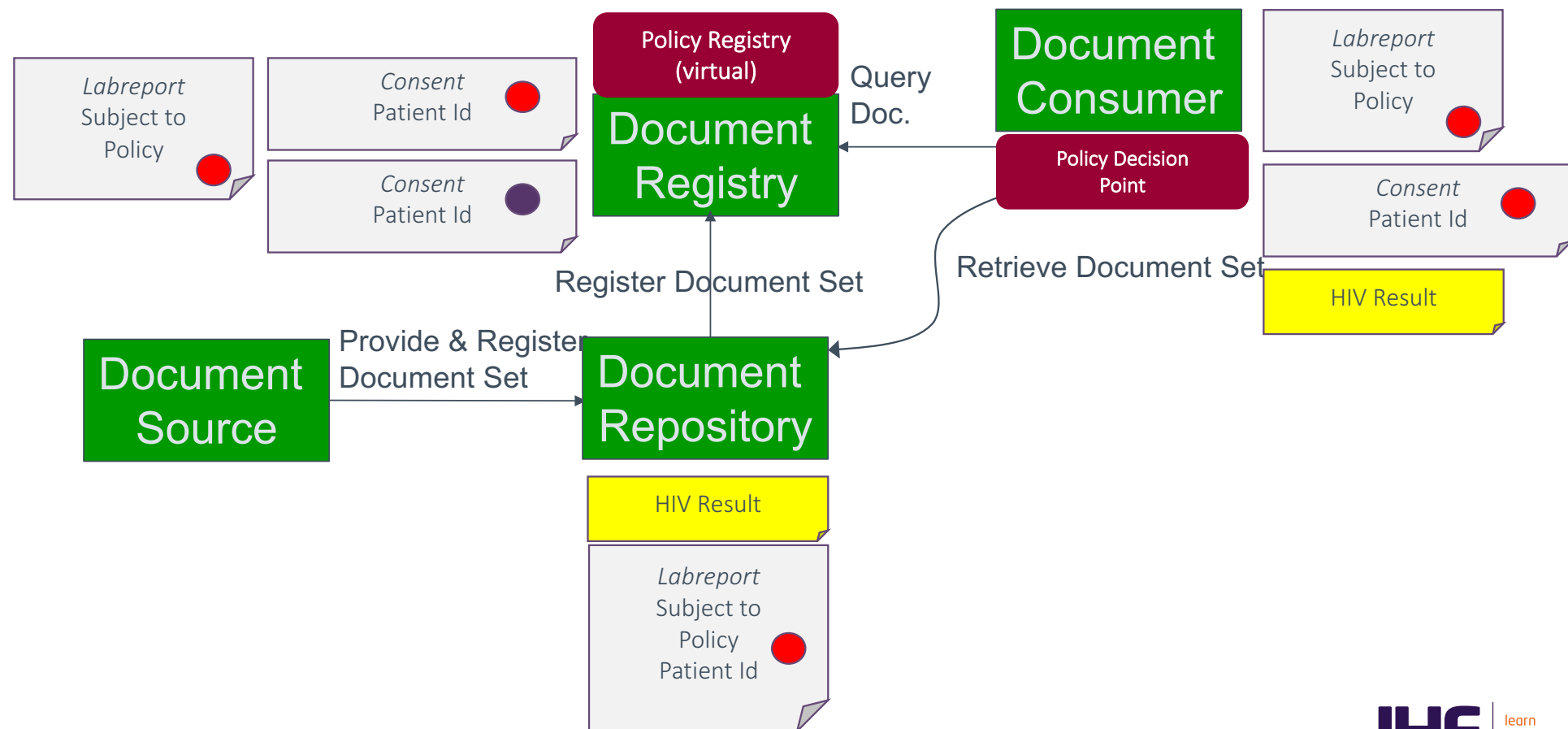
BPPC enables

- ◆ Basic opt-in and opt-out
- ◆ Specific use cases: authorize a specific use
- ◆ Control publish and pull
- ◆ Time based consent (episode based)
- ◆ Site specific consent

BPPC, Capturing Consent



BPPC, Verifying Consent



Gazelle EVS-client

Validating Messages and documents

General profiles

Cross-enterprise User Authentication (XUA)

Access Control

High level goals:

