IHE EUROPE Integrating the Healthcare Enterprise

Presentation of standards landscape Part I

Karima Bourquard, ***IHE-Europe, Director of Interoperability***

Alexander Berler, IHE-Europe IHE Services Director

Forum e-Zdrowia

15 – 16 September 2016

FORUM eZDROWIA

http://forumezdrowia.pl/en/

Introduction

Interoperability is one of the key challenges in **eHealth**

- How to improve citizens' health by making medical information available in a safe and trusted environment ?
- How to increase quality and access to the medical information
- How to make eHealth more effective, user friendly and widely accepted

From the goals of the EU *(reviewed)*:

http://ec.europa.eu/health/ehealth/policy/index_en.htm

What is Interoperability ?

Definition

- Based on technical definition: (from ISO IEE, 1990)

  Ability of different technology systems to communicate, exchange data and use information that has been exchanged.

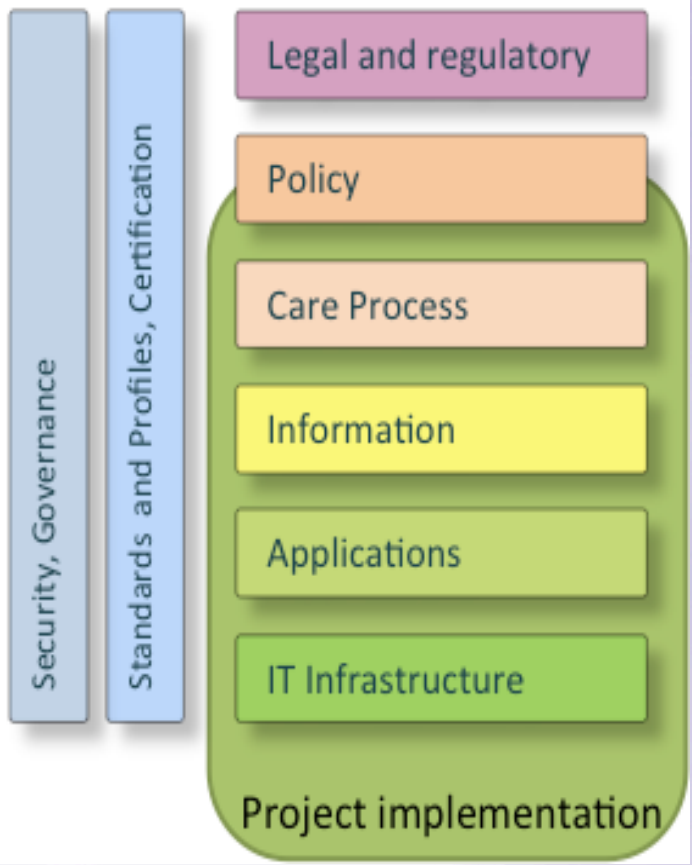
- In eHealth, the IT systems are the support of multiple activities developped by healthcare Professionnals and Patients

And more…

Interoperability cannot be defined with only one view:

- *Legal and policy (How to work together)*
- *organisation (processes),*
- *information (medical data) and*
- *Technical (messages and protocol*

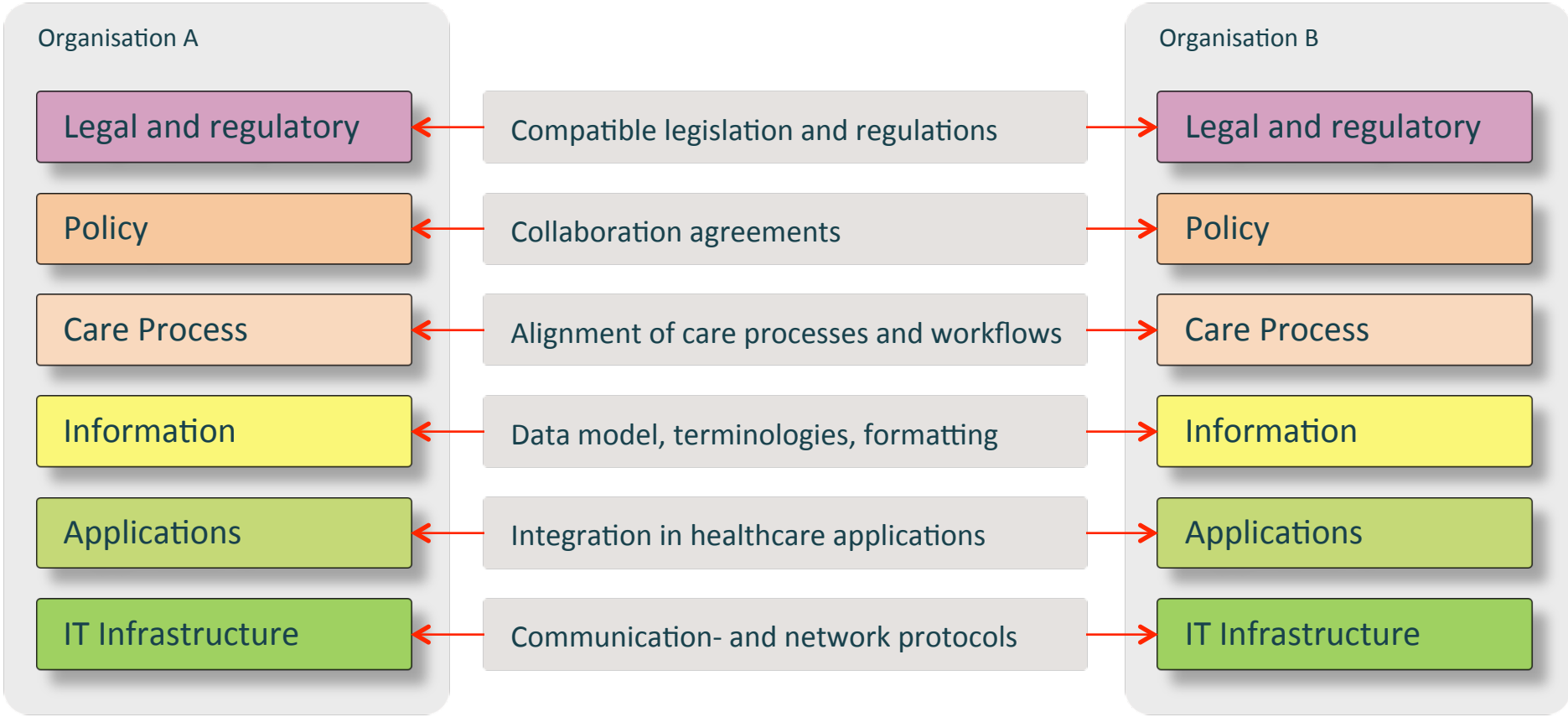
Interoperability Concepts



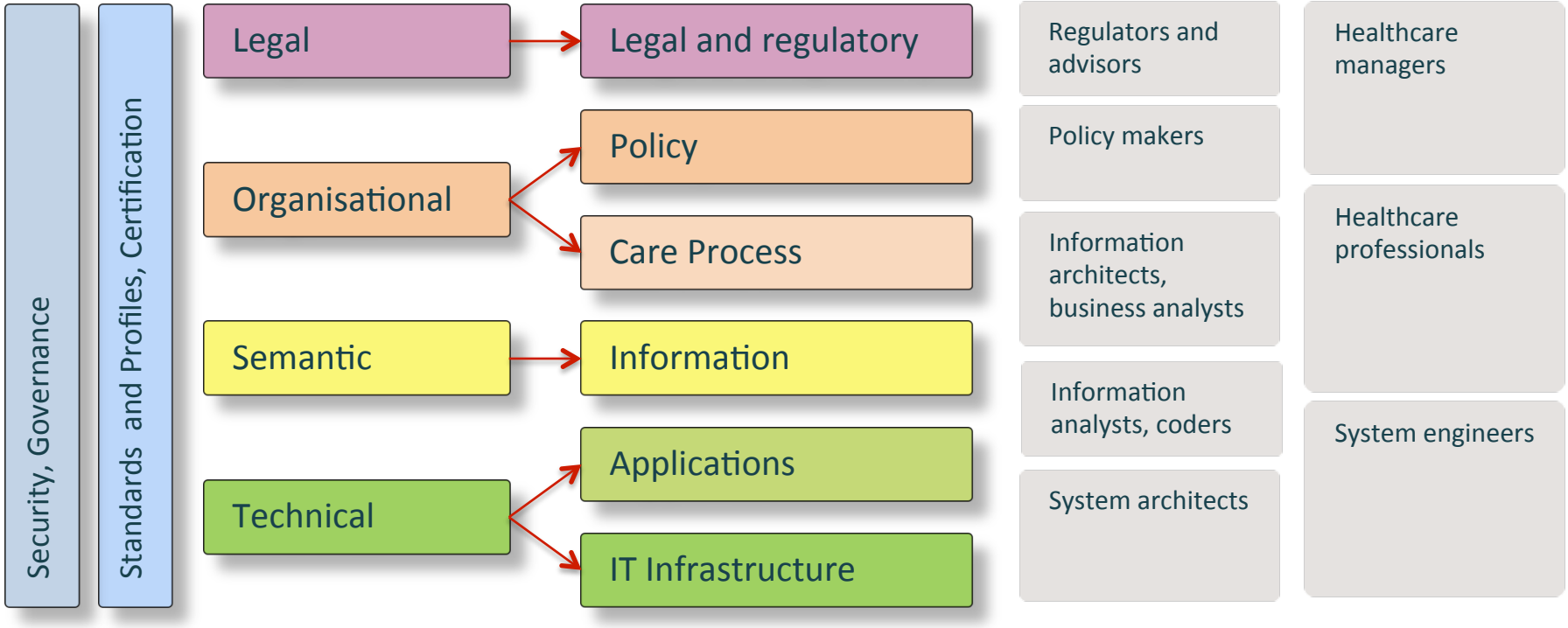
- **The legal and regulatory layer** that defines the legal constraints and rules for establishing lawful health information exchange
- **The policy layer** that defines the needed organizational rules as well as how the stakeholders will work altogether when the patient provides his (her) consent
- **The care process layer** is aligning with the medical and social processes
- **The information layer** contains both semantic and syntactic interoperability rules (terminologies, coding, etc)
- **The applications layer** describes the import export, messaging and display mechanisms of healthcare information
- **The infrastructure layer** describes communication and protocols layer (networks, etc)

From Antilope, and eHealth Network, 2015
Refined eHealth Interoperability Framework (ReEIF)

Interoperability means alignment on different levels



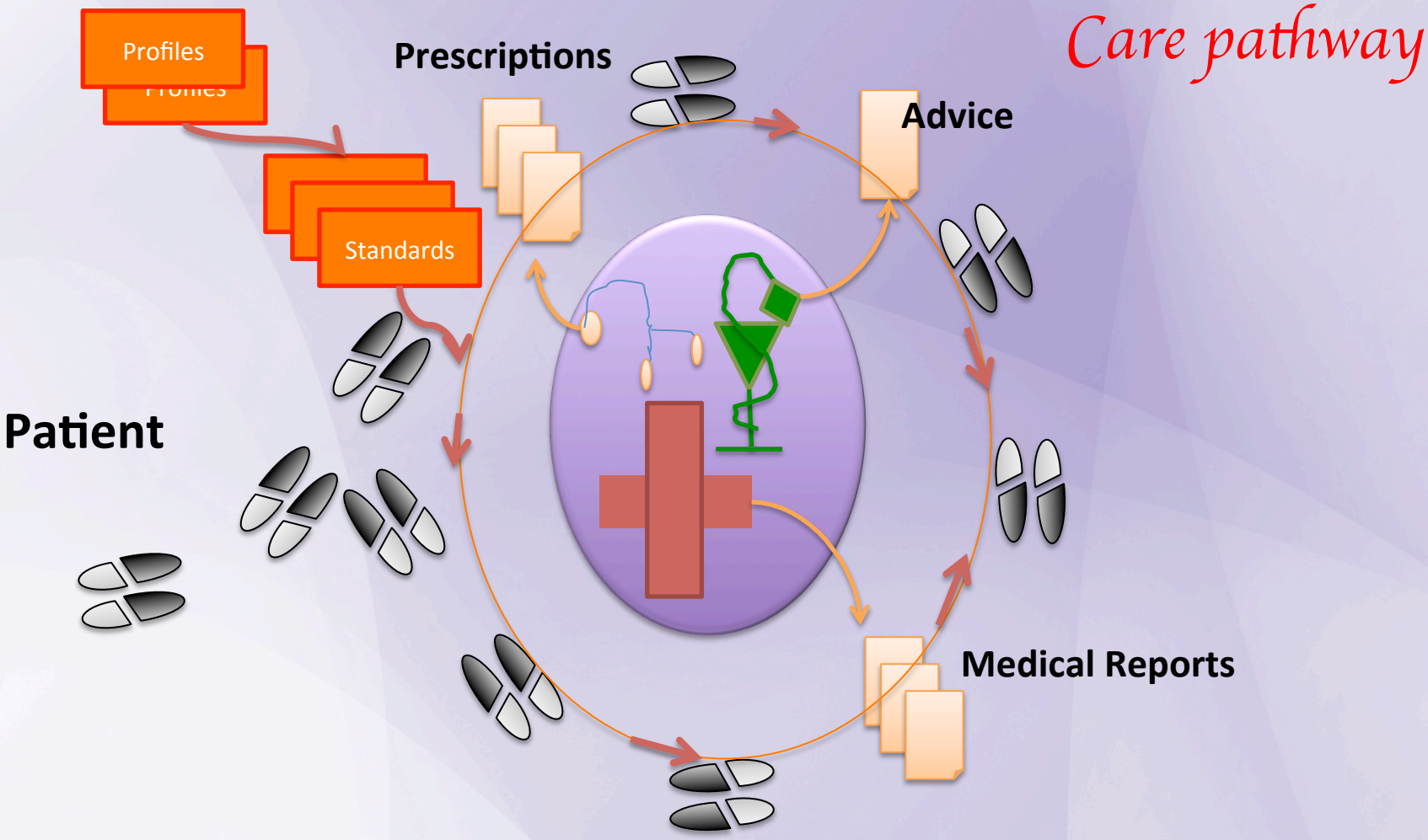
Interoperability means also involvement of Stakeholders



