IHE EUROPE EXPERIENCE DAY 13 SEPTEMBER 2022

Methodology for defining and specifying an e-health interoperability framework based on a “big picture”

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Objectives

To understand IHE process to define and maintain IHE integration profiles

To understand the process to define and maintain a NeHIF

To understand why it is important to have a “big picture”

Agenda

- IHE Methodology to design and maintain its technical frameworks
- Methodology and best practices to design and maintain a NeHIF at project level

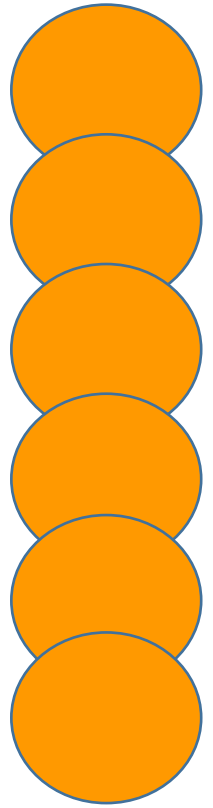
Introduction

Major cause of Health IT project failures

Base standards

OASIS
IEEE
ISO International Organization for Standardization
LOINC from Regenstrief
IETF
cen European Committee for Standardization
ETSI The Standards People
W3C
DICOM
cdisc
HL7 International
ihtsdo
ITU International Telecommunication Union

E-Health projects



Lack of interop. !!!

Health Interoperability Standards: Ignore & Face Consequences

From a problem to a solution

Base standards

OASIS
IEEE
ISO International Organization for Standardization
LOINC from Regenstrief
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cen European Committee for Standardization
ETSI The Standards People
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cdisc
HL7 International
ihtsdo
ITU International Telecommunication Union

Profiles Development Bodies

IHE
Continua

Project specific extensions

E-Health projects Interoperability Specifications

Profiling Organizations have emerged

Other issues…

Other issues during the definition, maintenance and evolution of a National e-Heath Interoperability Framework

- Lack of global national e-Health strategy
- Lack of global national e-Health roadmap
- How to handle legacy hand-processes with the objective to digitalize them including interoperability?
- How to handle “properly*” national specific interoperability needs?

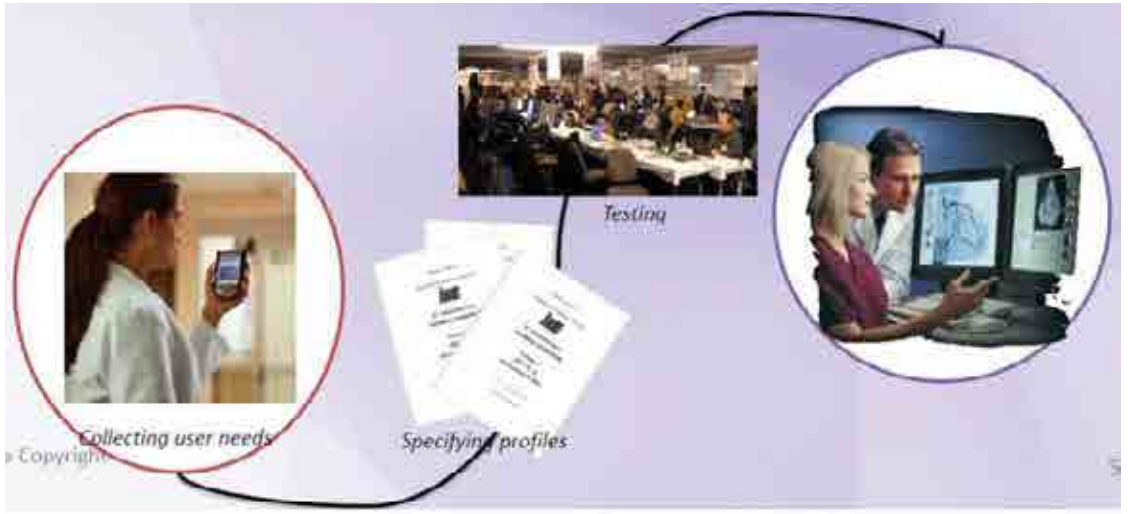
** Be careful not to include interoperability issues*

IHE at a glance
IHE methodology

What is IHE ?

