

IHE Main Concepts and Domains

Forum e-Zdrowia / eHealth Forum
Gdansk - September 15-16 2016

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IHE International Board Member, GE Healthcare

1. Setting **information exchange policies**

- Topic to which policy makers may relate
- Engages the establishment of a national approval process and chose what requires regulation

2. Select nationally relevant **priority Use Cases**

- Broaden the national governance and the collaborative process
- Pick first three or four use cases

3. Establish high-level **National Interoperability Architecture**

- Implementation generic/distinct from systems building/procurement. Spans the national, regional, local levels. Aligns with the health system organization and IT deployment responsibilities

4. Develop, review and adopt **National Interoperability**

Specifications for the above set of use Cases

- integrate a set of Profiles with national extensions)

5. Offer a corresponding **Testing Platform** (Adopt & Adapt Rigor/Tools) (details in Friday session)

➔ *Ensures that Interoperability is vendor/solutions neutral and efficient for procurement*

➔ *Ensures the best standard/profile given the use case is selected*

➔ *IHE Services assist several countries in one or more of the above steps*

Help is There: Mission of IHE

- IHE improves healthcare by providing specifications, tools and services for interoperability
- IHE engages clinicians, health authorities, industry, and users to develop, test, and implement standards-based solutions to vital health information needs
- IHE is both international (join forces and reuse) and local (autonomous, learn, adopt, deploy and feedback)

Help is There: What is IHE

- IHE: Integrating the Healthcare Enterprise
- IHE uses an open, consensus-based process to engage users, providers and suppliers of health IT solutions to identify and solve interoperability problems
- IHE is:
 - an international SDO of authorities, users and vendors
 - Profiles formally recognized by ISO though being Liaison A
 - Sponsoring and fostering a robust interoperability testing ecosystem (cross-standards, open source tooling, process rigor across entire lifecycle)
 - Directly supportive of ehealth projects (use cases, interoperability specifications, conformity assessment, projectathon, national certification)

IHE Technical Framework

Base Standards

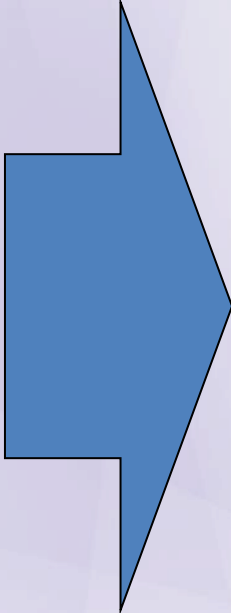
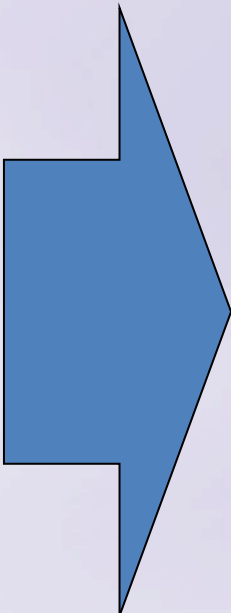
A collection of logos for various base standards organizations, including OASIS, IETF, ISO, W3C, cen, DICOM, IEEE, HL7, ESI, LOINC, ITU, and IHTSDO.

Profile Development

A light blue box containing the IHE logo.

eHealth Projects

A vertical stack of seven orange circles representing eHealth projects.



Project Specific Extensions



Profiling: Combine Standards & Constrains "optionality"

What does IHE deliver ?

- IHE has published a large body of detailed specifications (Profiles) that are being implemented today by healthcare providers and regional platforms to enable standards-based, safe, secure and efficient health information exchange.
- IHE holds periodically test and validation events in Europe, North America and Asia to allow proper verification and validation of systems claiming conformance to IHE Profiles.
 - Connectathon (connectivity marathon)
 - Conformity Assessment
- IHE provides support through IHE Services (Not for profit, shared test tooling, processes, technical adoption).

How does IHE work: Connecting Standards to Care

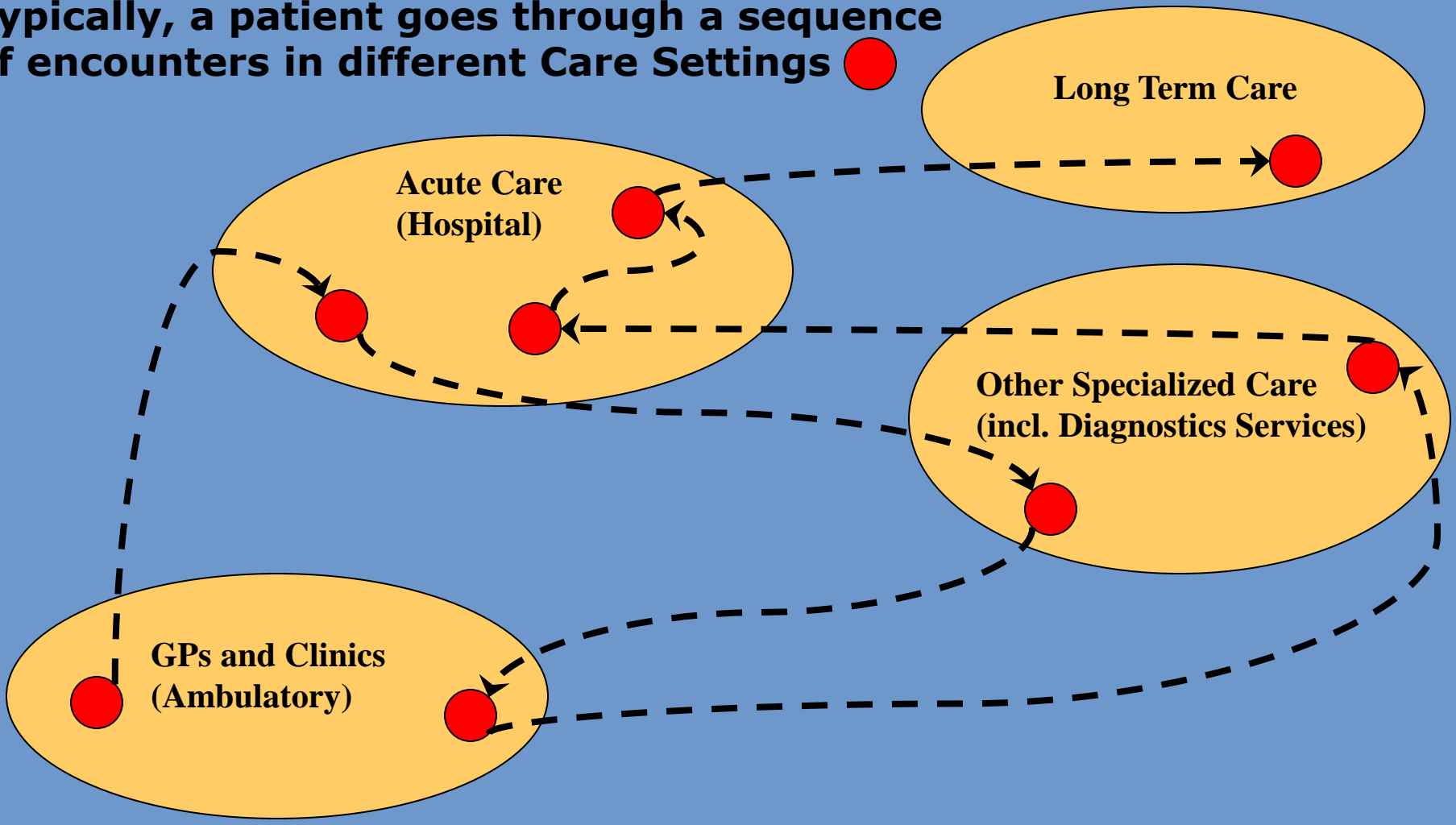
- Healthcare professionals work with industry
- Coordinate implementation of standards to meet clinical and administrative needs
 - Clinicians and HIT professionals identify the key interoperability problems they face
 - Providers and industry work together to develop and make available standards-based and tested specifications
 - Implementers follow common guidelines in purchasing and integrating effective systems