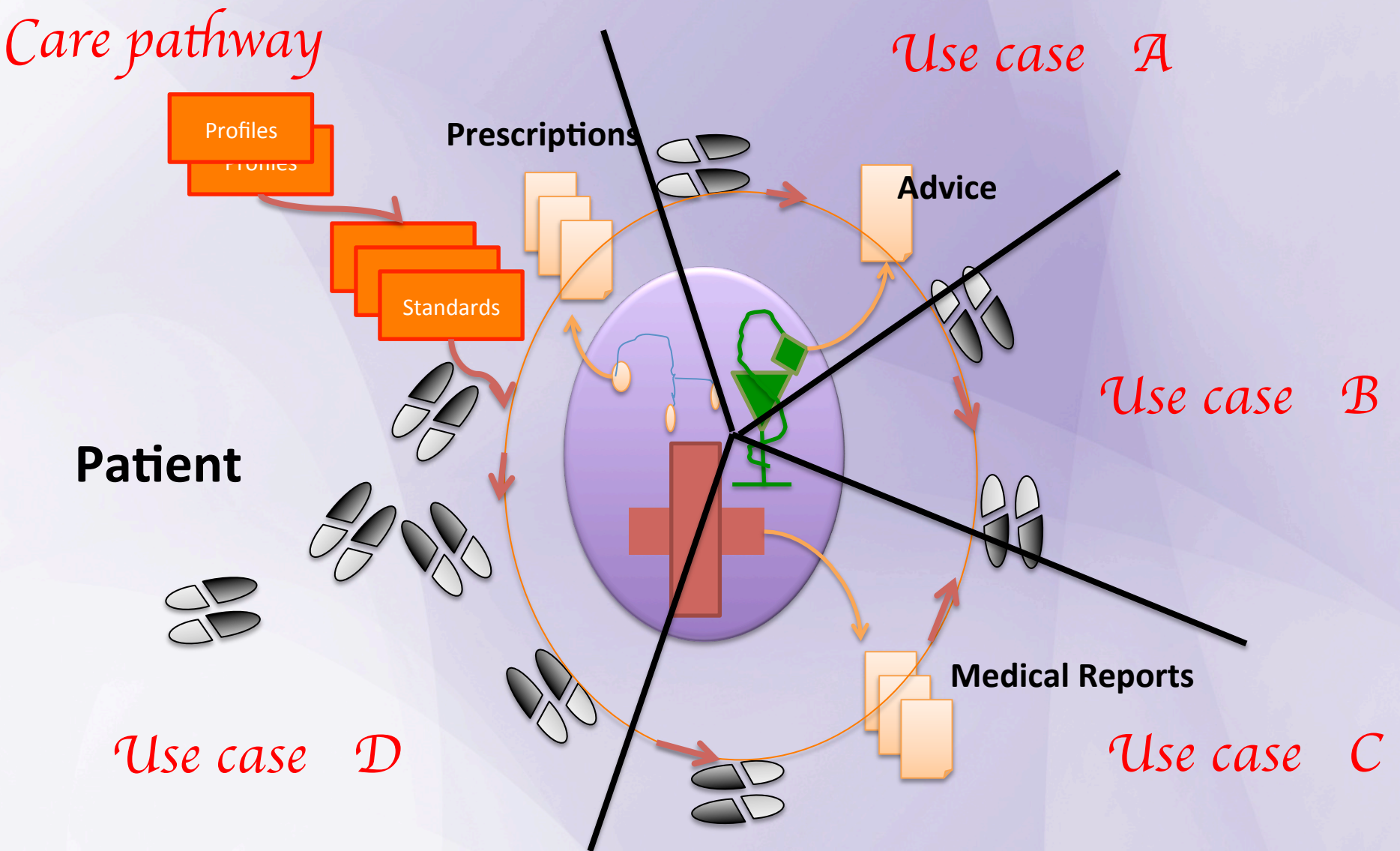
IHE EUROPE
Integrating the Healthcare Enterprise

Interoperability and standards

How can we achieve Interoperability in eHealth ?



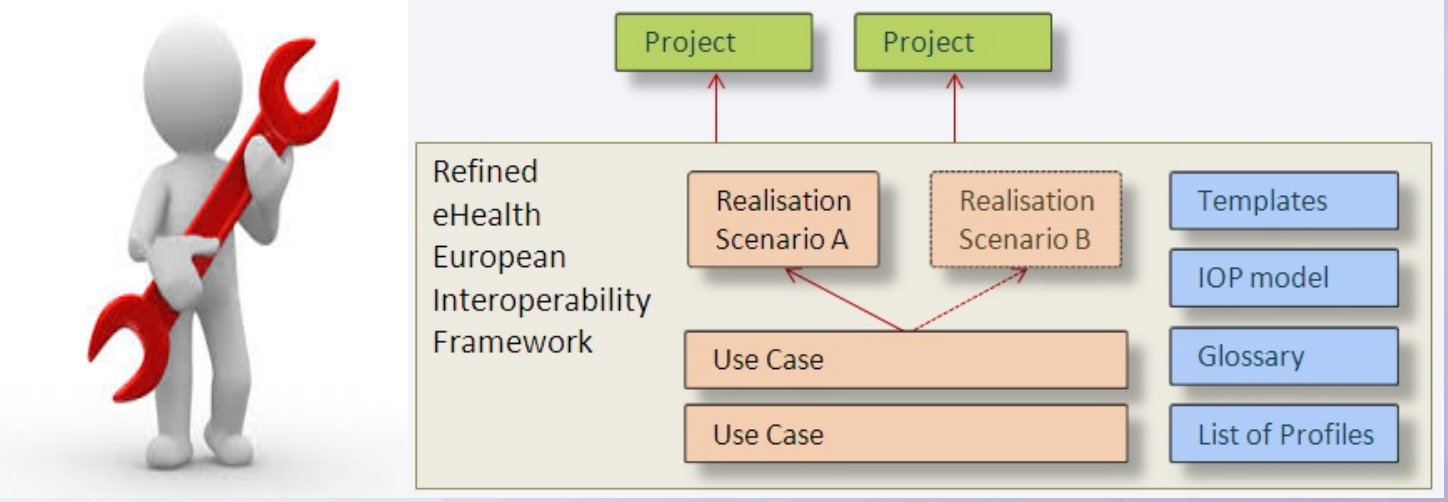
How can we achieve Interoperability in eHealth ?



From User needs to interoperable solutions: Use case driven approach

- Link between the user needs and the implementation in IT solutions is not so obvious for an end-user
- Guidance and tools are now available for bridging business processes to technical steps and implementable projects based standards and profiles :
  - The refined European Interoperability Framework
  - IHE and integrated profiles

The refined European Interoperability Framework

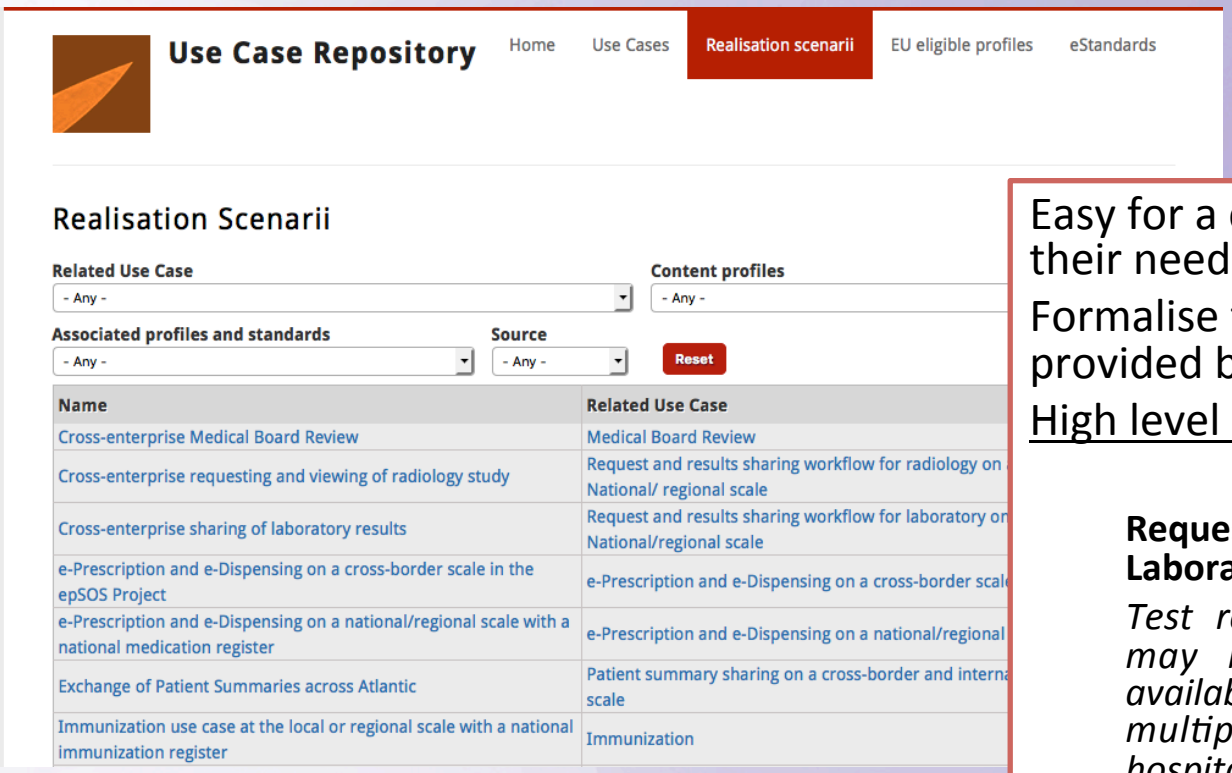


- The eHealth European Interoperability Framework (eEIF) was published in 2012 where 10 use cases and its related profiles and standards were described
- It was refined in the Antilope project (January 2015):

  The Antilope refined eEIF consists on
  - A refined model for interoperability
  - A set of templates for uniform description
  - A set of use cases as the basis for interoperability projects
  - A glossary of healthcare interoperability terms and definitions

Use cases Repository

https://usecase-repository.ihe-europe.net/



Easy for a clinician or patient to describe their needs with their own language

Formalise the process using the template provided by the ReEIF

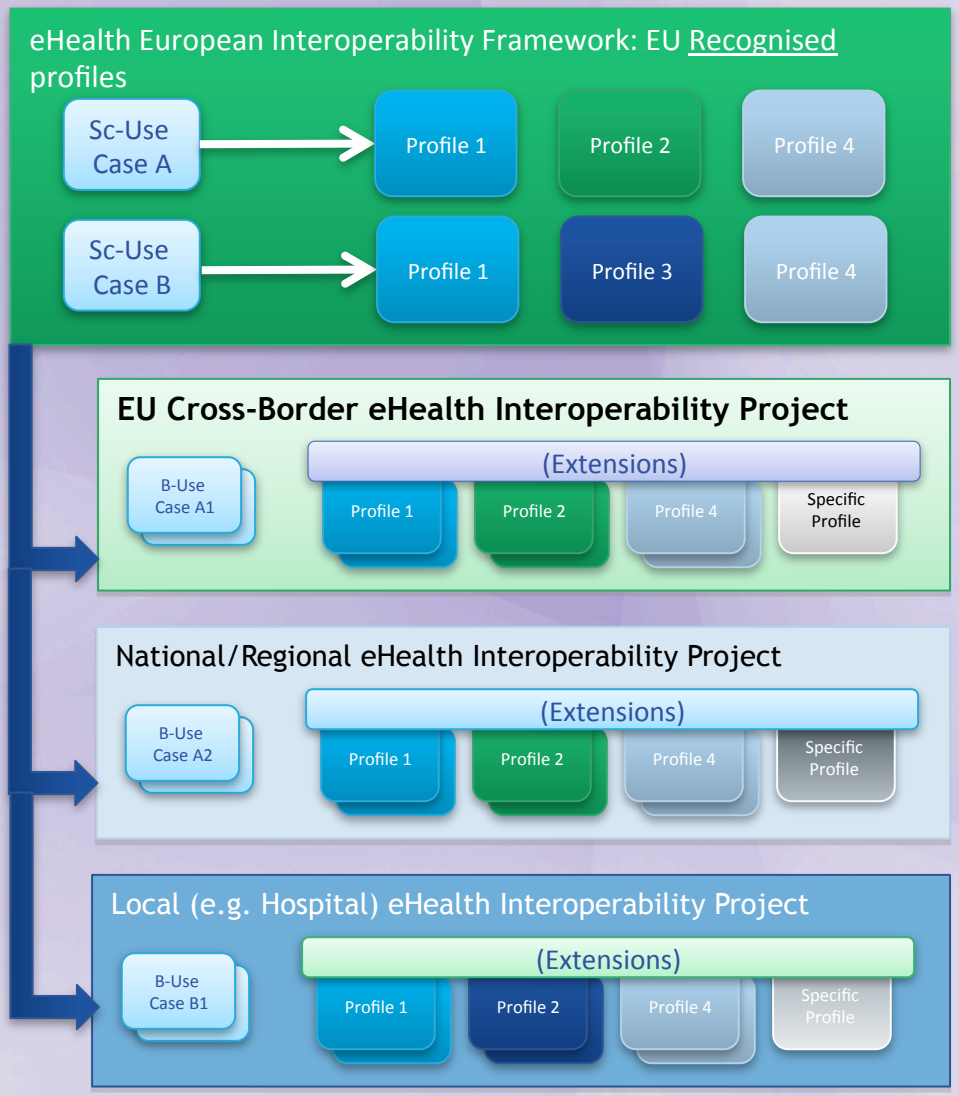
<u>High level description</u>

Request and results distribution workflow for Laboratory within the Hospital

Test results from clinical laboratory services may be requested and should be made available to medical caregivers who work in multiple medical departments within the hospital organisation on a need-to know basis. This use case should ensure the availability of timely, complete and consistent patient information as well as avoidance of potential duplicate testing within the hospital organisation.