International, Regional and National profiling bodies involving End Users and Vendors

Promoting e-Health interoperability by deploying profiles in Projects



IHE Methodology

IHE defined a methodology for the development, the validation and the deployment of profiles (ISO TR 28380 – 1/2/3)

Methodology: development of profiles based on interoperability use cases (requirements driven)

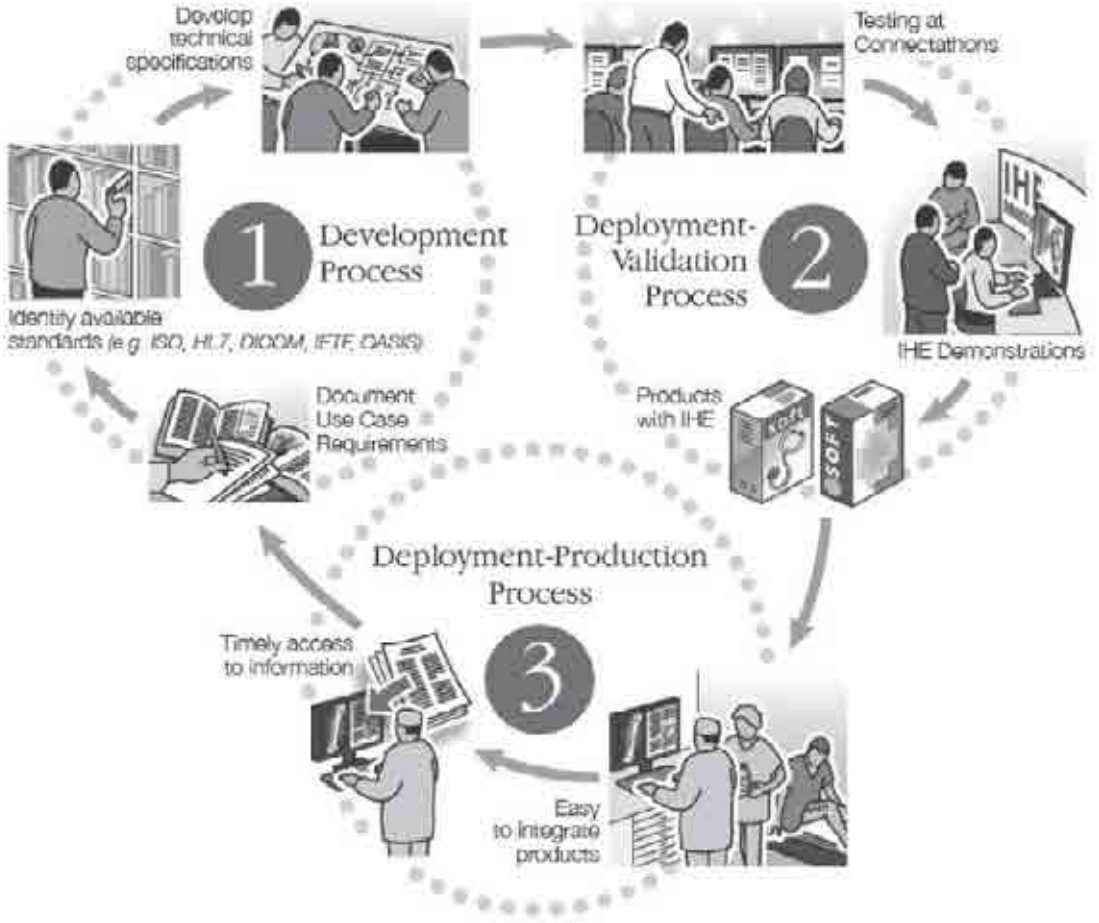


Figure 1 — IHE development and deployment process

Source: ISO/TR 28380-1:2014(E)

Interoperability use case

*"**Textual and graphical** depiction of the actors and operations that address information exchange in the context of a set of specific tasks for a workflow performed by different systems or devices"* (definition from ISO TR 28380 glossary)

"A depiction of the actors and services that address information exchange in the context of a set of specific tasks performed by different systems or devices in support of its users" (5.1 Concept of an interoperability Use Case ISO TR 28380-3)

Profile or Integration Profile

"IHE Integration Profile specifies the information exchanges to support a specific business process" (definition from ISO TR 28380 glossary)

A specific business process is divided in different use cases.