- ◆ Protecting the patient's privacy and right to self-determination
- ◆ Ensuring the integrity and proper handling of health data
- ◆ Enforcing an adequate risk management within organizations

Policies

- ◆ An Affinity Domain can
 - ◆ develop privacy policies,
 - ◆ and implement them with role-based or other access control mechanisms supported by EHR systems.
- ◆ Trend towards
 - ◆ Policy Based Access Control (PBAC)
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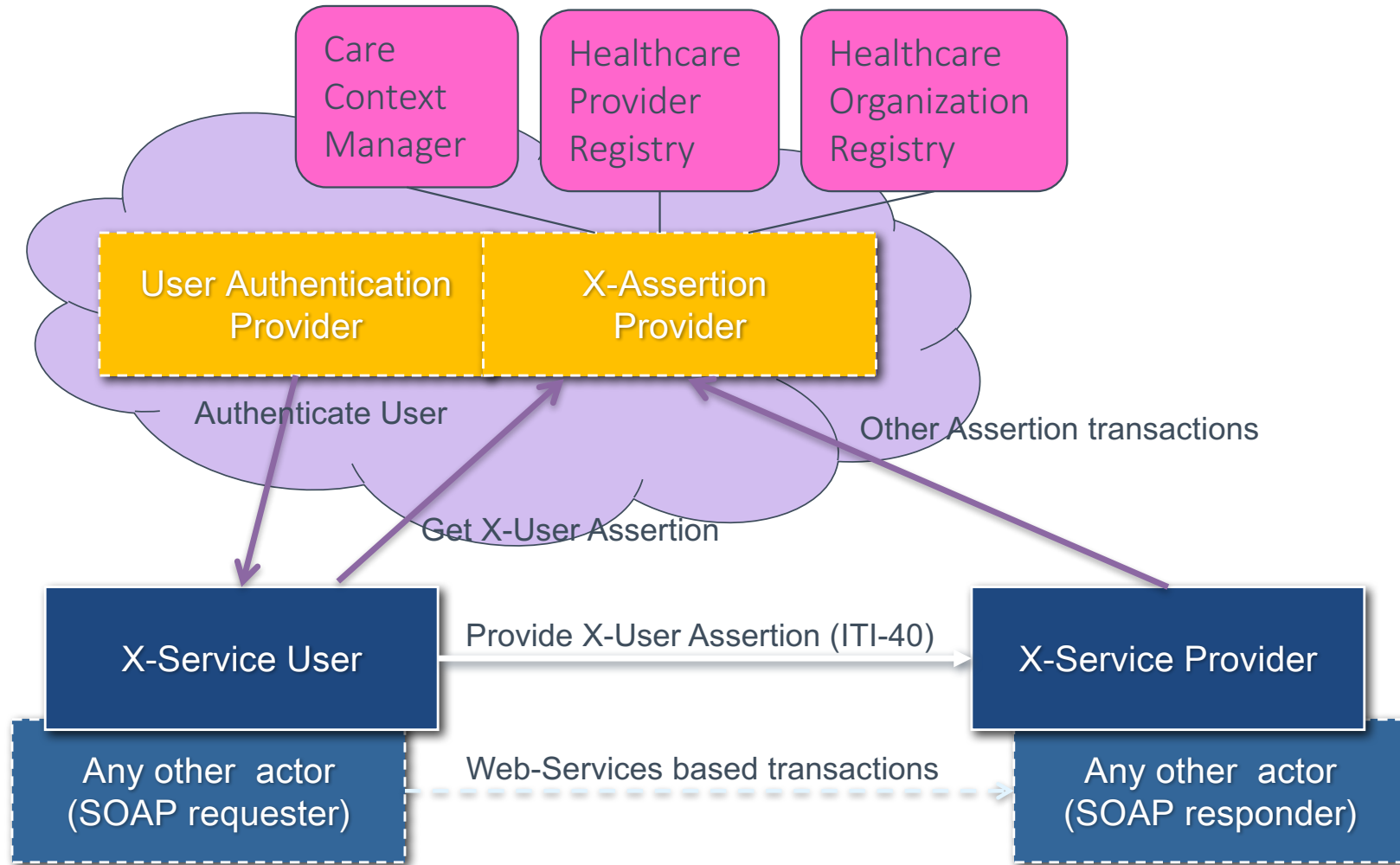
XUA Profile: Value Proposition