IHE: A forum for agreeing on how to implement standards and processes for making it happen

Lets start from an example: Use Case

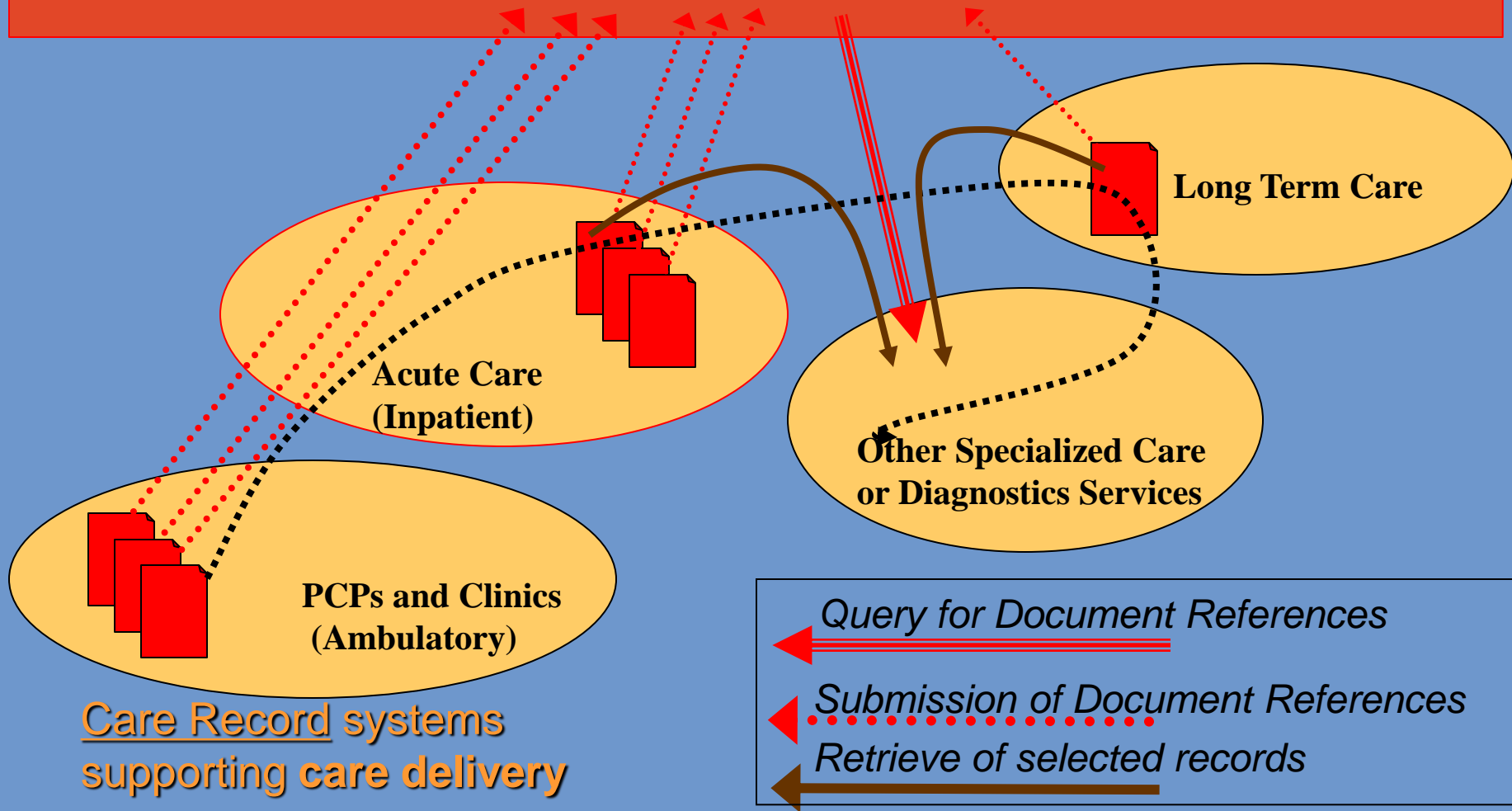
Publish, share and access health records

Typically, a patient goes through a sequence of encounters in different Care Settings ●