Realisation scenario

The scenario will describe in detail the technical steps and provide the set of profiles based on standards That will be used in the project



From the report on EIF, 2012

Use of IHE profiles in eHealth project

Key health systems objectives

Use cases

IHE profiles

Standards

HL7 Transition Update

ISO

DICOM Digital Imaging and Communications in Medicine

OASIS

IHTSDO

Profiles for Use Case A

Content & Terms

- Patient summary
- Lab Report
- Imaging Info Exchange
- ECG Report
- . . .

Services

- Patient Demographics
- X Document sharing
- Health Provider Directory
- . . .

Security and Privacy

- Consent management
- Audit Trail
- . . .

Interop-erability Tests

IHE Connect-athon

Use of IHE Profiles in eHealth Projects
Selecting Profiles for Interoperability Specification

Key health systems objectives

Business Use case A

IHE *Profiles*

HL7 Transition Update · ISO · DICOM Digital Imaging and Communications in Medicine · LOINC® Logical Observation Identifiers Names and Codes · OASIS · IHTSDO

Profiles for Use Case A

Content & Terms

- Patient summary
- Lab Report
- Imaging Info Exchange
- ECG Report
- . . .

Services

- Patient Demographics
- X Document sharing
- Health Provider Directory
- **X document workflow**

Security and Privacy

- Consent management
- Audit Trail
- . . .

Interop-erability Testing

Example on Neonatal Care Plan (local/ regional/national scales)

- Context: Accessibility of the Antepartum information from the perspective of the clinical care needs for a future baby and its mother.

	Profiles
Content	Antepartum Summary
	Antepartum lab results
	Antepartum education
Patient	Patient consent
	Patient identification Cross Referening
	PatientDemographic Query
HCP	Healthcare Prvider Directory
Infrastructure	Cross Reference Document Sharing
Workflow	Cross reference Document workflow
Security	Audit trail and security Node

What is IHE:

Integrating the Healthcare Enterprise

An initiative for interoperability

in the domain of Health

What is IHE ?

International, Regional and National organisations involving Users and Vendors

- To promote interoperability in eHealth by:
  - Collecting the User needs → Use cases
  - Selecting standards → Specify Profiles to support use cases
  - Testing profiles' implementation in solutions → Proof of concept
  - Deploying profiles in the projects: within hospitals or between eHealth organizations and home

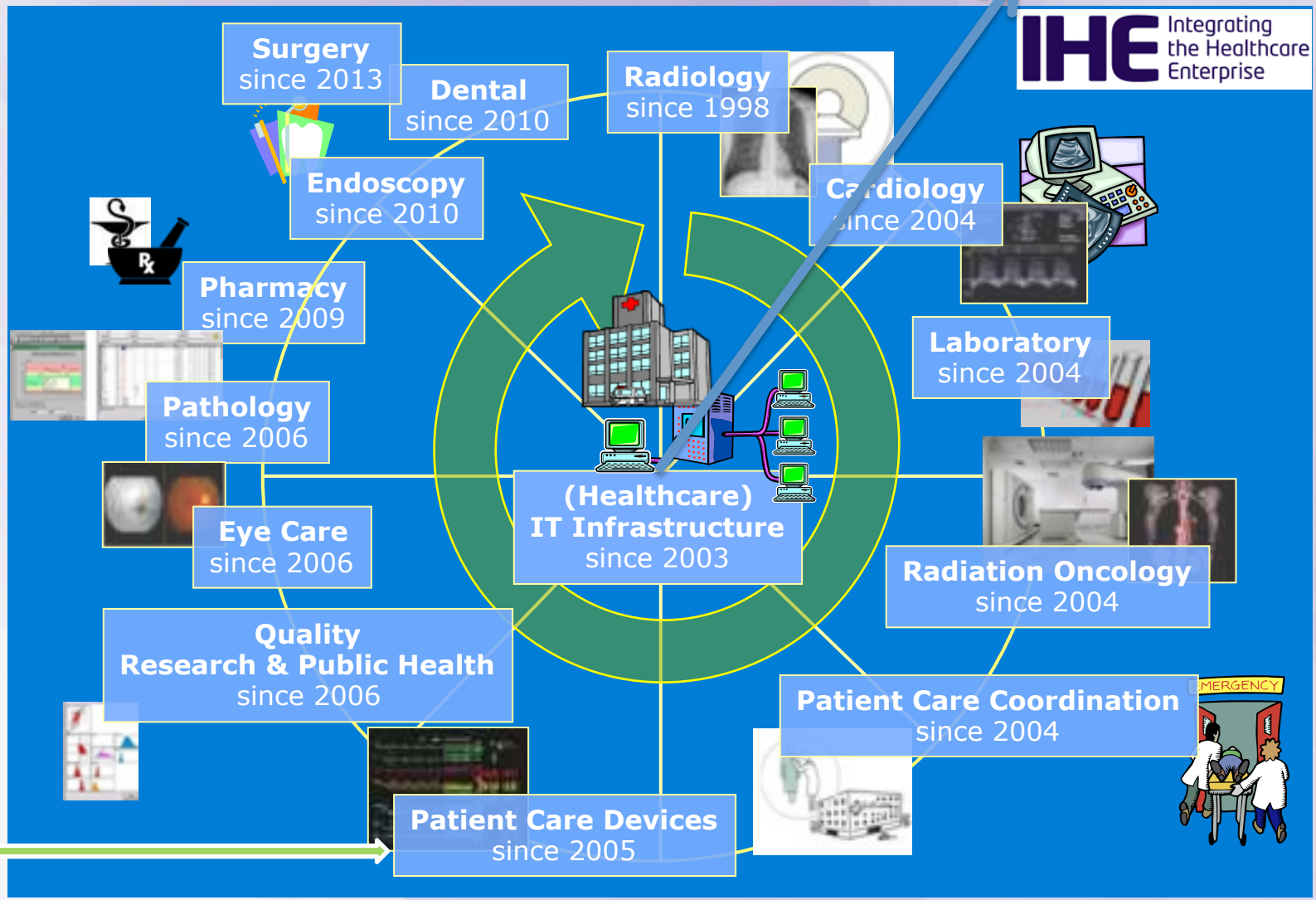
Profile Development Domains

18 Years of Steady Evolution 1998 – 2015

New Profiles for mApps
FHIR

180 IHE profiles specified and tested by Gazelle tools

11 epSOS profiles and 45 US profiles all based on IHE profiles

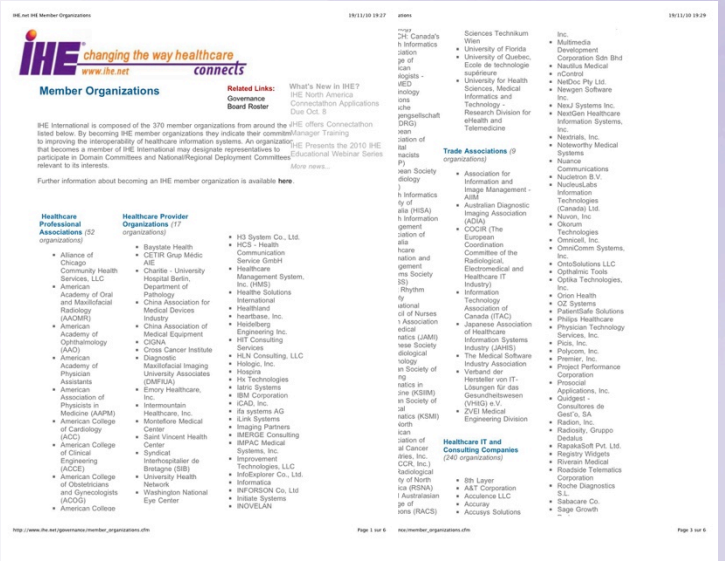


Continua HEALTH ALLIANCE

IHE is international: Governance

- Unique governance with 500 Users and Vendors Members covers:
  - International committees (needs and specifications)
  - International testing tools platform : Gazelle
  - Regional testing process : Connectathons
  - Deployment : Projects

Global Interoperability market based on operational standards promoting collaboration by sharing Users and Vendors expectations


IHE changing the way healthcare connects
www.ihe.net

Member Organizations

Related Links: Governance Board Roster

What's New in IHE?
IHE North America Connectathon Applications Due Oct. 8
IHE offers Connectathon Manager Training
IHE Presents the 2010 IHE Educational Webinar Series
More news...

IHE International is composed of the 370 member organizations from around the listed below. By becoming IHE member organizations they indicate their commitm to improving the interoperability of healthcare information systems. An organizatio that becomes a member of IHE International may designate representatives to participate in Domain Committees and National/Regional Deployment Committees relevant to its interests.

Further information about becoming an IHE member organization is available here.

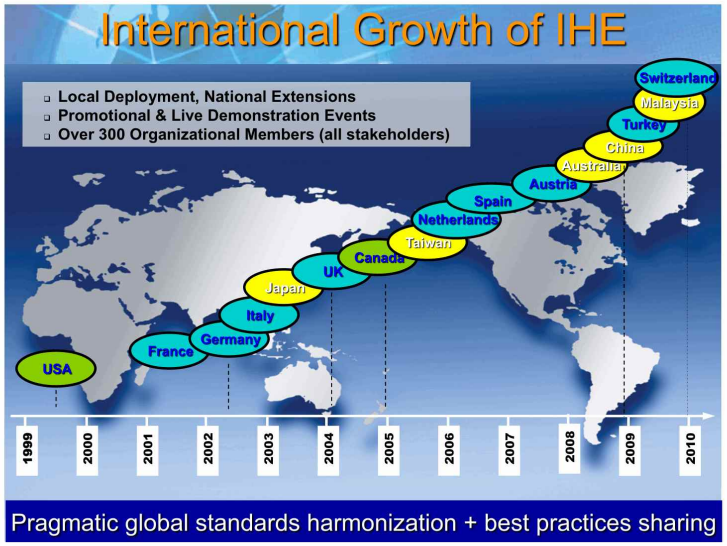
Healthcare Professional Associations (52 organizations)
- Alliance of Chicago Community Health Services, LLC
- American Academy of Oral and Maxillofacial Radiology (AAOMR)
- American Academy of Ophthalmology (AAO)
- American Academy of Physician Assistants
- American Association of Physicists in Medicine (AAPM)
- American College of Cardiology (ACC)
- American College of Clinical Engineering (ACCE)
- American College of Obstetricians and Gynecologists (ACOG)
- American College

Healthcare Provider Organizations (17 organizations)
- Baystate Health
- CETIR Grup Médic AIE
- Charité - University Hospital Berlin, Department of Pathology
- China Association for Medical Devices Industry
- China Association of Medical Equipment
- CIGNA
- Cross Cancer Institute
- Diagnostic Maxillofacial Imaging University Associates (DMFIUA)
- Emory Healthcare, Inc.
- Intermountain Healthcare, Inc.
- Montefiore Medical Center
- Saint Vincent Health Center
- Syndicat Interhospitalier de Bretagne (SIB)
- University Health Network
- Washington National Eye Center
- H3 System Co., Ltd.
- HCS - Health Communication Service GmbH
- Healthcare Management System, Inc. (HMS)
- Healthe Solutions International
- Healthland
- heartbase, Inc.
- Heidelberg Engineering Inc.
- HIT Consulting Services
- HLN Consulting, LLC
- Hologic, Inc.
- Hospira
- Hs Technologies
- Iatric Systems
- IBM Corporation
- ICAD, Inc.
- ifa systems AG
- iLink Systems
- Imaging Partners
- IMERGE Consulting
- IMPAC Medical Systems, Inc.
- Improvement Technologies, LLC
- InfoExplorer Co., Ltd.
- Informatica
- INFORSON Co, Ltd
- Initiate Systems
- INOVELAN

Sciences Technikum Wien
- University of Florida
- University of Quebec, Ecole de technologie supérieure
- University for Health Sciences, Medical Informatics and Technology - Research Division for eHealth and Telemedicine

Trade Associations (9 organizations)
- Association for Information and Image Management - AIIM
- Australian Diagnostic Imaging Association (ADIA)
- COCIR (The European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry)
- Information Technology Association of Canada (ITAC)
- Japanese Association of Healthcare Information Systems Industry (JAHIS)
- The Medical Software Industry Association
- Verband der Hersteller von IT-Lösungen für das Gesundheitswesen (VHIG) e.V.
- ZVEI Medical Engineering Division

Healthcare IT and Consulting Companies (240 organizations)
- 8th Layer
- A&T Corporation
- Acculence LLC
- Accuray
- Accuyis Solutions
- Inc.
- Multimedia Development Corporation Sdn Bhd
- Nautilus Medical
- nControl
- NetDoc Pty Ltd.
- Newgen Software Inc.
- NexJ Systems Inc.
- NextGen Healthcare Information Systems, Inc.
- Nextrials, Inc.
- Noteworthy Medical Systems
- Nuance Communications
- Nucletron B.V.
- NucleusLabs
- Information Technologies (Canada) Ltd.
- Nuvon, Inc.
- Okonum Technologies
- Omnicell, Inc.
- OmniComm Systems, Inc.
- OnDoSolutions LLC
- Opthalmic Tools
- Optika Technologies, Inc.
- Orion Health
- OZ Systems
- PatientSafe Solutions
- Philips Healthcare
- Physician Technology Services, Inc.
- Picis, Inc.
- Polycom, Inc.
- Premier, Inc.
- Project Performance Corporation
- Prosocial Applications, Inc.
- Quidgest - Consultores de Gest'o, SA
- Radion, Inc.
- Radiosity, Gruppo Dedalus
- RapakaSoft Pvt. Ltd.
- Registry Widgets
- Riveran Medical
- Roadside Telematics Corporation
- Roche Diagnostics S.L.
- Sabacare Co.
- Sage Growth