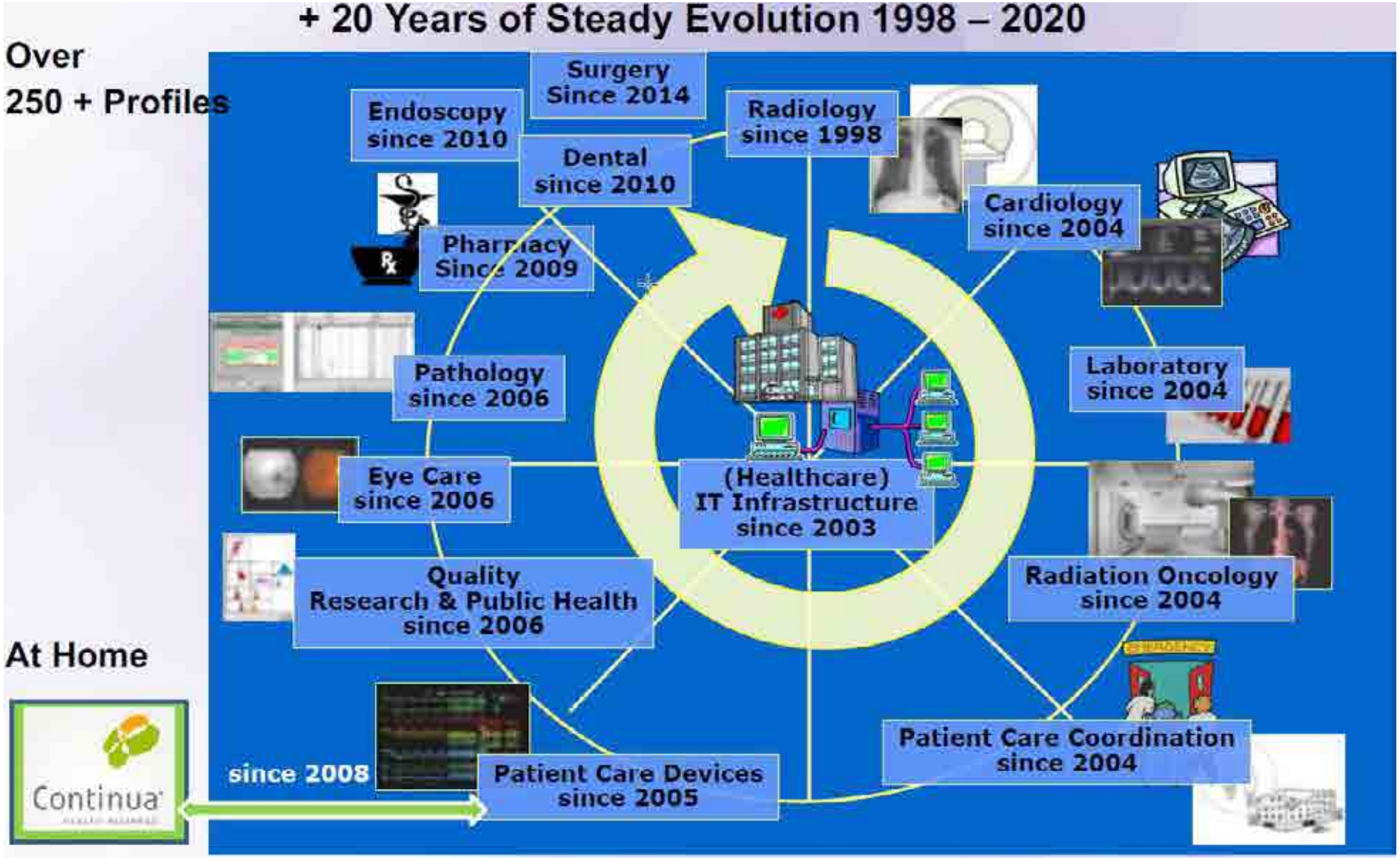
A profile is based on underlying norms and standards (HL7, DICOM, IETF, etc.).