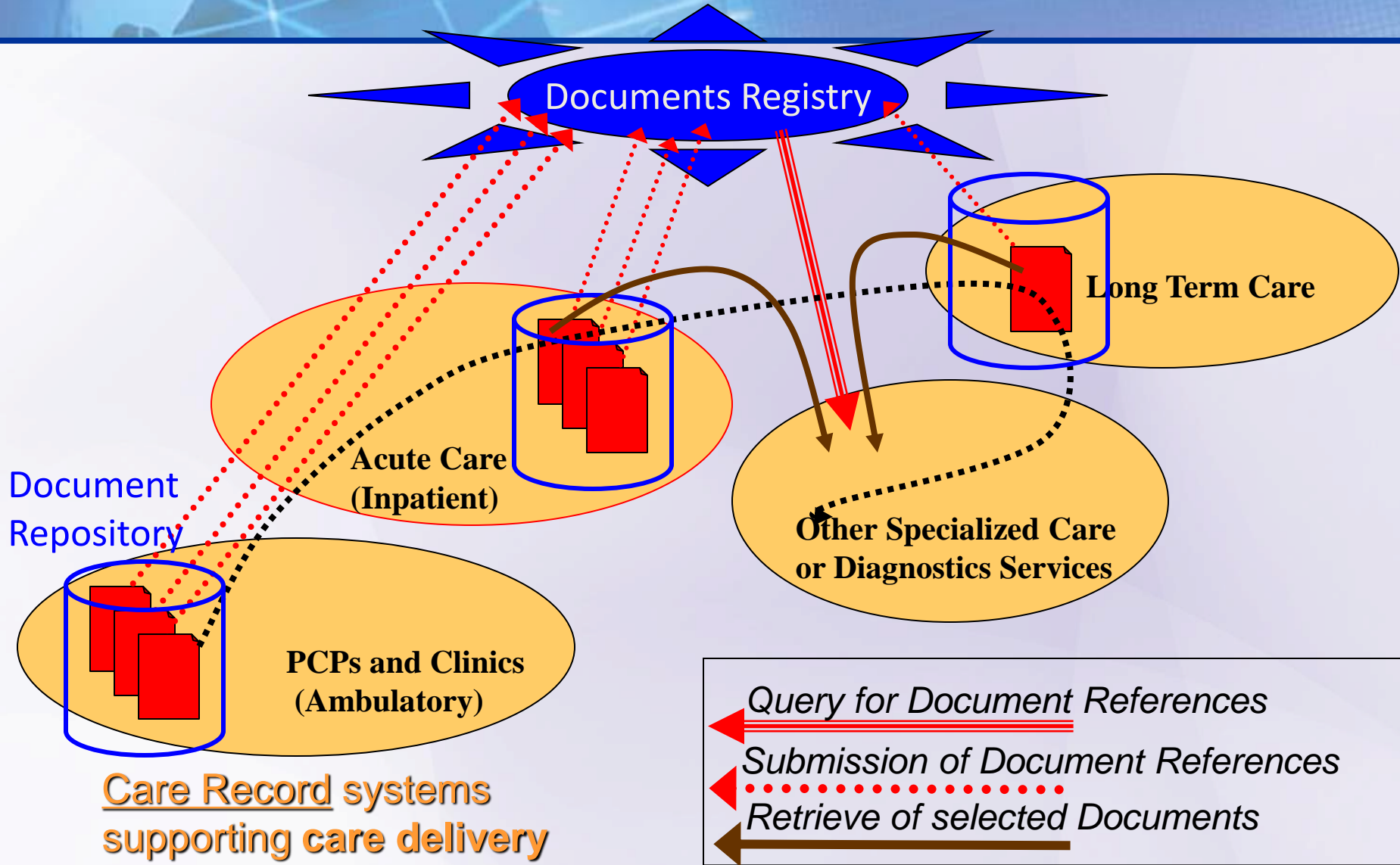


Assembling and accessing health records

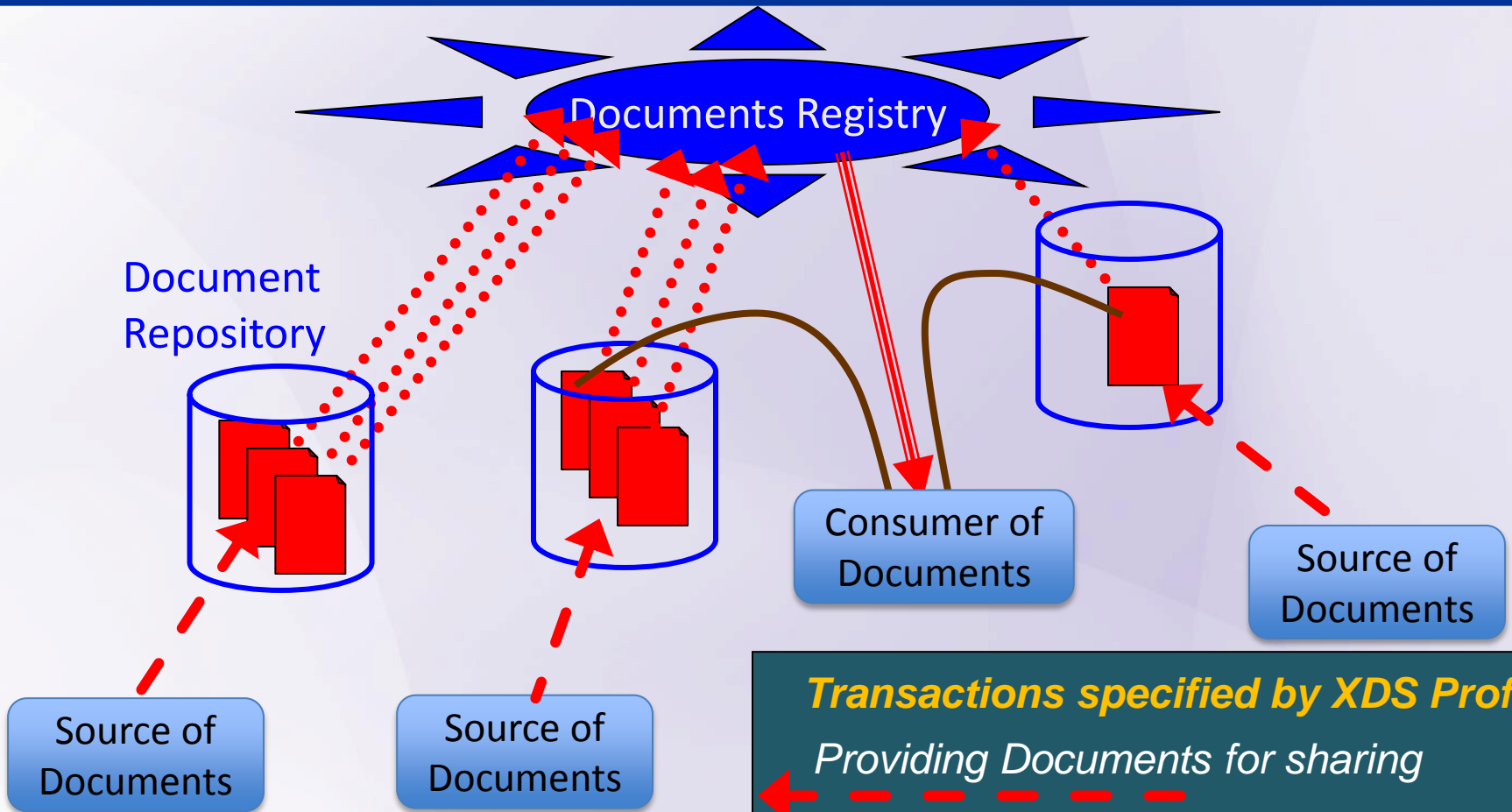
Document Index: Longitudinal Record as used across-encounters



XDS Profile: Sharing Health Records at a large scale



XDS Profile: Sharing Health Records at a large scale



Transactions specified by XDS Profile

- Providing Documents for sharing* (dashed red arrow)
- Submission of Document References* (dotted red arrow)
- Query for Document References* (solid red arrow)
- Retrieve of selected Documents* (solid brown arrow)

- This was an example of an IHE profile....
Cross-Enterprise Document Sharing or XDS
- Over the past 15 years, IHE has received hundreds of such “use cases” requests and responded with over 180 Profile Specifications

Interoperability results from an Ecosystem



Develop technical specifications

Identify available standards (e.g. HL7, DICOM, IETF, OASIS)