- ◆ Allow User Identity to be used in the entire Affinity Domain
 - ◆ Users include Providers, Patients, Clerical, etc
 - ◆ Must support cross-enterprise transactions, can be used inside enterprise
 - ◆ Distributed or Centralized Identity management (Directories)
- ◆ Provide information necessary so that receiving actors can make Access Control decisions
 - ◆ Authentication mechanism used
 - ◆ Attributes about the user (roles)
 - ◆ Does not include Access Control mechanism

XUA: Standards Used

- ◆ WS-I Basic Security Profile 1.1
- ◆ SAML 2.0 Token Profile and the various profiles from W3C, and OASIS to support identity federation
 - ◆ Does not constrain 'how' the Assertion was obtained
- ◆ If XUA is used compliant IHE Web-Services transactions will *additionally* use the Web-Services Security header with a SAML 2.0 Token containing the identity Assertion.

ITI-40 Provide X-User Assertions



XUA: assertion attributes

- ◆ Healthcare provider
 - ◆ Subject-Id (name of healthcare provider)
 - ◆ Subject-Role (RBAC)
 - ◆ National Provider Identifier
- ◆ Patient / care context
 - ◆ Patient ID
 - ◆ *Encounter-Organization-Id (healthcare organization) **
 - ◆ *Encounter-Id **
- ◆ Authz-Consent
 - ◆ Other consent/Authorization evidence
- ◆ Purpose of Use
 - ◆ Care provision, research, population health, emergency (break glass) ..

* Affinity Domain specific SAML Tokens

General profiles

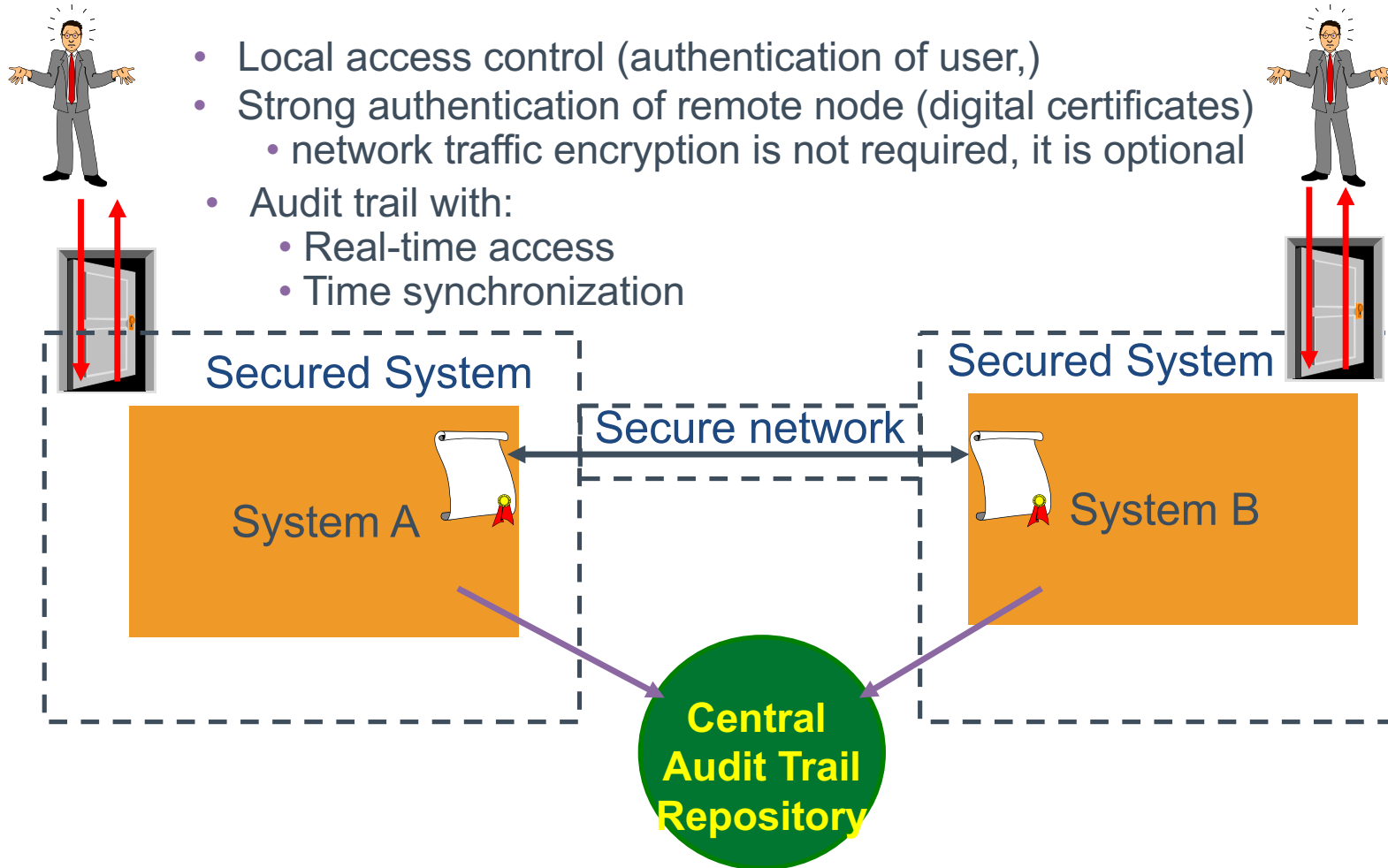
Audit Trail and Node Authentication (ATNA)