PDQm Profile *(business needs)*

"The following list provides a few examples of how PDQm might be leveraged by implementers:

- A health portal securely exposing demographics data to browser-based plugins
- Medical devices which need to access patient demographic information
- Mobile devices used by physicians (example bedside eCharts) which need to establish patient context by scanning a bracelet
- Web based EHR/EMR applications which wish to provide dynamic updates of patient demographic information such as a non-postback search, additional demographic detail, etc.
- Any low resource application which exposes patient demographic search functionality
- Any application using the MHD Profile to access documents may use PDQm to find an appropriate patient identifier"

IHE Domains


+ 20 Years of Steady Evolution 1998 – 2020
Over
250 + Profiles
Surgery
Since 2014
Endoscopy
since 2010
Radiology
since 1998
Dental
since 2010
Cardiology
since 2004
Pharmacy
Since 2009
Pathology
since 2006
Laboratory
since 2004
Eye Care
since 2006
(Healthcare)
IT Infrastructure
since 2003
Quality
Research & Public Health
since 2006
Radiation Oncology
since 2004
At Home
Continua
since 2008
Patient Care Devices
since 2005
Patient Care Coordination
since 2004

IHE domains: example “pharmacy domain”

Pharmacy

Domain

Comments and implementer feedback on all documents can be submitted at Pharmacy Public Comments.

Current Technical Framework – To Be Developed

Technical Framework

Supplements for Trial Implementation

The IHE Pharmacy Technical Committee invites organizations to begin development work based on the following supplements to the forthcoming Pharmacy Technical Framework. These trial implementation profiles will be available for testing at subsequent IHE Connectathons.

Profiles

- Common Parts Document – Revised 2014-09-29
- Community Dispense (DIS) – Revised 2022-02-17
- Community Medication Administration (CMA) – Revised 2022-02-17
- Community Medication List (PML) – Revised 2022-02-17
- Community Medication Prescription and Dispense (CMPD) – Revised 2022-02-17
- Community Medication Treatment Plan (MTP) – Revised 2022-02-17
- Community Pharmaceutical Advice (PADV) – Revised 2022-02-17
- Community Prescription (PRE) – Revised 2022-02-17
- Hospital Medication Workflow (HMW) – Revised 2013-10-11
- Mobile Medication Administration (MMA) – Published 2017-12-04
- Uniform Barcode Processing (UBP) – Published 2017-12-04

Pharmacy White Papers

The IHE Pharmacy Technical Committee has published the following white papers.

- Supply of Products for Healthcare – Published 2020-03-11

Each domain contains its own technical framework

Technical Frameworks

- IHE Technical Frameworks General Introduction and Shared Appendices
- Anatomic Pathology
- Cardiology
- Dental
- Devices
- Endoscopy
- Eye Care
- IT Infrastructure
- Laboratory
- Pathology and Laboratory Medicine
- Patient Care Coordination
- Pharmacy
- Quality, Research and Public Health
- Radiation Oncology
- Radiology

The IHE Technical Frameworks, available for download below, are a resource for users, developers and implementers of healthcare imaging and information systems. They define specific implementations of established standards to achieve effective systems integration, facilitate appropriate sharing of medical information and support optimal patient care. Technical Framework documents are maintained regularly by the IHE Technical Committees through the identification and correction of errata.

Patient Care Coordination Technical Framework

Comments and implementer feedback on all documents can be submitted PCC Public Comments

Current Technical Framework – Revision 11.0

November 11, 2016
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- Volume 1 (PCC TF-1): Integration Profiles
- Volume 2 (PCC TF-2): Transactions and Content Modules

These Technical Framework Volumes provide specification of the following profiles:

- Cross Enterprise Sharing of Medical Summaries Integration Profile (XDS-MS), including Medical Summary Document Content (MS) specification
- Emergency Department Referral (EDR)
- Exchange of Personal Health Record Content (XPHR
- Immunization Content (IC) – Incorporated Into the TF 2013-10-04

Brief descriptions of these profiles are available here.

Supplements for Trial Implementation

The IHE Patient Care Coordination Technical Committee invites organizations to begin development work based on the following supplements to the PCC Technical Framework. These trial implementation profiles are eligible for testing at subsequent IHE Connectathons.