Document Use Case Requirements



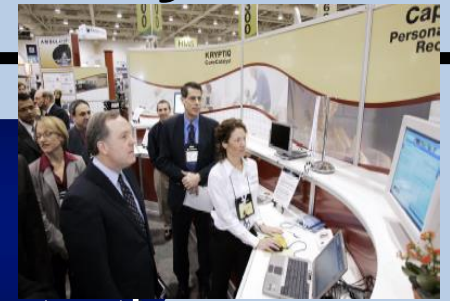
Testing at Connectathons



Timely access to information



IHE Demonstrations



Products with IHE

[Redacted] - IHE Integration Statement		Date
Vendor	Product Name	Version
[Redacted]	[Redacted]	04/04/07
This product implements all transactions specified in the IHE Technical Framework to support the IHE Integration Profiles. Actors and Options listed below:		
Integration Profiles Implemented	Actors Implemented	Options Implemented
Scheduled Workflow	Aspiration Modality	Basic Workflow
		Printer Based Workflow
		Modality Group Case
Prevention of Group Procedures	Aspiration Modality	
Consistent Presentation of Images	Aspiration Modality	None
Printer Infrastructure Recommendations	Aspiration Modality	None
Internet address to [Redacted] IHE information:	Aspiration Modality	None
Links to Standards Conformance Statements for the Implementation		
HL7		Not applicable

Easy to integrate products



International Growth of IHE

- Local Deployment, National Extensions
- Promotional & Live Demonstration Events
- Over 200 Organizational Members
(see www.ihe.net/governance)



Pragmatic global standards harmonization + best practices sharing

IHE offers a broad collection of Profiles

- A Technical/Semantical Use Cases is addressed by a profile.
- They are specified based on robust, accepted and evolutionary standards in a series of Technical Frameworks (Volume 1 for the TF of each Domain)
- Different classes of profiles:
 - Integration (how to move the data)
 - Content (what the data conveys) and Terminology (when global)
 - Security/privacy
 - Workflow
- Complete list on: www.ihe.net/technical_framework
- More on specific Profiles in the following presentation

Portfolio of IHE profiles

Over 180 IHE Profiles in 14 Domains

List and overview at:

wiki.ihe.net/index.php?title=Profiles

Specifications in Technical Frameworks at:

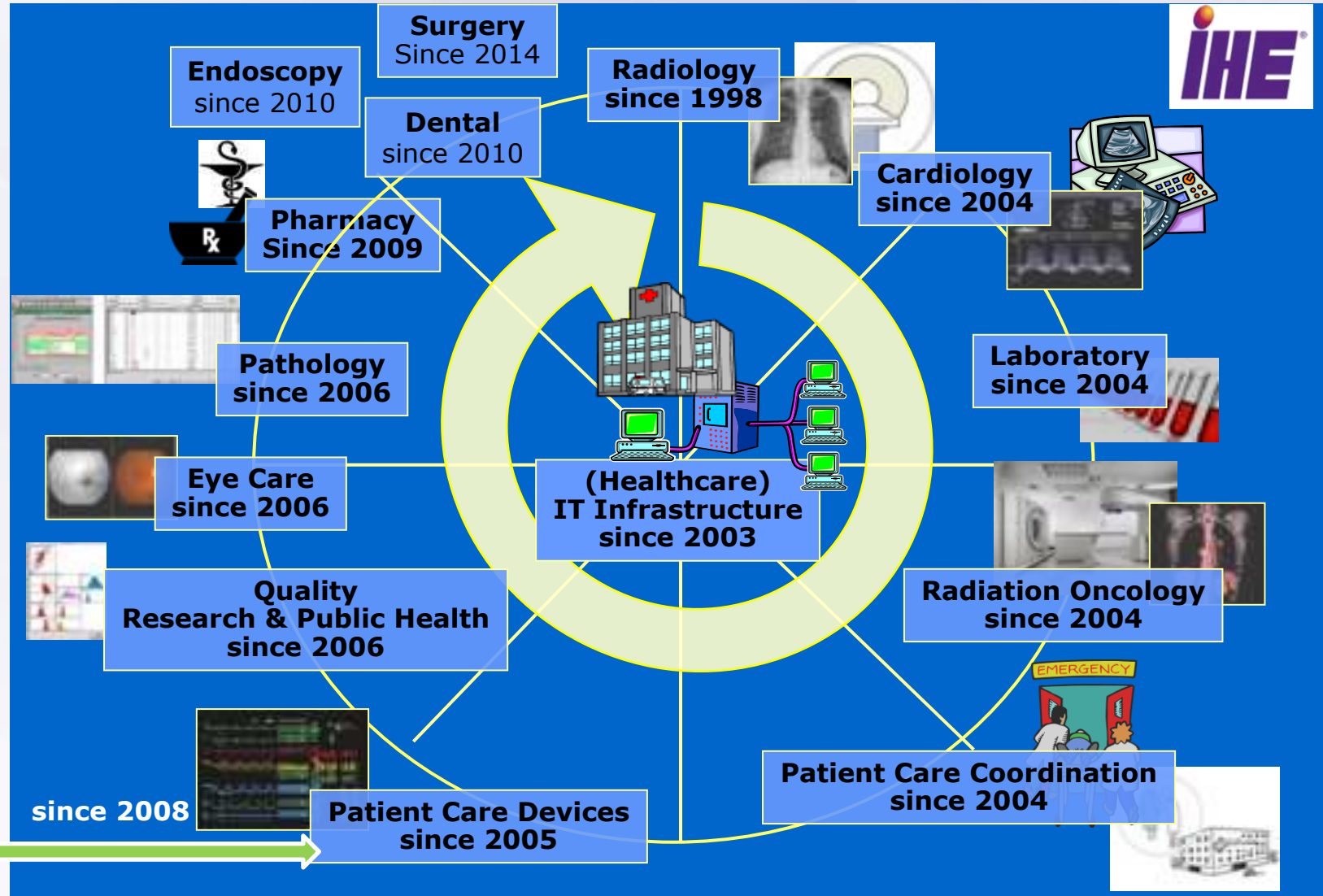
www.ihe.net/technical_frameworks

The IHE Development Domains

18 Years of Steady Evolution 1998 – 2016

Today over 180 Profiles for Interop. within the Enterprise & National -Regional Health Info Exchange

At Home



Overview of IHE profiles

<http://wiki.ihe.net/index.php/Profiles>

IHE IT Infrastructure Profiles

- [ATNA] Audit Trail and Node Authentication
- [BPPC] Basic Patient Privacy Consents
- [CT] Consistent Time
- [XCA] Cross-Community Access
- [XDM] Cross-enterprise Document Media Interchange
- [XDR] Cross-enterprise Document Reliable Interchange
- [XDS] Cross Enterprise Document Sharing
- [XDS-SD] Cross-enterprise Sharing of Scanned Documents
- [XUA] Cross-Enterprise User Assertion
- [EUA] Enterprise User Authentication
- [MPQ] Multi-Patient Queries
- [PAM] Patient Administration Management
- [PDQ] Patient Demographics Query
- [PIX] Patient Identifier Cross Referencing
- [PDQv3] Patient Demographics Query HL7 v3
- [PIXv3] Patient Identifier Cross-Reference HL7 v3
- [PSA] Patient Synchronized Application
- [PWP] Personnel White Pages
- [RID] Retrieve Information for Display
- [XCF] Cross Community Fetch
- [XCPD] Cross-Community Patient Discovery
- [XDW] Cross Enterprise Workflow
- [DEN] Document Encryption
- [DRR] Document-based Referral Request
- [DSG] Document Digital Signature
- [DSUB] Document Metadata Subscription
- [HPD] Healthcare Provider Directory