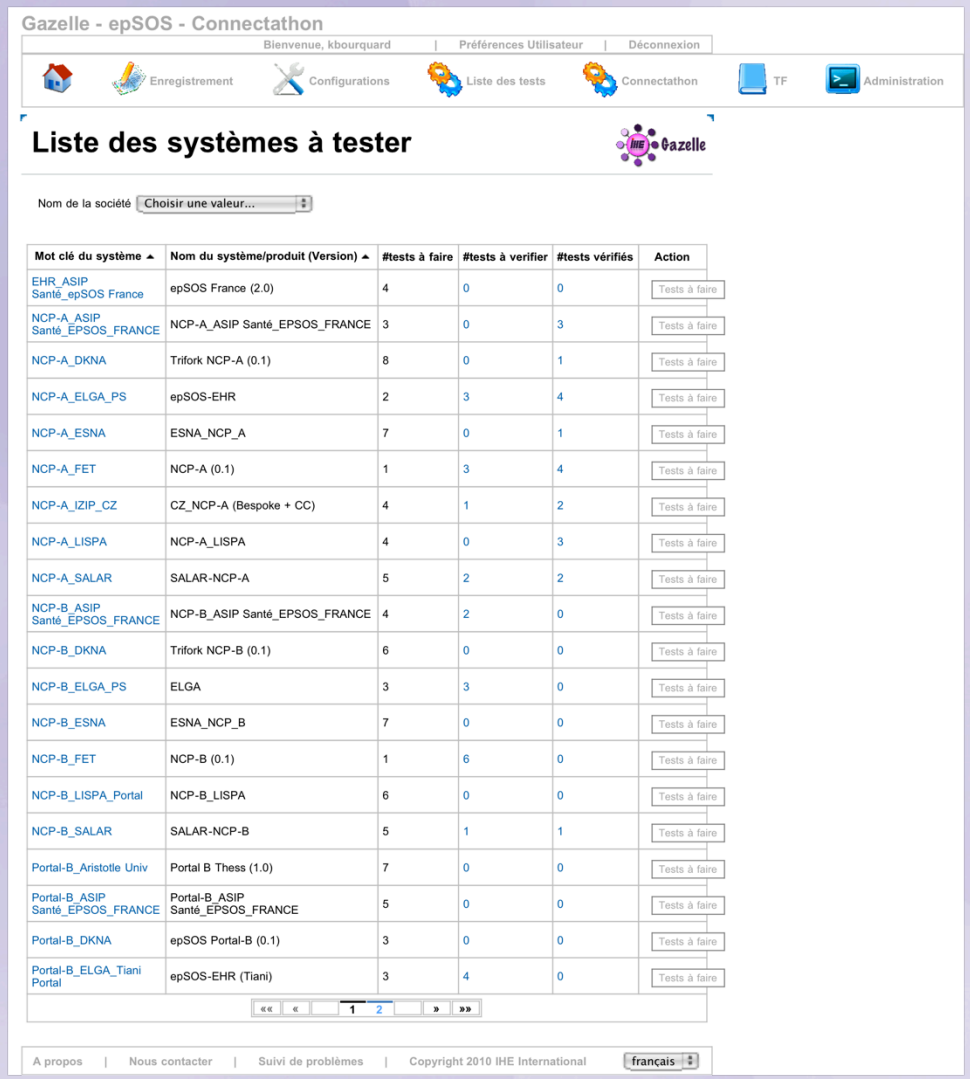


IHE is international: one testing platform & process

Connectathons:

« Marathons of connectivity »

In different countries
& regions of the world:
US, Japan, Europe, Korea, China
Australia…

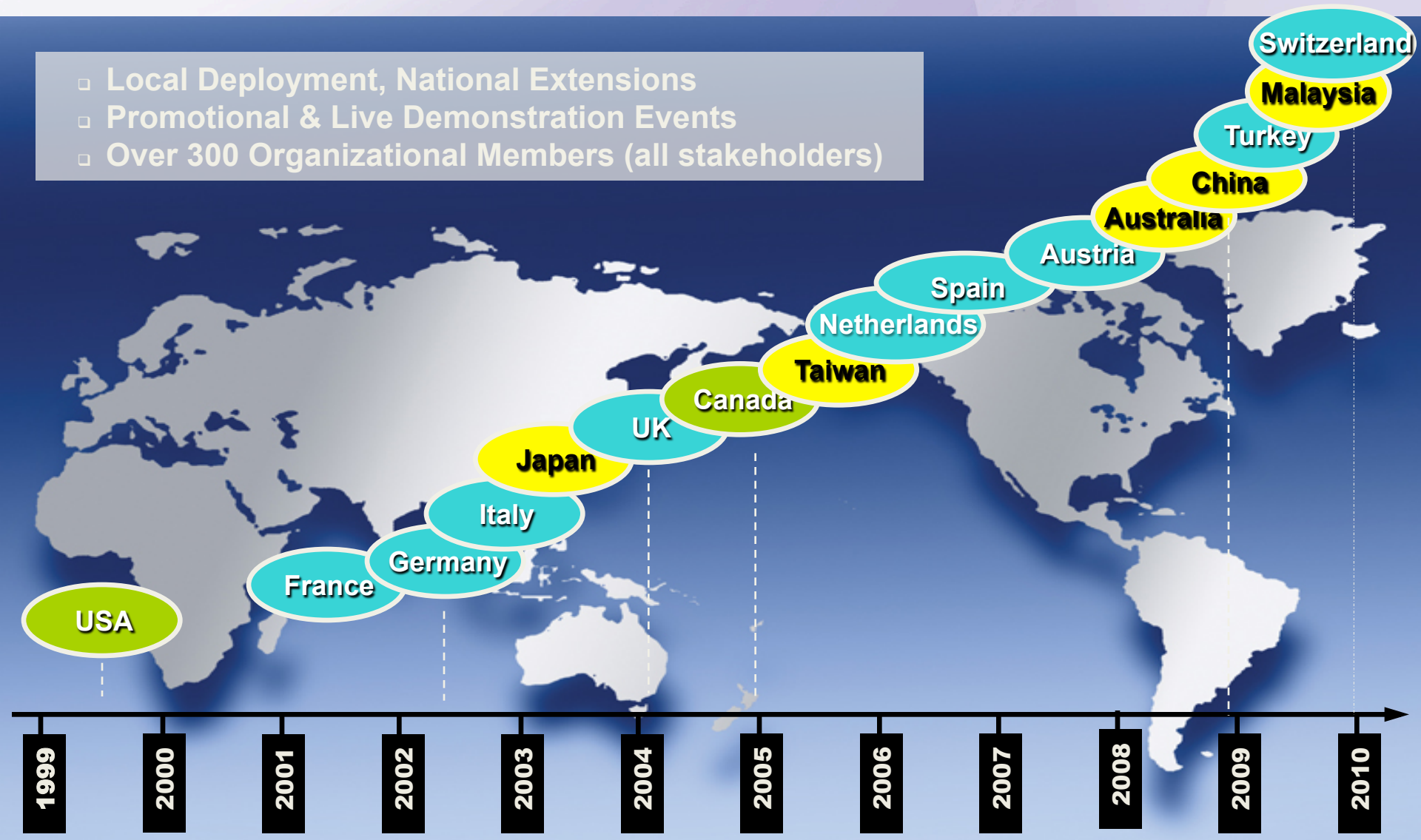


Stakeholder Benefits

- Healthcare providers and health authorities
  - Improved workflows
  - Information whenever and wherever needed
  - Reduced implementation costs
- Vendors
  - Align product interoperability with industry consensus
  - Decreased cost and complexity of interface installation and management
  - Focus competition on functionality/service not information transport
- SDOs
  - Rapid feedback to adjust standards to real-world
  - Establishment of critical mass and widespread adoption

International Growth of IHE

- Local Deployment, National Extensions
- Promotional & Live Demonstration Events
- Over 300 Organizational Members (all stakeholders)



Pragmatic global standards harmonization + best practices sharing

IHE International Membership

- 500 Member Organizations world-wide
- Effective multi-stakeholder, multi-country balance

  www.ihe.net/governance/member_organizations.cfm

- You may join today !
- Even better, organize an IHE initiative in your country and join IHE International !

IHE Organizational Structure

IHE International Board

Regional Profile Deployment

IHE North America

- Canada
- USA

IHE Asia-Oceania

- China
- Japan
- Korea
- Taiwan

IHE Europe

- Austria
- France
- Germany
- Netherlands
- Italy
- Switzerland
- Spain
- Turkey
- UK

Global Profile Development

- Radiology
- IT Infrastructure
- Laboratory
- Cardiology
- Patient Care Coordination
- Pathology
- Radiation Oncology
- Patient Care Devices
- Eye Care
- Public Health, Quality and Research
- Pharmacy

Professional Societies / Sponsors/ Health Authorities

ACC, ACCE, ACEP, ACP, ASIP, HIMSS, RSNA, SFR, SFIL, COCIR, EAR-ECR, DRG, SIRM, BIR, NICTIZ, ESC, EuroRec, ELGA, JAHIS, JIRA, JRS, METI-MLHW, MEDIS-DC, JAMI

Contributing & Participating Vendors

IHE- Roles of Different levels

International Governance

IHE International Board

International
Use Cases & Profiles

Global Profile Development

Radiology	IT Infrastructure	Laboratory
Cardiology	Patient Care Coordination	Pathology
Radiation Oncology	Patient Care Devices	Eye Care
Public Health, Quality and Research	Pharmacy	

European Coordination
Testing & Education

Regional Profile Deployment

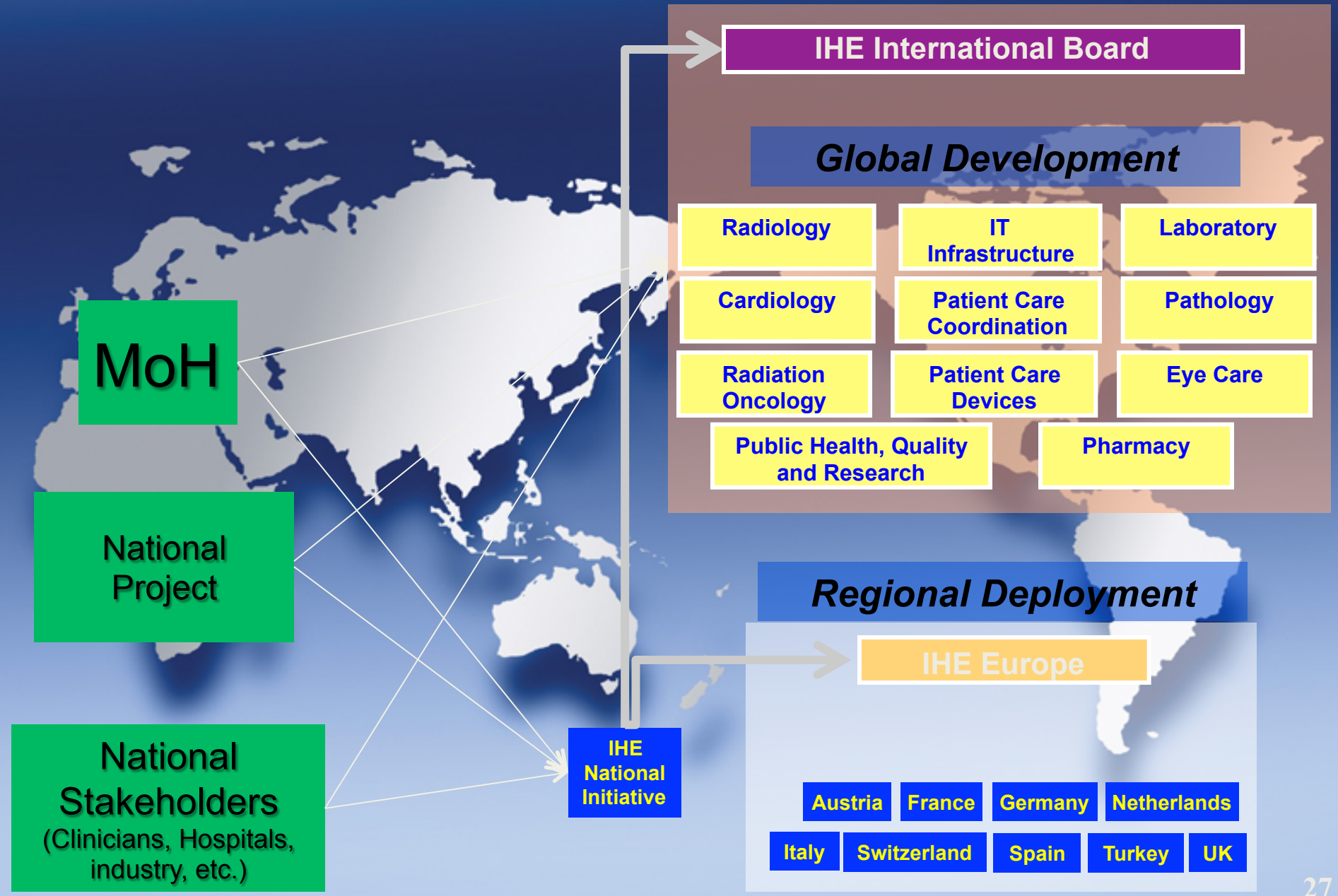
IHE Europe

Austria | France | Germany | Netherlands | Italy | Switzerland | Spain | Turkey | UK

National Engagement

IHE
National Initiative

IHE- Where to Engage ?