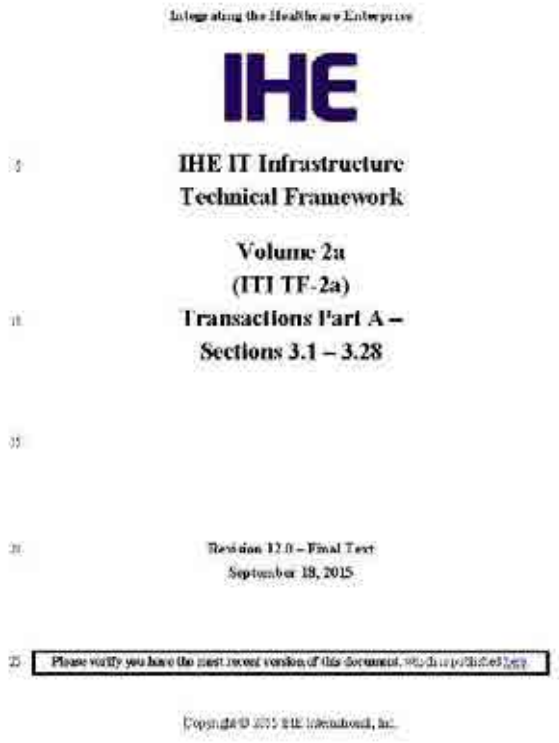
- 360 Exchange Closed Loop Referral (360X) – Revised 2021-04-14
- Antepartum Profiles (includes the following profiles) – Revised 2011-09-09
  - Antepartum Education (APE)
  - Antepartum Laboratory (APL)
  - Antepartum History and Physical (APHP)
  - Antepartum Summary (APS)
- Assessment Curation and Data Collection (ACDC) – Revised 2020-03-24

Technical Framework

- Volume 1: **Integration Profiles**
  - Use case, Actors/Transaction and Process Flow descriptions
- Volume 2: Transactions
  - Detailed description of the transactions
- Volume 3: Cross-Transaction and Content-Specifications
- Volume 4: National Extensions

Integration Profiles

- Cover a specific use-case
- Divides the use-case into …
  - **Actors**, later implemented as software modules, and
  - **Transactions** between them
- Cover the 80% which are common
- Stages of maturity
  - Trial Implementation
  - Final text


Integrating the Healthcare Enterprise

IHE

IHE IT Infrastructure Technical Framework

Volume 2a (ITI TF-2a) Transactions Part A – Sections 3.1 – 3.28

Revision 12.0 – Final Text
September 18, 2015

Please verify you have the most recent version of this document, see ... for latest

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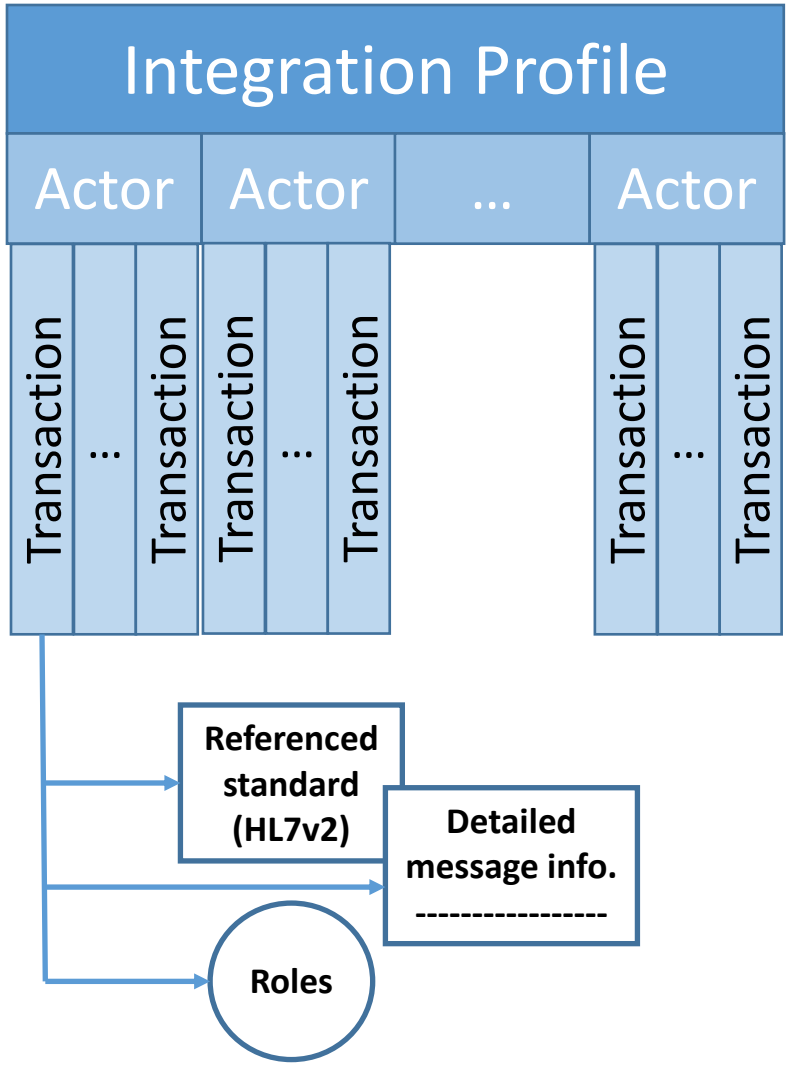
What is an integration profile?