- [NAV] Notification of Document Availability
- [RFD] Retrieve Form for Data Capture
- [SVS] Sharing Value Sets
- [XPID] XAD-PID Change Management

IHE Anatomic Pathology Profiles

- [APW] - Anatomic Pathology Workflow
- [ARPH] - Anatomic Pathology Reporting to Public Health
- [APSR] - Anatomic Pathology Structured Report

IHE Cardiology Profiles

- [CATH] - Cardiac Cath Workflow
- [ECHO] - Echocardiography Workflow
- [ECG] - Retrieve ECG for Display
- [ED] - Evidence Documents
- [STRESS] - Stress Testing Workflow
- [DRPT] - Displayable Reports
- [REWF] - Resting ECG Workflow
- [IEO] - Image-Enabled Office Workflow
- [CIRC] - Cardiac Imaging Report Content

IHE Eyecare Profiles

- [EYECARE] - Eye Care Workflow
- [CHG] - Charge Posting
- [ECED] - Eye Care Evidence Documents
- [ECDR] - Eye Care Displayable Report

Overview of IHE profiles

<http://wiki.ihe.net/index.php/Profiles>

IHE Patient Care Coordination Profiles

- [MS] Medical Summaries
- [XPHR] Exchange of Personal Health Record
- [FSA] Functional Status Assessments
- [QED] Query for Existing Data
- [IC] Immunization Content
- [CM] [Care Management](#)
- [PPOC] Patient Plan of Care
- [RCG] Request for Clinical Guidance
- [EDR] Emergency Department Referral

Emergency Department Encounter Profiles

- [TN] Triage Note
- [NN] Nursing Note
- [CTNN] Composite Triage and Nursing Note.
- [EDPN] ED Physician Note

Antepartum Profiles

- [APS] Antepartum Summary
- [APHP] Antepartum History and Physical
- [APL] Antepartum Laboratory
- [APE] Antepartum Education

Labor and Delivery Profiles

- [LDHP] Labor and Delivery History and Physical
- [LDS] Labor and Delivery Summary
- [MDS] Maternal Discharge Summary

IHE Patient Care Device Profiles

- [DEC] Device Enterprise Communication
- [PIV] Point of Care Infusion Verification
- [IDCO] Implantable Device Cardiac Observation
- [RTM] Rosetta Terminology Mapping
- [ACM] Alarm Communication Management
- [IPEC] Infusion Pump Event Communication

IHE Pharmacy Profiles

- [CMPD] Community Medication Prescription and Dispense
- [PRE] Pharmacy Prescription Document
- [PADV] Pharmacy Pharmaceutical Advice Document
- [DIS] Pharmacy Dispense Document
- [HMW] Hospital Medication Workflow

IHE Laboratory Profiles

- [LTW] - Laboratory Testing Workflow
- [XD-LAB] - Sharing Laboratory Reports
- [LDA] - Laboratory Device Automation
- [LBL] - Laboratory Barcode Labeling
- [LPOCT] - Laboratory Point Of Care Testing
- [LCSD] - Laboratory Code Sets Distribution
- [ILW] - Inter Laboratory Workflow
- [LAW] - Laboratory Analytical Workflow

Overview of IHE profiles

<http://wiki.ihe.net/index.php/Profiles>

IHE Radiology Profiles

Profiles for Workflow

- [SWF] Scheduled Workflow
- [PIR] Patient Information Reconciliation
- [PWF] Post-Processing Workflow
- [RWF] Reporting Workflow
- [IRWF] Import Reconciliation Workflow
- [MAWF] Mammography Acquisition Workflow.

Profiles for Content

- [NMI] Nuclear Medicine Image
- [MAMMO] Mammography Image
- [ED] Evidence Documents
- [SINR] Simple Image and Numeric Report
- [REM] Radiation Exposure Monitoring.
- [PERF] CT/MR Perfusion Imaging
- [DIFF] MR Diffusion Imaging

Profiles for Presentation

- [KIN] Key Image Note
- [CPI] Consistent Presentation of Images
- [PGP] Presentation of Grouped Procedures.
- [FUS] Image Fusion
- [BIR] Basic Image Review

Profiles for Infrastructure

- [PDI] Portable Data for Imaging
- [XDS-I.b] Cross-enterprise Document Sharing for Imaging.b
- [TCE] Teaching File and Clinical Trial Export
- [ARI] Access to Radiology Information

- [ATNA] Audit Trail and Node Authentication - Radiology Option
- [CHG] Charge Posting

IHE Radiation Oncology Profiles

- [BRTO] Basic Radiation Therapy Objects
- [MMRO] Multimodality Registration for Radiation Oncology
- [ARTI] Advanced Radiotherapy Objects Interoperability
- [TDW] Treatment Delivery Workflow
- [DCOM] Dose Compositing
- [ECSI] Enterprise-Centric Scheduling Interoperability

IHE Quality, Research, and Public Health Profiles

- [CRD] Clinical Research Document
- [DSC] Drug Safety Content
- [EHCP] Early Hearing Care Plan
- [MCH-BFDrpt] Maternal Child Health-Birth and Fetal Death Reporting
- [PRPH-Ca] Physician Reporting to a Public Health Repository – Cancer Registry
- [RPE] Retrieve Process for Execution

IHE Connectathon

- It is a structured test event, driving a culture of interoperability (much more than a hackathon).
- Process refined and automated since 1998
- Open invitation to vendor and other implementers community
- Advanced open source testing tools (GAZELLE) with support services
- Testing organized and supervised by neutral project management team
- Thousands of cross-vendor tests performed
- Results recorded and published
- Opens the way to Product Conformity Assessment

IHE Connectathons

Each year:

- USA, January
- China, March
- Europe, April
- Korea, September
- Japan, October

Massive yearly events :
70-80 vendors
250-300 engineers
100-150 systems
.....tested in 5 days



Connect-a-thon Results Browsing

Which participant has tested which profile ?

The screenshot shows a Mozilla Firefox browser window with the address bar at http://www.ihe-europe.org/con_result. The page title is "Connectathon Results Browsing". On the left, there is a navigation menu with "Simple browsing" selected, and links for "Advanced browsing", "www.ihe.net", and "www.ihe-europe.org". Below the menu is a "Webmaster" section with consultation and modification dates. The main content area features three search filters: "Select a connectathon", "Select a vendor", and "Select an actor". The "Select an actor" dropdown is open, showing a list of roles including "Image Manager", which is highlighted. Each filter has a "Go" button next to it.