IHE based "Interoperability" experience has demonstrated significant benefits to national programs:

- Reduce specification consensus time
- Simplify implementation efforts
- Reuse of testing tools and processes
- Shared implementation experience

IHE EUROPE Integrating the Healthcare Enterprise

Presentation of standards landscape Part II

Alexander Berler, ***IHE-Europe, IHE Services Director***

Karima Bourquard, IHE-Europe, Director of Interoperability

Forum e-Zdrowia

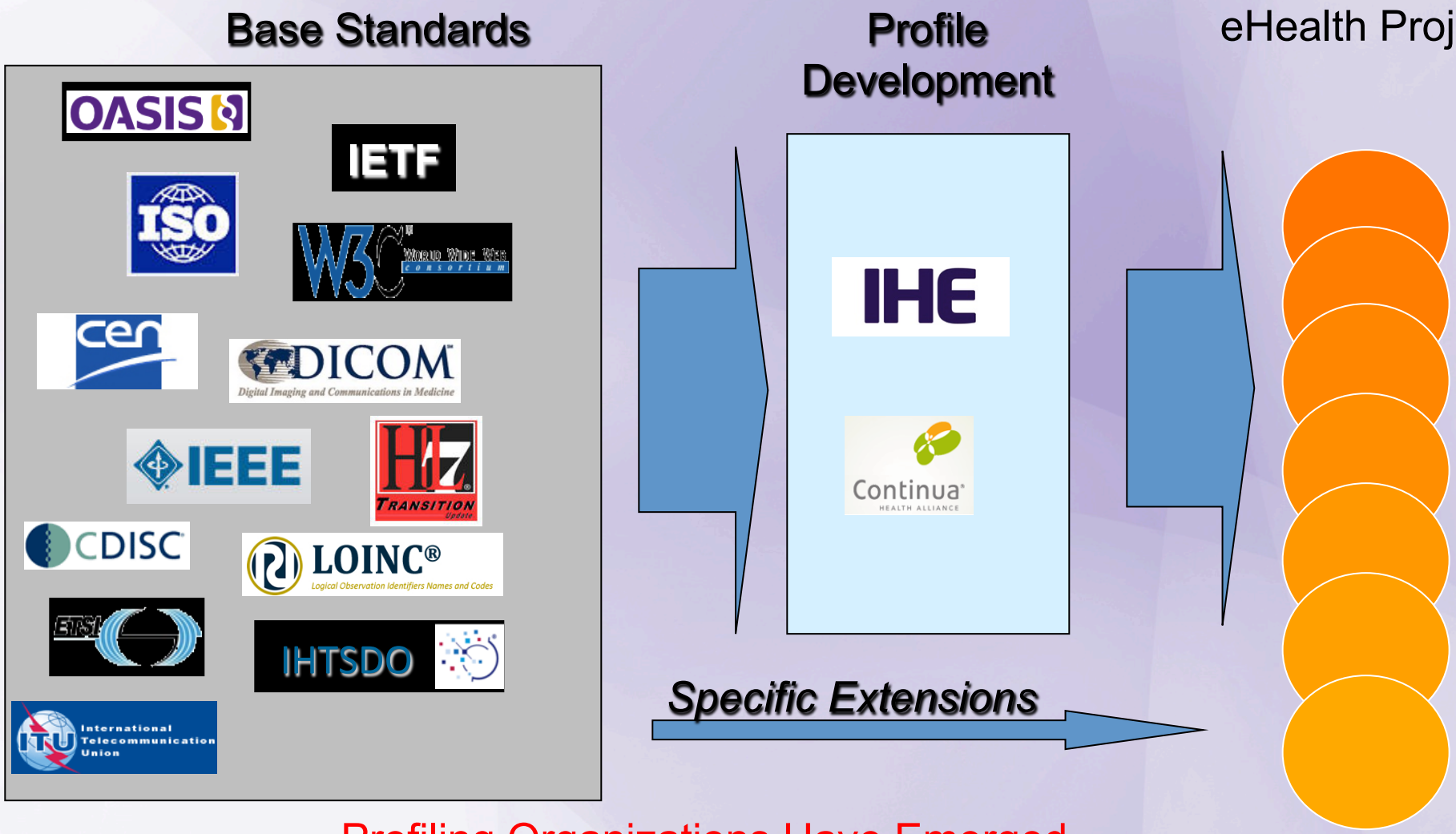
15 – 16 September 2016

FORUM eZDROWIA

http://forumezdrowia.pl/en/

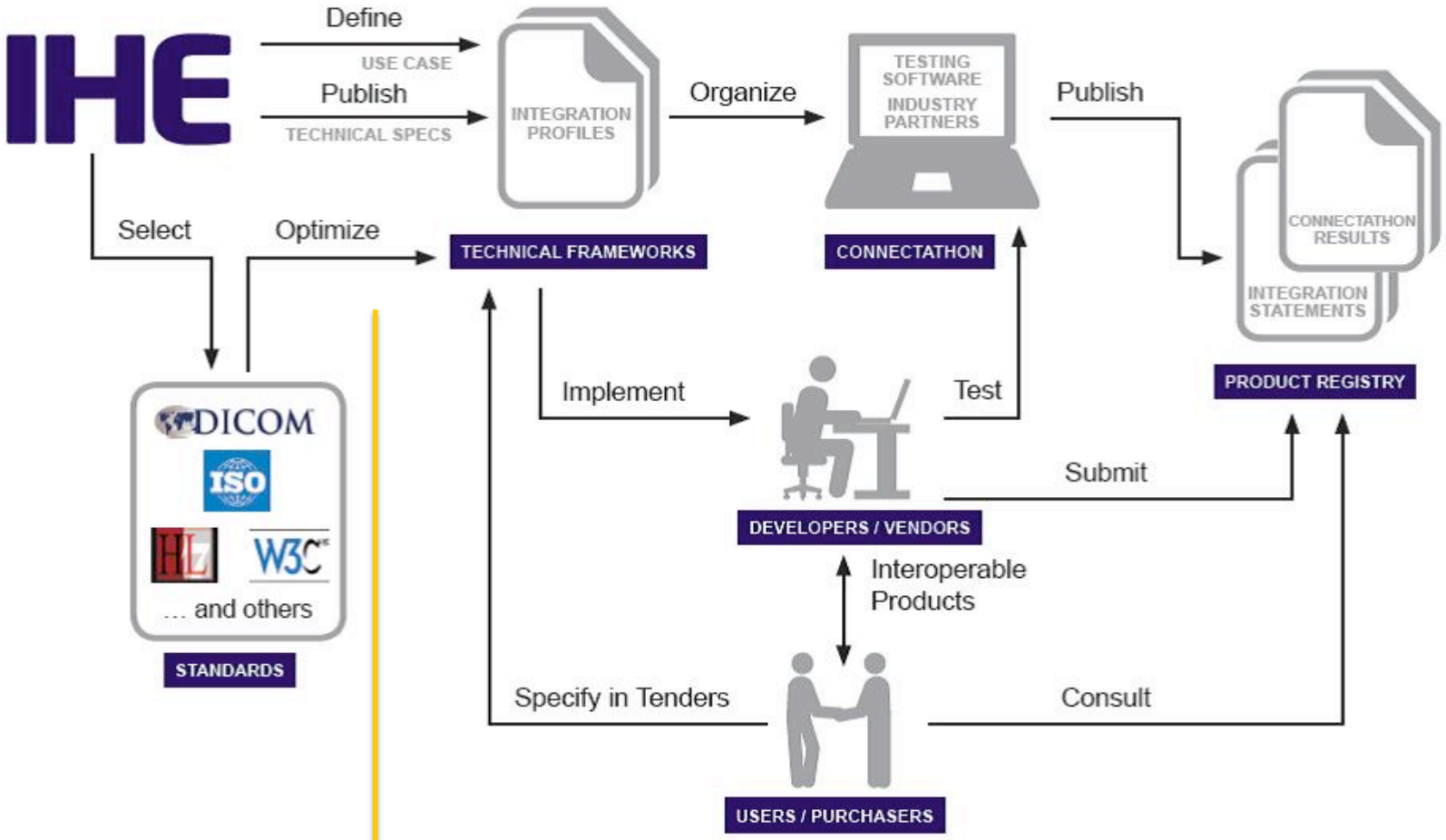
IHE EUROPE
Integrating the Healthcare Enterprise

Interoperability: from a problem to a solution



Profiling Organizations Have Emerged

IHE Profile Base Standards Development Process



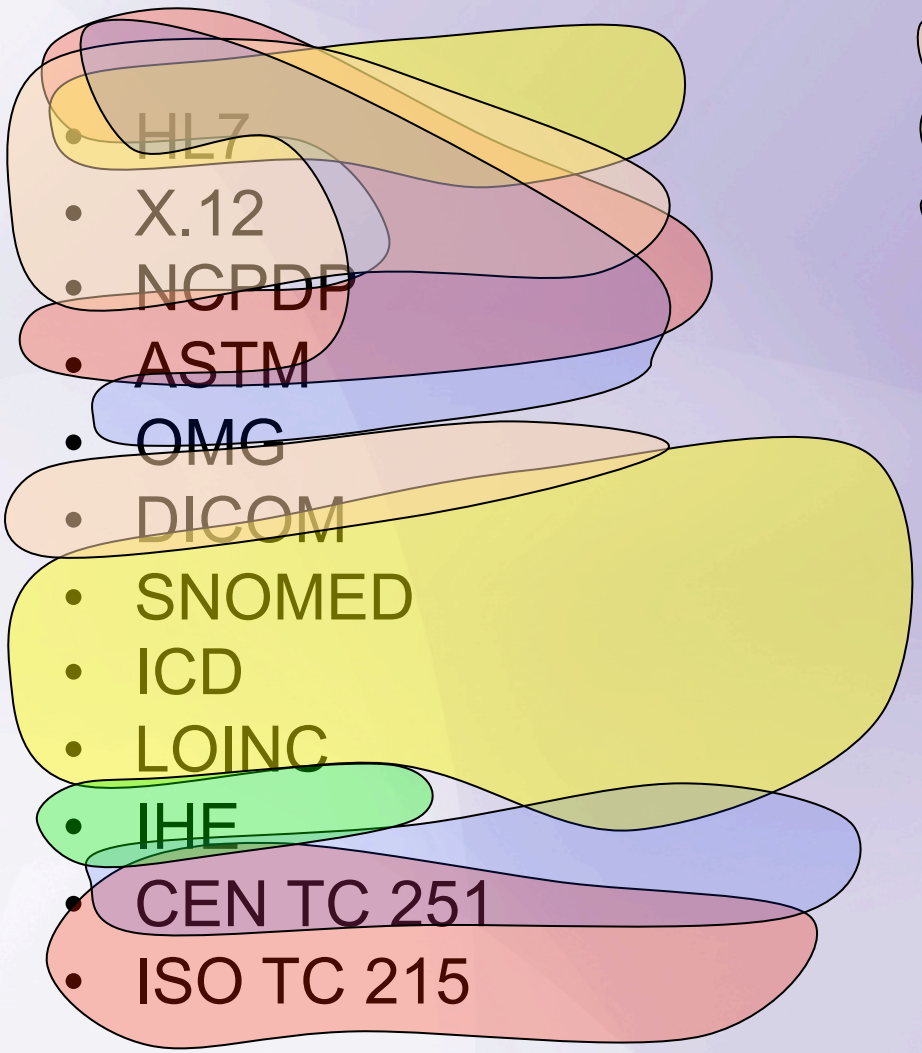
Base Standards Development Process

ISO/TR 28380-1/2/3 : 2014

Health informatics -- IHE global standards adoption

www.ihe.net

Standards in eHealth…



Messaging Standards

Terminology Standards

"Functional" Standards

Structured Doc Standards

Services Standards

Standards Profiling

IHE EUROPE Integrating the Healthcare Enterprise

Some Codifications and nomenclatures in Healthcare…

- London Bills of Mortality (1662)
- International Classification of Diseases (ICD-1) (1901)
- Current Procedural Terminology (CPT) (1966)
- Anatomical Therapeutic Chemical (ATC) (1969)
- ICD-9 (1977), ICD-10 (1992)
- HCFA-DRGs (1983)
- Diagnostic and Statistical Manual of Mental Disorders IV
- Read Codes 2 (1982) & 3(1995)
- International Classification in Primary Care (ICPC-2) (1998)
- Systematized Nomenclature of Human and Veterinary Medicine (SNOMED RT) (1928)
- SNOMED CT (2001)
- International Classification for Nursing Practice (2001)
- International Classification of Functioning, Disability, Health

List of Standards included in epSOS specs for cross border healthcare

- **Technical Interoperability**
- SAML v2.0
- TLS 1.0
- TLS 1.1
- TLS 1.2
- IHE - XDS.b
- IHE - XDM
- SOAP version 1.1
- WS-Security (WSS)
- WS-Trust v1.3 March 2007
- Web Services Business Process Execution Language v2.0
- WSDL 1.1
- XSPA , Cross-Enterprise Security and Privacy Authorization
- IPSec , Security Architecture for the Internet Protocol

- **Semantic interoperability**
- ISO TC 215
- CEN TC/251
- UCUM
- HL7 Version 3 Standards : transport specification - web services profile release 2
- HL7 Common Terminology Services 2 Service Functional Model (SFM)
- Lexicon Query Service version 1.0
- SNOMED_CT Technical Implementation Guide
- EDQM standards
- LOINC
- ATC
- ICD
- OWL
- CDA
- XML Schema
- XSL version 1.0
- XSL version 1.0