ATNA - Purpose

◆ Purpose of ATNA is twofold:

1. *Node to node authentication* : Host authentication as a basis for access controls
2. *Centralized privacy audit trail*: Secure node is responsible for secure audit logging

ATNA - Integrating Trusted Nodes



Audit Log - Accountability

- ◆ Mitigation against unauthorized use
 - ◆ Investigate Audit log for patterns and behavior outside policy. Enforce policy
 - ◆ Secure Node requires appropriate Access Controls to enforce at the enterprise by XDS Source and Consumers
- ◆ Investigation of patient complaints
 - ◆ Investigate Audit log for specific evidence
 - ◆ ATNA Audit Repositories can filter and auto-forward
- ◆ Support an Accounting of Disclosures
 - ◆ ATNA Report is informed by XDS-Export + XDS-Import

Auditing System

- ◆ Designed for surveillance rather than forensic use.
- ◆ IETF Audit message format (RFC-3881)
 - ◆ Stable, generic
 - ◆ See www.xml.org/xml/schema/7f0d86bd/healthcare-security-audit.xsd
- ◆ XML encoded messages, permitting extensions using XML standard extension mechanisms.

ATNA: Auditable Events

Actor-start-stop	The starting or stopping of any application or actor.
Audit-log-used	Reading or modification of any stored audit log
Begin-storing-instances	The storage of any persistent object, e.g. DICOM instances, is begun
Health-service-event	Other health service related auditable event.
Images-availability-query	The query for instances of persistent objects.
Instances-deleted	The deletion of persistent objects.
Instances-stored	The storage of persistent objects is completed.

Questions?

To download the standard: http://www.ihe.net/Technical_Frameworks/

Usefull links

◆ Links:

- ◆ Homepage IHE Netherlands: www.ihe-nl.org
- ◆ IHE wiki (profiles) wiki.ihe.net
- ◆ IHE [Technical Frameworks](http://www.ihe.net/Technical_Frameworks/): [www.ihe.net/Technical Frameworks/](http://www.ihe.net/Technical_Frameworks/)
- ◆ IHE Europe: <http://www.ihe-europe.net/>
- ◆ Connectathon-results.ihe.net
- ◆ Testing tool Gazelle: <https://gazelle.ihe.net/EU-CAT>

Usefull mailgroups

- ◆ European Connectathon : https://groups.google.com/forum/#!forum/eu_connectathon
- ◆ XDS Implementers : <https://groups.google.com/forum/#!forum/ihe-xds-implementors>
- ◆ PCC Implementers : <https://groups.google.com/forum/#!forum/ihe-pcc-implementors>
- ◆ HPD Implementers : <https://groups.google.com/forum/#!forum/ihe-hpd-implementors>
- ◆ MHD Implementers : <https://groups.google.com/forum/#!forum/ihe-mhd-implementors>
- ◆ XDW Implementers : <https://groups.google.com/forum/#!forum/ihe-xdw-implementors>
- ◆ Dicom Web : <https://groups.google.com/forum/#!forum/dicomweb-implementers>

What can we conclude?