Simple browsing

- Advanced browsing
- www.ihe.net
- www.ihe-europe.org

Connectathon Results Browsing

-- Select a connectathon -- Go

Or

-- Select a vendor -- Go

Or

-- Select an actor -- Go

- Display
- Document Consumer
- Document Registry
- Document Repository
- Document Source
- Enterprise Report Repository
- Evidence Creator
- External Report Repository Access
- Image Display
- Image Manager**
- Information Source
- Kerberized Server
- Kerberos Authentication Server
- Order Placer
- Order Result Tracker
- Patient Context Participant
- Patient Demographics Consumer
- Patient Demographics Supplier
- Patient Identity Consumer
- Patient Identity Cross-reference Manager


[Webmaster](#)
Consultation date: Mon, 27 Jun 2005 00:25:51 GMT
Last modified: Sun, 26 Jun 2005 23:20:56 GMT

Come to Venice – Learn potential of Connectathons

Venice, Italy, 3-7 April 2017

- Visit or Participate to the Next European Connectathon
 - ➔ Meet the real implementers
- Attend the IHE Symposium to learn about various national ehealth programs, the EU Commission and their use of IHE Profiles
- More at: <http://connectathon.ihe-europe.net/>



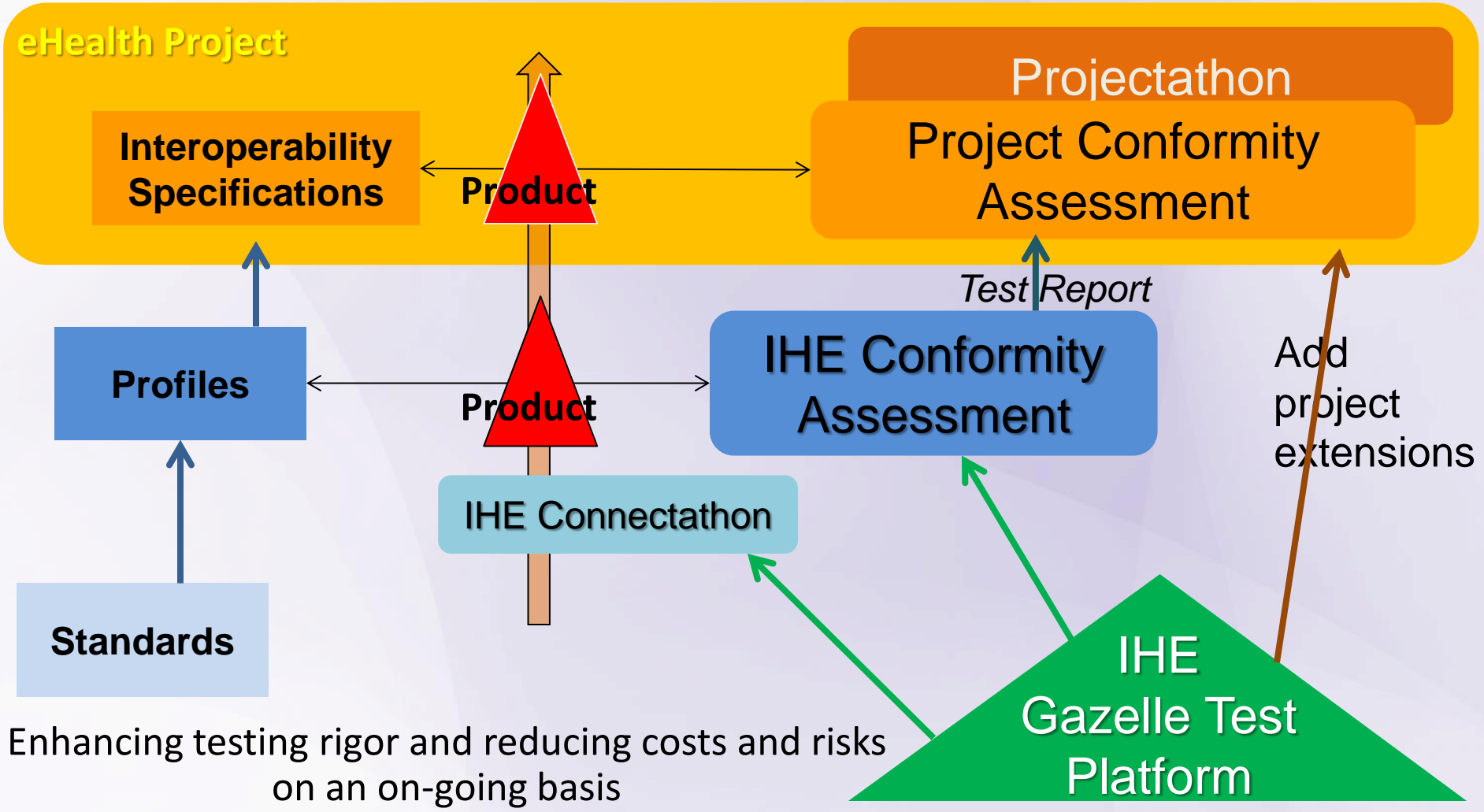
- Focus on Testing (not certification)
→ deliver a trusted test report 
- Enable countries/projects to require and recognize these test reports and perform any additional project specific testing (they may also add a certification process on top of the testing process).
- Ensure international equivalency of test reports and recognition of these test reports of their trustworthiness:
 - A single process → conformity assessment scheme
 - The same test tooling → provided by IHE International
 - Test report published → by IHE International
- Allow multiple testing laboratories across the world to be accredited and authorized by IHE International

Why Conformity Assessment?

- Widespread adoption of IHE Profiles by national, regional and hospital eHealth projects
- Many ehealth projects explicitly leverage Connectathon results in their product tenders/acquisition.
- Projects report un-even compliance to IHE profiles across products and discrepancies between commercial products IHE features and vendor connectathon results
- Increasing number of national/regional ehealth projects that establish their own conformity testing. Expected for project specific extensions, but duplicative for IHE profile conformity.

➔ Vendor and ehealth projects interested to avoid duplicative testing of generic IHE Profile conformity.

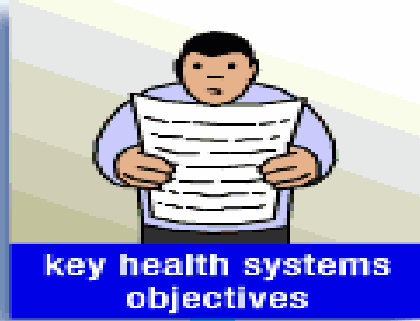
IHE's contribution to ehealth projects



Enhancing testing rigor and reducing costs and risks on an on-going basis

Building an Interoperability Specification

(Picture from ISO TR 28380)