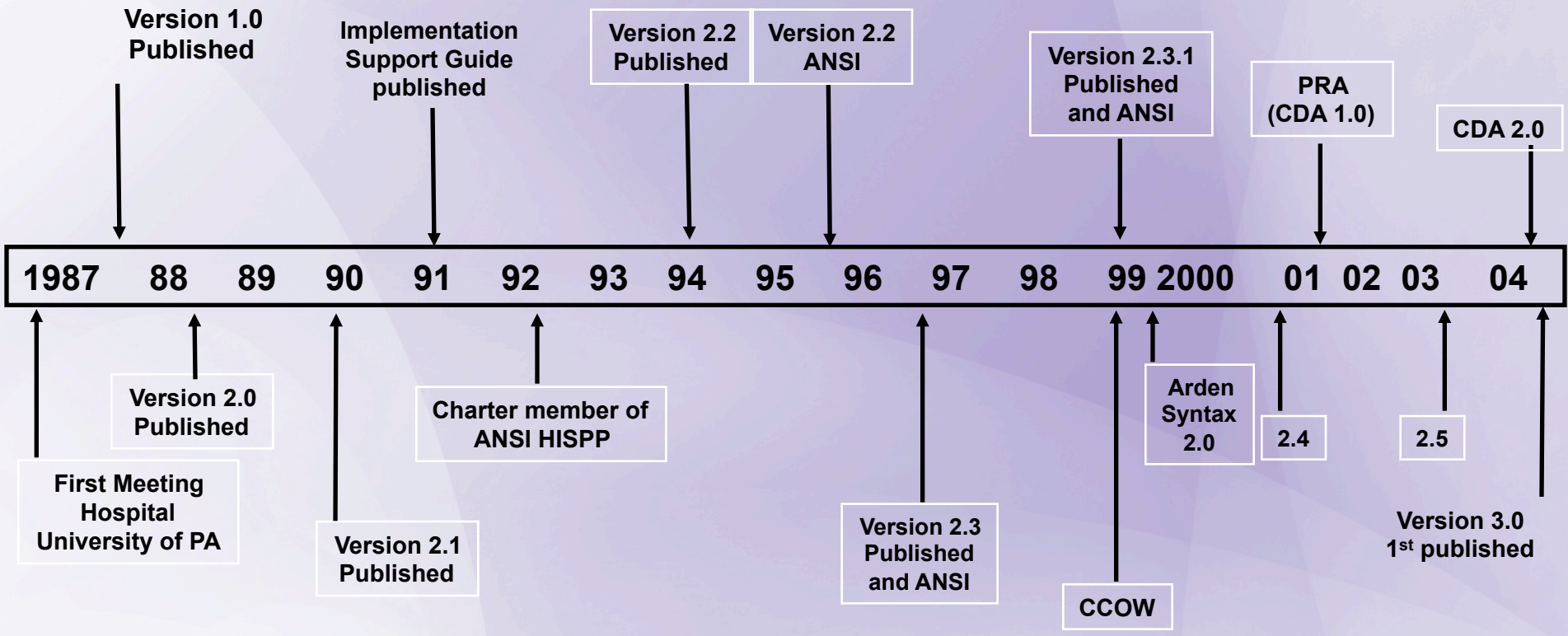
What is HL7?

- Health Level Seven (HL7) is an ANSI accredited Standards Developing Organization (SDO), and develops the HL7 standard for Interoperability in Healthcare domain
- HL7 is more than you think
  - is an **ISO** certified series of standards - Examples
    - ISO/HL7 10781:2009 = HL7 Electronic Health Record-System Functional Model, Release 1.1
    - ISO/HL7 27932:2009 = HL7 Clinical Document Architecture, Release 2
    - ISO/HL7 21731:2014 = HL7 version 3 -- Reference information model -- Release 4
    - ISO/HL7 27951:2009 = HL7 Common terminology services, release 1
    - ISO/HL7 27931:2009 = HL7 Version 2.5 -- An application protocol for electronic data exchange in healthcare environments
    - ISO/HL7 27953-2:2011 = HL7 Individual case safety reports (ICSRs) in pharmacovigilance -- Part 2: Human pharmaceutical reporting requirements for ICSR
  - It is an "Open Standard" accepted by the majority of healthcare solution suppliers
  - Allows for data exchange between applications of different suppliers ➔ flexibility on solutions to be selected and adopted
  - Is adopted by Governments as part of their strategic policy related to ICT in Healthcare
  - But…is not enough to solve the interoperability problems of the healthcare domain!

HL7 around the world

IHE EUROPE Integrating the Healthcare Enterprise

HL7 Standards Development across time



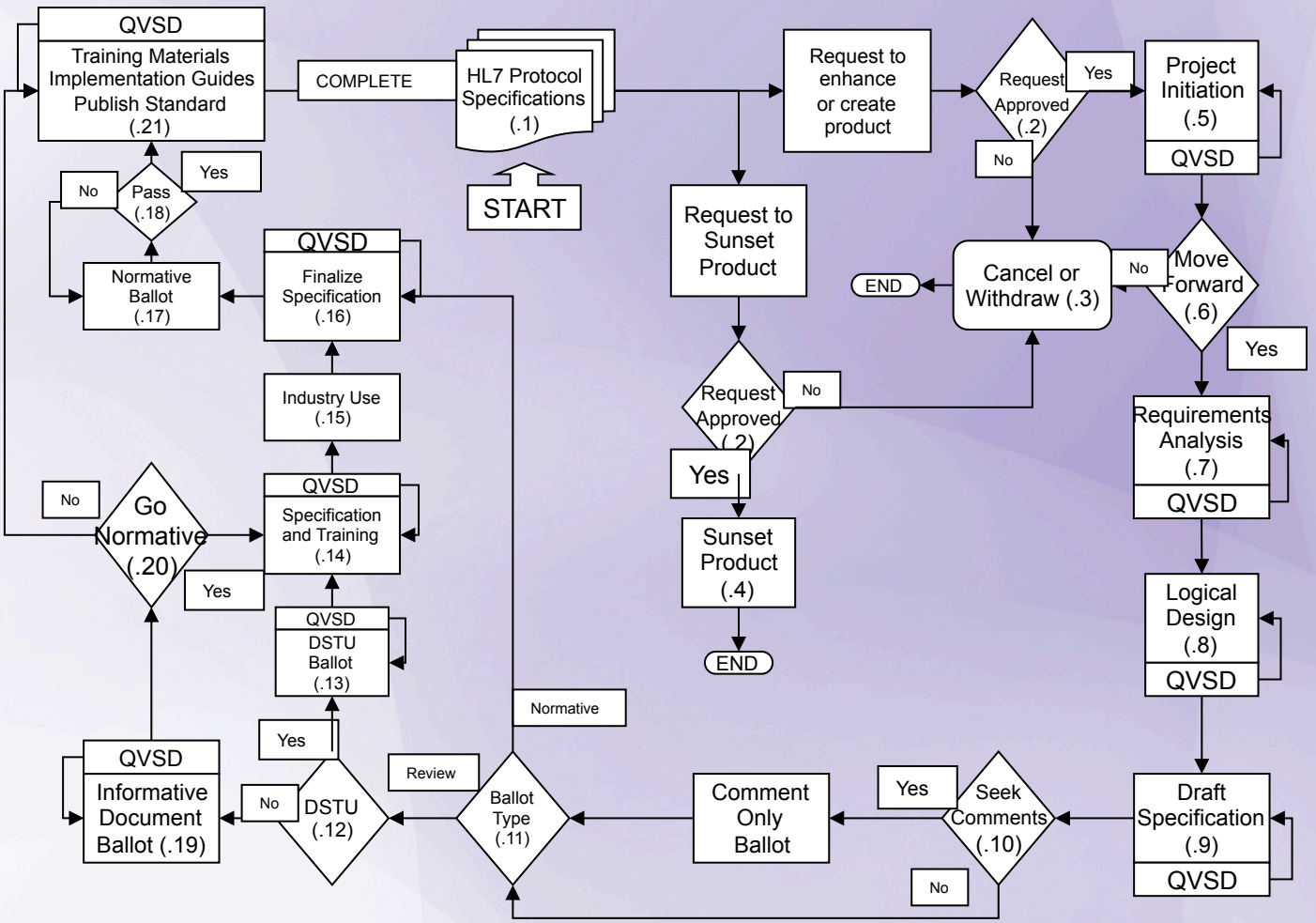
IHE EUROPE Integrating the Healthcare Enterprise

HL7 International's 56 Working Groups and counting

HL7 Work Groups:

- Affiliate Due Diligence
- Anatomic Pathology
- Architecture Board
- Arden Syntax
- Attachments
- Child Health
- Clinical Context Object Workgroup (CCOW)
- Clinical Decision Support
- Clinical Genomics
- Clinical Interoperability Council
- Clinical Statement
- Community Based Collaborative Care
- Conformance and Guidance for Implementation and Testing
- Education
- Electronic Health Record
- Electronic Services
- Emergency Care
- Financial Management
- Generation of Anesthesia Standards
- Governance and Operations
- Government Projects
- Health Care Devices
- Imaging Integration
- Implementable Technology Specifications
- Implementation / Conformance
- Infrastructure and Messaging
- International Council
- International Mentoring
- Marketing
- Mobile Health
- Modeling and Methodology
- Nomination Committee
- Orders and Observations
- Organizational Relations
- Outreach Committee for Clinical Research
- Patient Administration
- Patient Care
- Patient Safety
- Pharmacy
- Policy Advisory
- Process Improvement
- Project Services
- Public Health and Emergency Response
- Publishing
- Recognition and Awards
- Regulated Clinical Research Information Management (RCRIM)
- RIM Based Application Architecture
- Security
- Services Oriented Architecture
- Strategic Initiative Committee
- Structured Documents
- Templates
- Tooling
- Vocabulary

HL7 Standards procedures



May, 2012

IHE EUROPE Integrating the Healthcare Enterprise

HL7 V2.X Domain

- ADT
- Order entry
- Result reporting
- Clinical Guidelines
- Clinical Observations
- Scheduling
- Patient care
- Immunizations
- Discharge summaries
- Adverse event reporting
- Automated waveforms
- Medical transcriptions
- Referrals
- Consultations
- Clinical trials
- Nursing care plans
- Data Warehousing

IHE EUROPE
Integrating the Healthcare Enterprise

Version 2.7 Chapters

1. Introduction
2. Control / Data Types / Conformance & Code Tables
3. Patient Administration
4. Orders (US Revision in V.2.8.2)
5. Queries
6. Financial Management
7. Observations (revisions for US in V.2.8.2)
8. Master Files
9. Medical Records / Information Mgmt
10. Scheduling
11. Patient Referral
12. Patient Care
13. Clinical Laboratory Automation
14. Application Management
15. Personnel Management
16. Non-US eClaims *(new)*
17. Materials Mgmt. *(new)*

Appendices:

A. Data Definition Tables
B. Lower Layer Protocol
C. BNF Definitions
D. Glossary
E. Index

Version 2 Example: Patient Registration

Message Header and Event

```
MSH|^~\&|REGADT|MCM|IFENG||199112311501||ADT^A04|000001|P|2.4|||<cr>
EVN|A04|199901101500|199901101400|01||199901101410<cr>
```

Patient Identity

```
PID|||191919^^^GENHOS^MR~371-66-9256^^^USSSA^SS|253763|MASSIE^JAMES^A||19560129|M|||
    171 ZOBERLEIN^^ISHPEMING^MI^49849^"""^||(900)485-5344|(900)485-5344||S|C|
    10199925^^^GENHOS^AN|371-66-9256||<cr>
```

Next of kin

```
NK1|1|MASSIE^ELLEN|SPOUSE|171 ZOBERLEIN^^ISHPEMING^MI^49849^"""^|(900)485-5344|
    (900)545-1234~(900)545-1200|EC1^FIRST EMERGENCY CONTACT<cr>
NK1|2|MASSIE^MARYLOU|MOTHER|300 ZOBERLEIN^^ISHPEMING^MI^49849^"""^|(900)485-5344|
    (900)545-1234~(900)545-1200|EC2^SECOND EMERGENCY CONTACT<cr>
```

Patient Visit Information

```
PV1||O|O/R||||0148^ADDISON,JAMES|0148^ADDISON,JAMES|0148^ADDISON,JAMES|AMB|||||||
    0148^ADDISON,JAMES|S|1400|A|||||||||||||||||GENHOS|||||199501101410|<cr>
PV2|||||||||199901101400|||||||||||||||||||||||||199901101400<cr>
```

Patient Height and Weight

```
OBX||ST|1010.1^BODY WEIGHT||62|kg|||||F<cr>
OBX||ST|1010.1^HEIGHT||190|cm|||||F<cr>
```

Diagnosis

```
DG1|1|19||BIOPSY||00|<cr>
```

Guarantor and Insurance

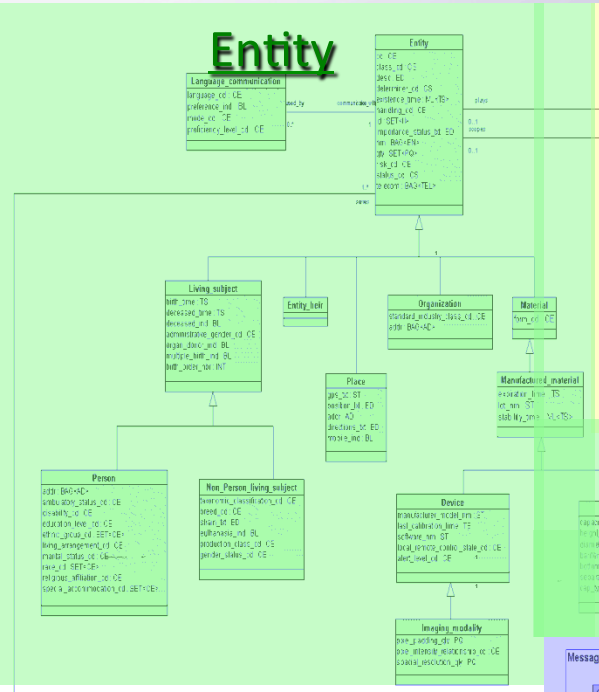
```
GT1|1||MASSIE^JAMES^"""^"""^"""^"""^||171 ZOBERLEIN^^ISHPEMING^MI^49849^"""^|
    (900)485-5344|(900)485-5344||||SE^SELF|371-66-925||||MOOSES AUTO  CLINIC|171
    ZOBERLEIN^^ISHPEMING^MI^49849^"""|(900)485-5344|<cr>
IN1|0|0|BC1|BLUE CROSS|171 ZOBERLEIN^^ISHPEMING^M149849^"""^||(900)485-5344|90||||||50
    OK|<cr>
```

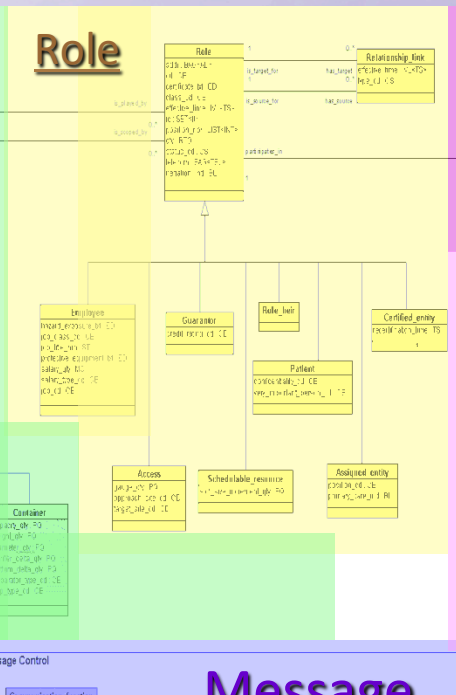
HL7 v3 Family of Standards

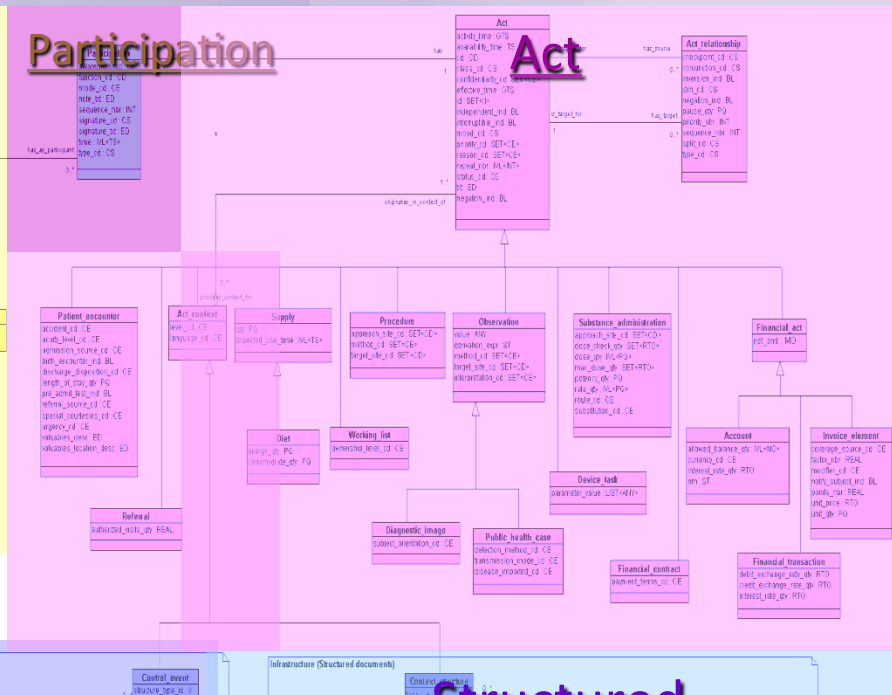
- Version 3 RIM (ISO/HL7 21731:2006 RIM)
- V3 Messaging
- Documents
  - Clinical Document Architecture (CDA – release 2)
- Service Oriented Architecture:
  - Entity Identification Services (EIS)
  - Common Terminology Services (CTS)
  - Resource Location and Update Services (RLUS)
  - Decision Support Services (DSS)
- RIM Based Application Architectures (RIMBAA)
  - Java APIs

IHE EUROPE
Integrating the Healthcare Enterprise

HL7 RIM





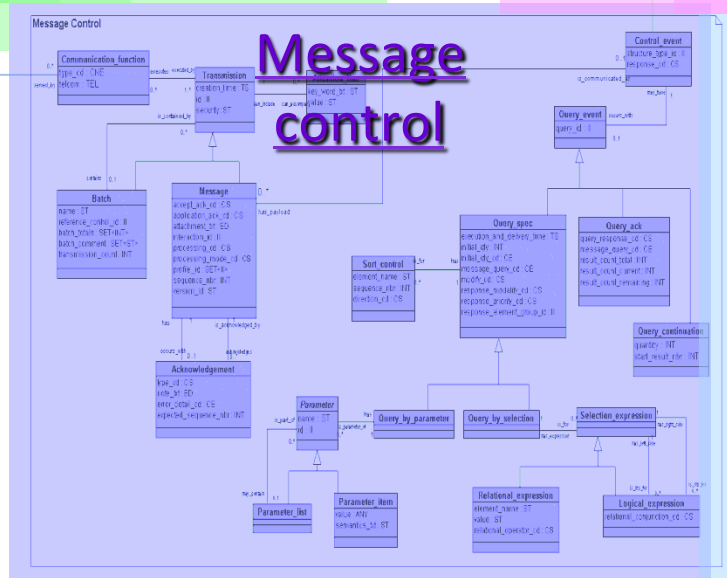


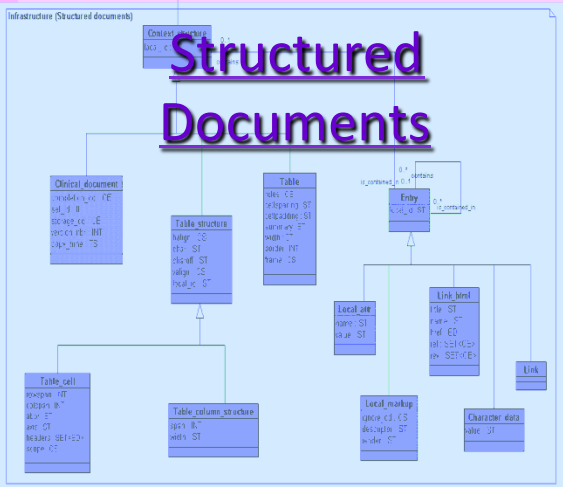
HEALTH LEVEL 7
REFERENCE INFORMATION MODEL
VERSION 1.12 (RIM_0112)

Version is basis for second committee-level ballot of Version 3. It was released January 2002, and reflects RIM changes through Harmonization on 11/30/2001

Entities
Roles
Infrastructure (Structured documents)
Acts (Clinical)
Acts (Financial)
Infrastructure (Message control)

Billboard produced by Rochester Outdoor Advertising





IHE EUROPE Integrating the Healthcare Enterprise

Domains of HL7v3

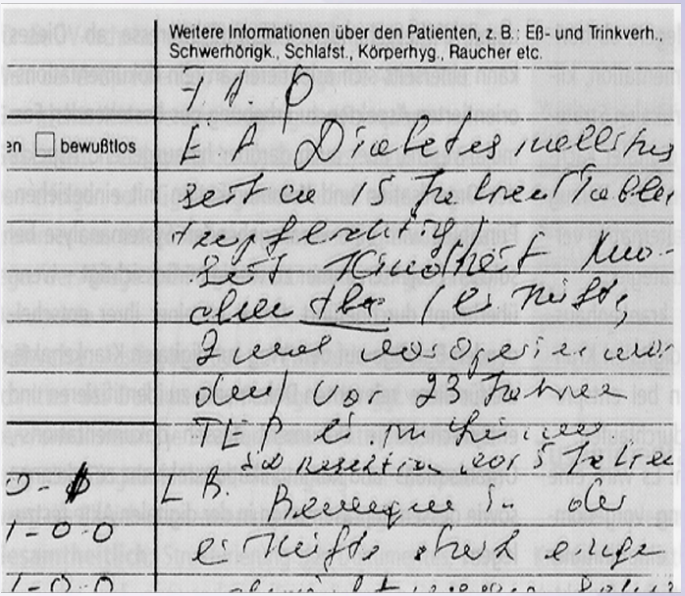
- Accounting and Billing
- Blood, Tissue, and Organ*
- Care Provision
- Clinical Genomics
- Claims and Reimbursement
- Clinical Document Architecture
- Clinical Decision Support
- Clinical Statement
- Common Message Element Types
- Imaging Integration
- Immunization*
- Laboratory*
- Medication*
- Materials Management*
- Medical Records
- Observations*
- Orders*
- Patient Administration
- Personnel Management*
- Pharmacy*
- Public Health
- Registries*
- Regulated Products
- Regulated Studies (Clinical Trials)
- Scheduling
- Shared Messages
- Specimen Domain
- Therapeutic Devices

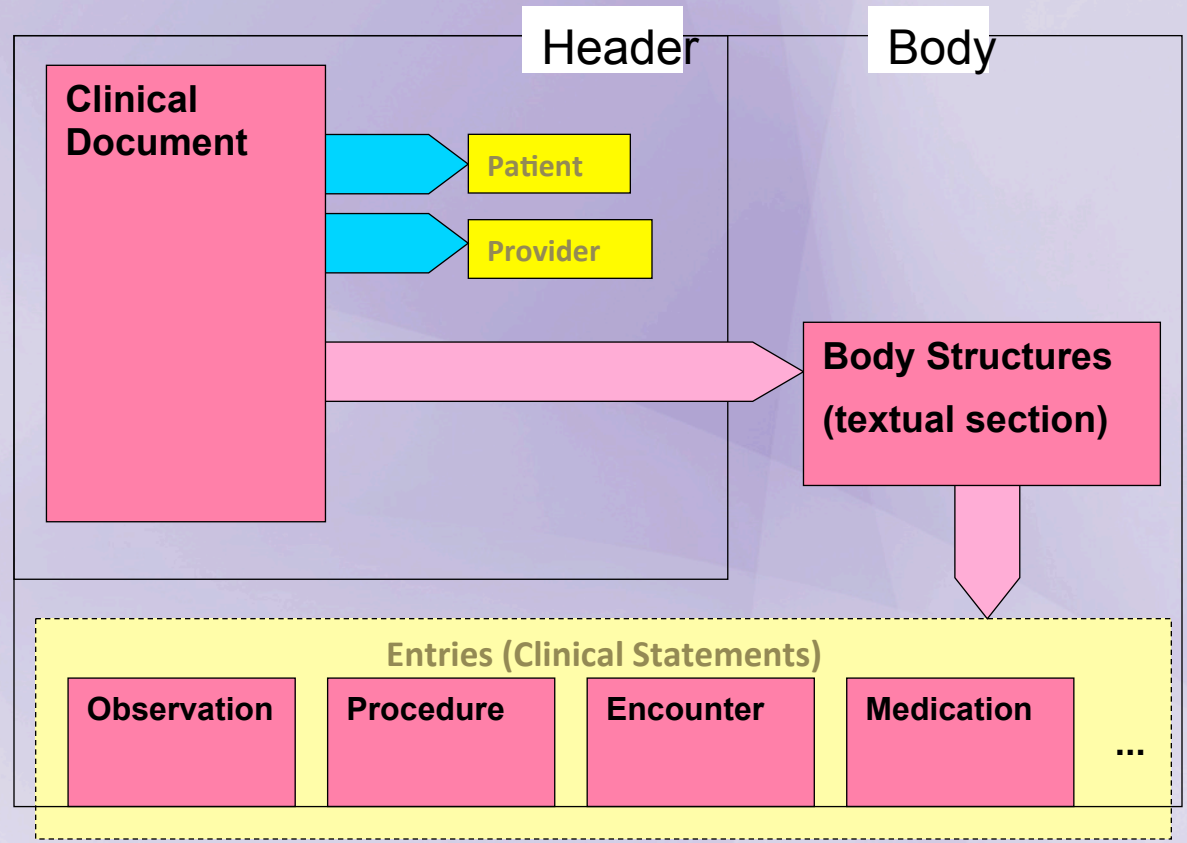
IHE EUROPE Integrating the Healthcare Enterprise

Clinical Document Architecture

- A “container” representation for representing electronic documents for intra- and inter-organization information sharing
- Different than messaging due to “holistic” representation
- Ability to support security, maintain integrity, and capturing signing information
- Three levels of increasing specificity

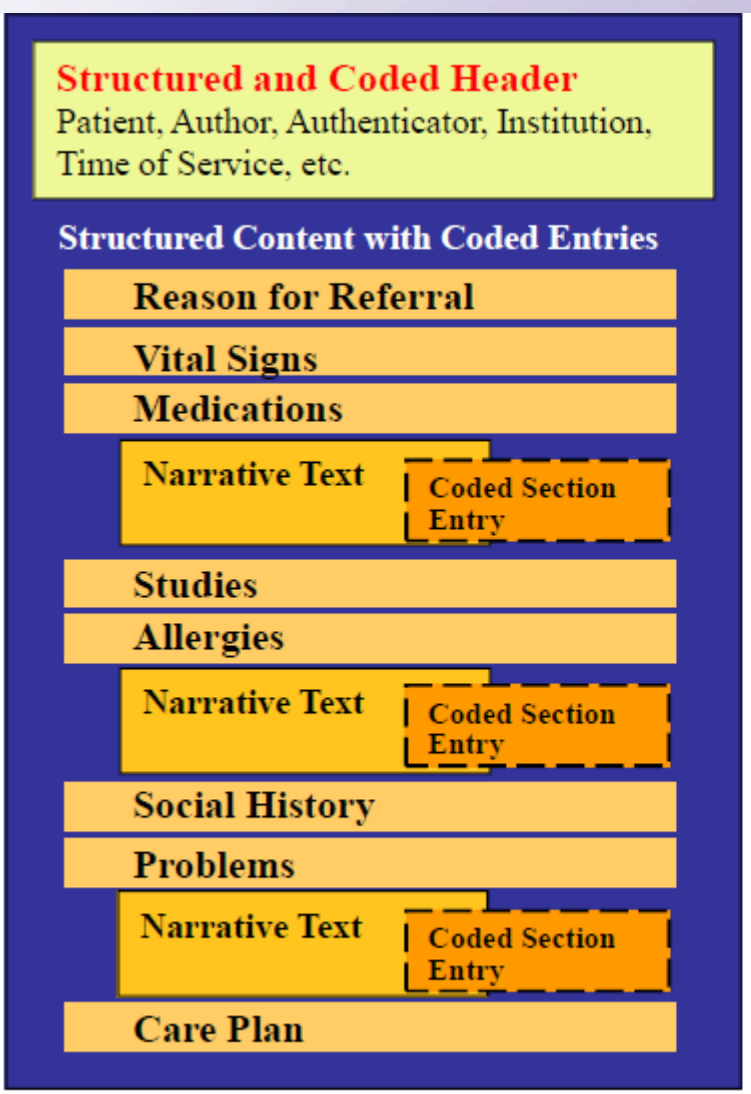
CDA: Clinical Document Architecture





Slide used by permission of Kai Heitmann

CDA: Clinical Document Architecture



Level 1 → Header always structured and coded

Level 2 → Title-coded sections with nor-structured non-coded content (text, lists, tables). ➔ Simple Viewing (XML Style sheet)

Level 2+ → Meds, Problems and Allergies required as highly structured text. ➔ Text easy to import/parse

Level 3 → Meds, Problems and Allergies have a required fine-grain structure with optional coding. Coding Scheme not standardized, but explicitly identified.