Use of IHE Profiles in eHealth Projects



Integrating
the Health
Enterprise

Selecting Profiles for Interoperability Specification

Key health systems objectives

Interop. Use case A

Technical
Use case 1

Technical
Use case 2

Technical
Use case 3

IHE
Profile for
Content

IHE Profile
Sharing Doc
Services

IHE
Profile for
Security

Custom
Profile for
Terms

IHE Profile
Patient Id
Mgt

IHE
Profile for
Privacy

IHE

Profiles

**Project Interoperability
Specification for Use Case A**

Combination / Glue

IHE Profile
for
Content

Custom
Profile for
Terms

IHE Profile
Sharing Doc
Services

IHE Profile
Patient Id
Mgt

IHE Profile
for
Security

IHE Profile
for
Privacy

Direct and indirect benefits of profile based Interoperability Specification

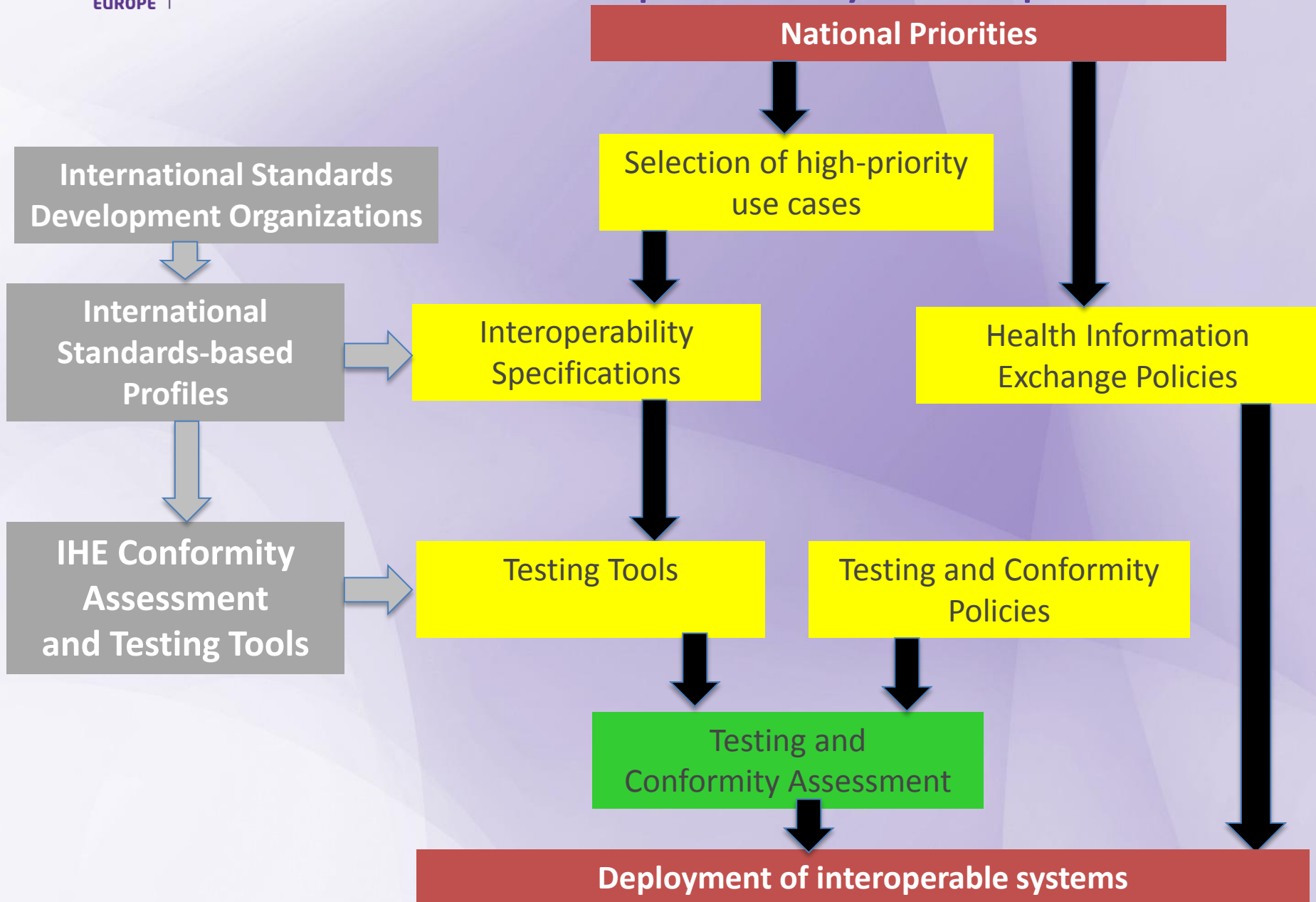
When an eHealth project chooses to build its Interoperability Specification by referencing Profiles, it introduces:

- modularity, with a design that has been agreed by a world-wide community of experts and users.
- Enables flexibility to address the project specific requirements, without having to face the complexity to develop such an Interoperability Specification from the ground up, by starting from the base standards.

Far greater benefits include:

1. Responsiveness in the maintenance of the profile specification and of the underlying base standards.
2. Reduced costs to develop applications that conform to the Profile across a large number of products that are needed to serve the many niche market segments that compose health systems.
3. Defragmentation of the eHealth market, lowering barriers to rapid adoption.
4. Ease of access to pre-existing testing tools and processes to ensure quality interoperability, as well as associated certification processes to assist market transparency.
5. Reduced cost of software development and increased speed of development and deployment. Possibility of “off the shelf” products which already implement IHE profiles, being used
6. Training and deployment skills needed to deploy the above software applications, systems and devices. Availability of existing pool of companies and IT professionals skilled in IHE profile implementation
7. Simplifying the specifications of the various policies needed to support interoperability (e.g. security, privacy) through reuse of policies across projects, when possible.
8. Improved clarity of documentation
9. Reduced cost of software maintenance

eHealth Interoperability tasks process flow



IHE Profile Adoption Worldwide in Regional and National eHealth

Adopted across the world:

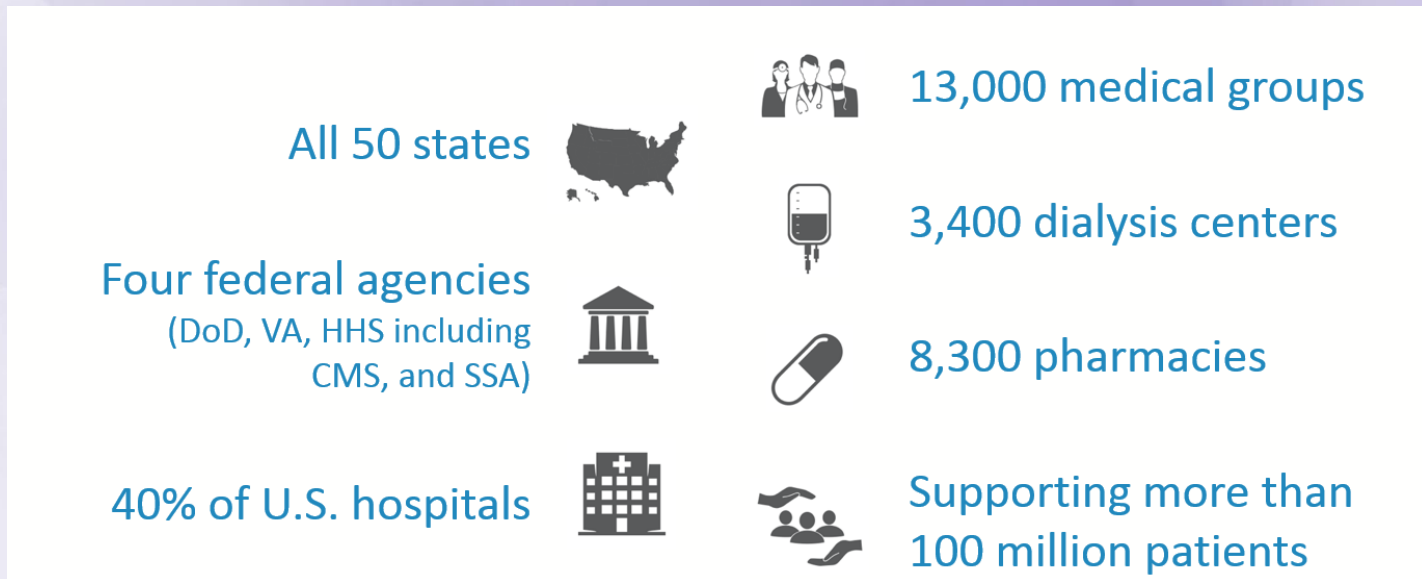
- *Lower Austria region*
- *US States (Vermont, New York, Texas, Pennsylvania, etc.)*
- *Nagoya City*
- *Dutch regions*
- *European Cross-Border (epSOS now moving to CEF/DSI)*
- *US ehealth Exchange (Sequoia, plus Care Equality)*
- *US CommonWell*
- *France*
- *Austria*
- *Italian Regions*
- *Denmark Regions*
- *Switzerland Regions*
- *Luxembourg*
- *German Regions*
- *Slovenia*

In deployment:

- *Finland, Denmark (PHR)*
- *Switzerland*
- *US Interop Standards Advisory*
- *US National Record Location Service (Surescript)*
- *Uruguay, South Africa, Japan*

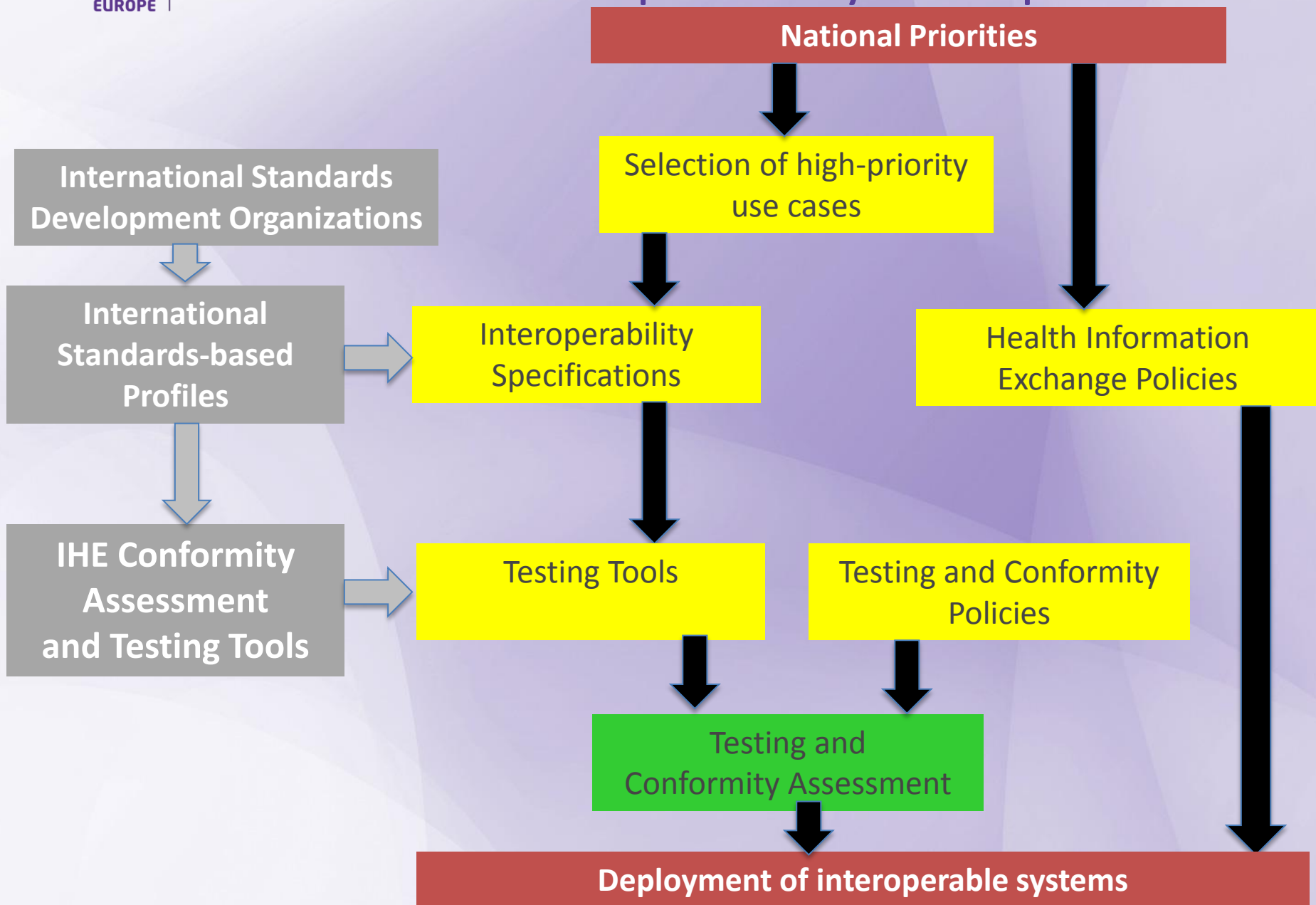
US Health Information Exchange

- Major public/private entities (Kaiser Permanente, Mayo Clinic, VA, DoD, Geisinger, state HIEs, etc.) are using nationwide interoperability (Managed by Sequoia Project):



- Built upon IHE Profiles (Same set as epSOS):
 - Interchange (IHE XCA/XDR/XCPD)
 - Security (IHE ATNA), Privacy (IHE XUA)
 - Content: Consolidated CDA

eHealth Interoperability tasks process flow



Making Interoperability a Success



Prioritize the types of information to exchange with the conjunction of these key conditions

IHE Web sites

- **IHE International Web site**

www.ihe.net

- **IHE Profiles in Technical Frameworks:**

Overview of profiles: <http://wiki.ihe.net/index.php/Profiles>

See Volume 1 of each TF for Use cases: ihe.net/Technical_Frameworks/

- **IHE Europe Web site (testing, services)**

www.ihe-europe.net

- **Connectathon Result:**

www.ihe.net/Events/connectathon_results.cfm

- **Vendor Products Integration Statements**

<https://gazelle.ihe.net/content/product-registry>

- **Participation in Connectathons**

<http://ihe-europe.net/connectathon/connectathon>



iHE[®] *changing the way healthcare*
www.ihe.net *connects*

WWW.IHE.NET