HL7 FHIR

F H I R

Fast

Healthcare

Interoperability

Resources

HL7 Fast Healthcare Interoperability Resources (FHIR)

- Fast Healthcare Interoperability Resources (FHIR, pronounced "Fire") defines a set of "Resources" that represent granular clinical concepts.
- The resources can be managed in isolation, or aggregated into complex documents. Where possible, open internet standards are used for data representation.
- FHIR resources are based on simple XML or JSON structures, with an http-based RESTful protocol where each resource has predictable URL.

http://wiki.hl7.org/index.php?title=FHIR
www.fhir.org
http://www.fhir.org

DICOM

http://DICOM.nema.org

- What is DICOM? DICOM is a global Information-Technology standard that is used in virtually all hospitals worldwide. Its current structure, which was developed in 1993, is designed to ensure the interoperability of systems used to: Produce, Store, Display, Process, Send, Retrieve, Query or Print medical images and derived structured documents as well as to manage related workflow.

DICOM Objects

- CR : Computer Radiography
- DR : Digital radiography
- NM : Nuclear Medicine
- PET : TEP
- RT : Radiothérapy
- VL : Visible Light
- SR : Structured Reporting
- CT : Comp. Tomo. Scan.
- MR : IRM
- US : Ultra-Sound (Echo.)
- SC : Secondary Capture

IHE EUROPE Integrating the Healthcare Enterprise

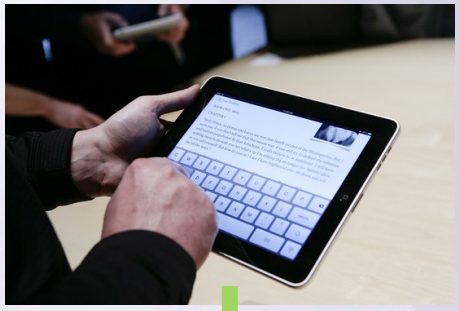
Who needs DICOM?

- **Hospitals, clinics, imaging centers and specialists**. By purchasing only equipment and information systems that conform to the DICOM Standard, one can ensure that these tools will work together to produce, manage and distribute images regardless of your previous, current or future vendors
- **Manufacturers of imaging equipment and imaging information systems**. DICOM conformance ensures that every medical imaging facility is a potential customer, because your equipment can work with any workflow or electronic health record systems.
- **Manufacturers of peripheral equipment** lowered cost of care. (e.g., film scanners, printers, computer monitors and workstations, image archives).
- DICOM is also an integral part of Integrating the Healthcare Enterprise (IHE),

Current Mobile App ecosystem in health

Interoperability challenges in the Deployment of mHealth

Mobile App for health professionals



Specific Healthcare IT system or device within a care delivery organization: EMR, PACS/RIS, etc.

Patient access App to a portal (appointments, reminders, access to results and records).

Portal of a specific Healthcare delivery organization: hospital, insurance, laboratory, etc.

Personal health management app either stand-alone or connected

Device specific cloud-based personal health management application

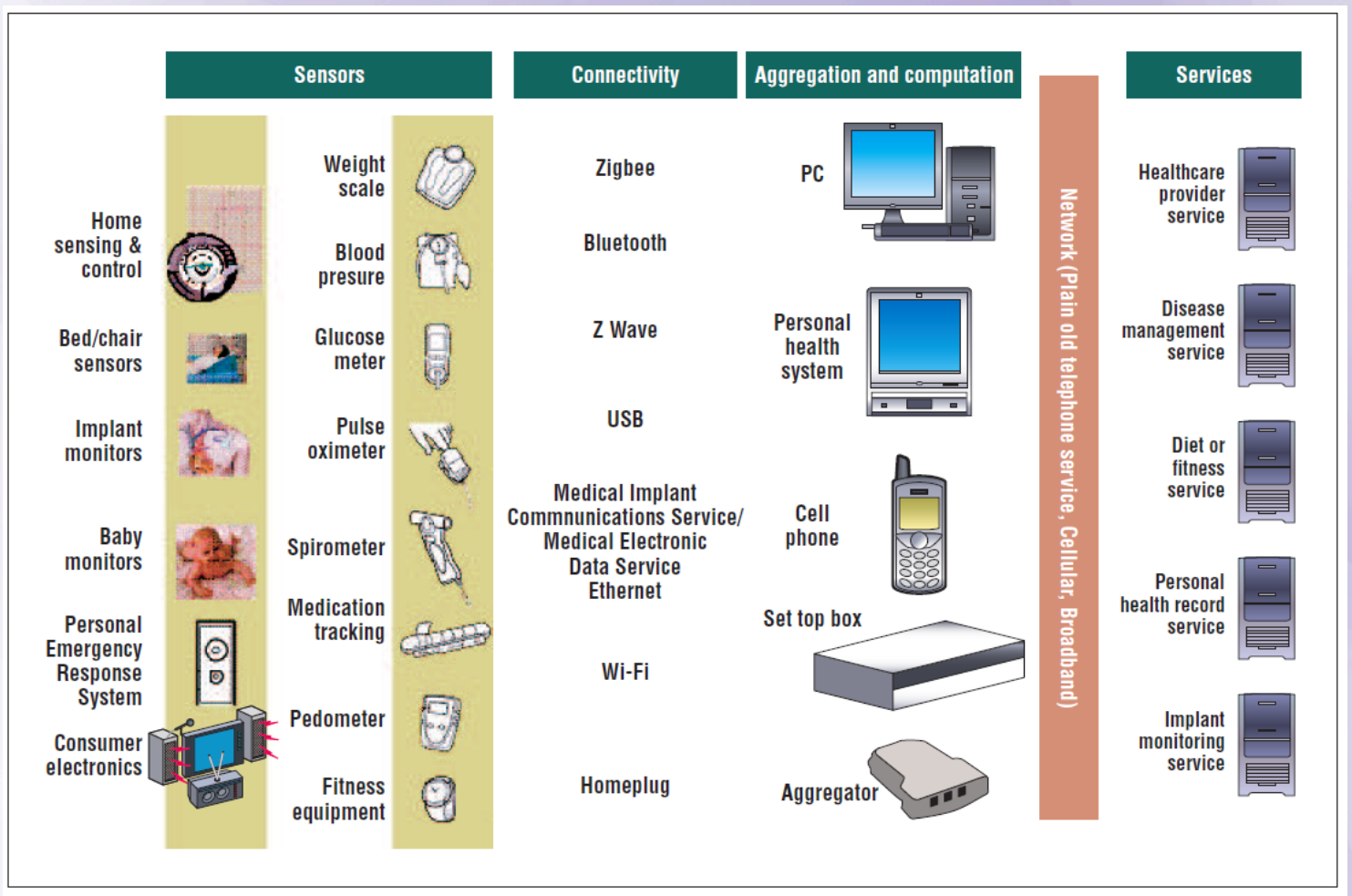
Mobility increases number of Silos

IHE EUROPE
Integrating the Healthcare Enterprise

Internet of Things

By 2020 there will be
50 billion
connected devices - 6 for every connected person

Source: Broadband Commission, 2012

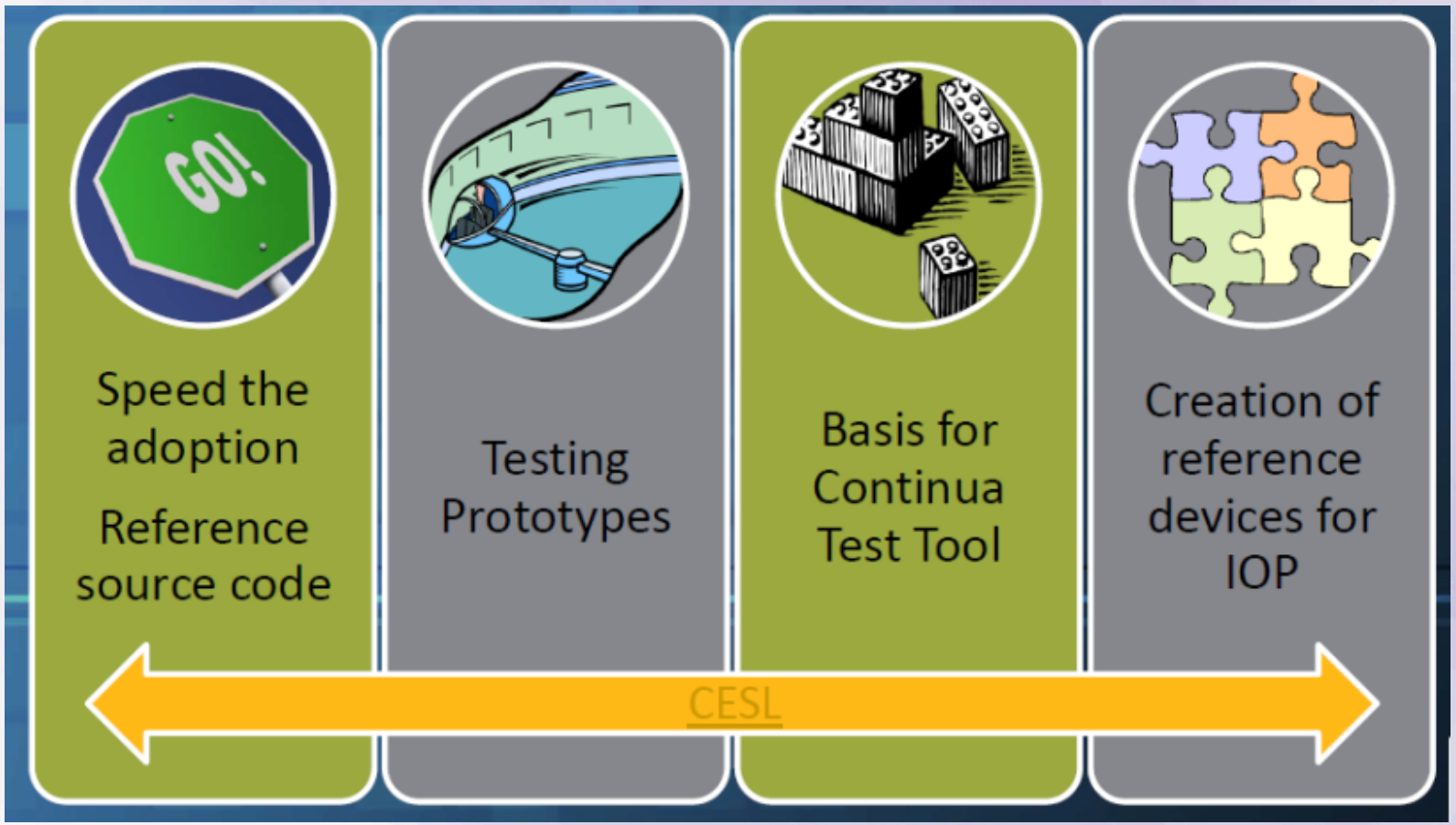


Connecting Devices

- www.ihe.net
- Patient Care Device (PCD) Domain
  - Alert Communication Management (ACM)
  - Device Enterprise Communication (DEC)
  - Implantable Device - Cardiac Observation (IDCO)
  - Point-of-Care Infusion Verification (PIV)
  - Rosetta Terminology Mapping (RTM)
  - Infusion Pump Event Communication (IPEC)
  - Pulse Oximetry Integration (POI)
  - Retrospective Data Query (RDQ)
  - Subscribe to Patient Data (SPD)
  - Waveform Content Module (WCM)
- http://www.continuaalliance.org/

IHE EUROPE Integrating the Healthcare Enterprise

Continua Enabling Software Library



Continua Domains

To organize its work, Continua segmented the market in three large Domains

Living Independently Longer

Wellness

Manage Chronic Conditions

People are at the center of everything PCHA does

Already Complete: Interfaces & Standards

IHE EUROPE — Integrating the Healthcare Enterprise

Personal Device

- Thermometer
- Pulse Oximeter
- Pulse / Blood Pressure
- Weight Scale
- Glucose Meter
- Cardio / Strength
- Independent Living Activity
- Peak Flow
- Medication Adherence
- Physical Activity

Aggregation Manager

ISO
IEEE

Continua BT Profiles
Bluetooth
USB
ZigBee

Device Connectivity

Telehealth Service Center

Continua HEALTH ALLIANCE
IHE
W3C
HL7
GSMA
Wi Fi ALLIANCE

Wide Area Network (WAN) Interface

Health Record Network Interface

Health Records

CCD
PCD 01

EHR
HIE
PHR
NHIN

Closing Remarks

- There are many standards needed to implement specific ehealth scenarios
  - This is what organization such as IHE does by proposing its integration profiles and technical frameworks
- Also there are harmonization projects and initiatives so that SDOs exchange views and cooperate amongst themselves

Antilope

eStandards

Joint Initiative Council

IHE EUROPE
Integrating the Healthcare Enterprise

QUESTIONS ?

Karima.bourquard@ihe-europe.net
Alexander. berler@ihe-europe.net