An integration profile describes workflow that support a given health process:

- Actors: “functional component of a system that exchanges transactions with other actors as defined in an IHE integration profile”
- Transactions: “specification for a set of messages exchanged between pairs of actors in support of an integration profile”
- Message: standard based specifications



What is an integration profile?

An “integration profile” is the fundamental concept in IHE

- … it **resolves** a very particular **interoperability use-case** of the user
- … it uses a mechanism to resolve the problem
  - **IHE methodology**
- … but is yet flexible and **allows project-specific specialties**
- … it may have dependencies or may be grouped to other profiles
- … shall be seen as “sellable unit”
  - “*if software is installed on different systems based on the same IHE profile, there should be some basic interoperability*“

IHE offers a broad range of integration profiles

Technical/syntactical /semantical aspects are addressed by a profile

Profiles are specified based on robust, accepted and evolutionary standards in series of technical frameworks

Different classes of profiles:

- **Transport / integration (how to move the data)**
- **Content (what the data conveys) and terminologies / value sets**
- **Security / Privacy**
- **Workflow**

Complete list on: https://www.ihe.net/resources/technical_frameworks

Examples of profiles

Transport / integration profile

- Cross-Enterprise Document Media interchange (XDM)
- Mobile access to Health Document (MHD)

Content profile

- Sharing Laboratory Reports (XD-LAB)
- International Patient Summary (IPS)

Security profile

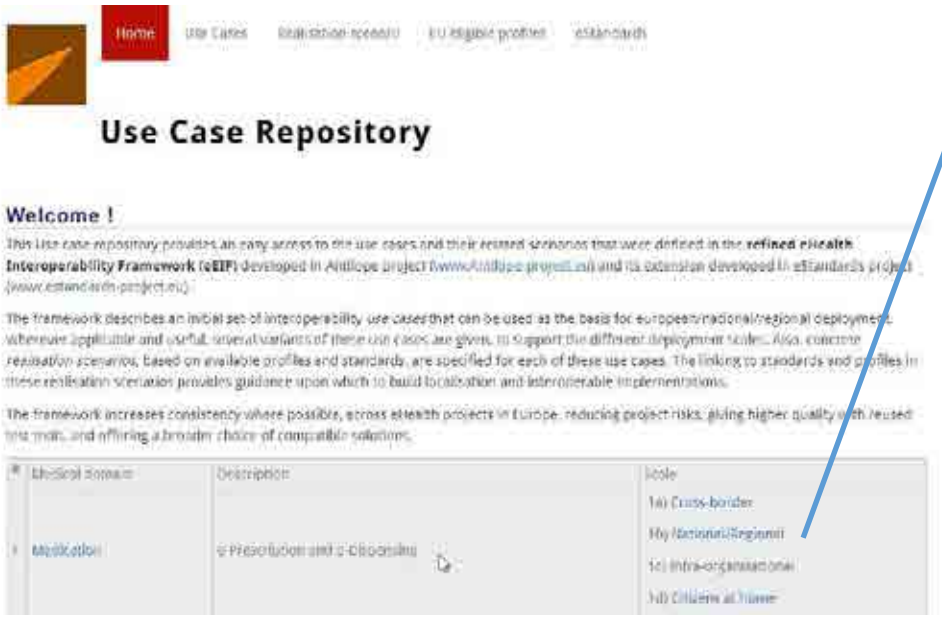
- Internet User Authorization (IUA)
- Audit Trail and Node Authentication (ATNA)

Workflow profile

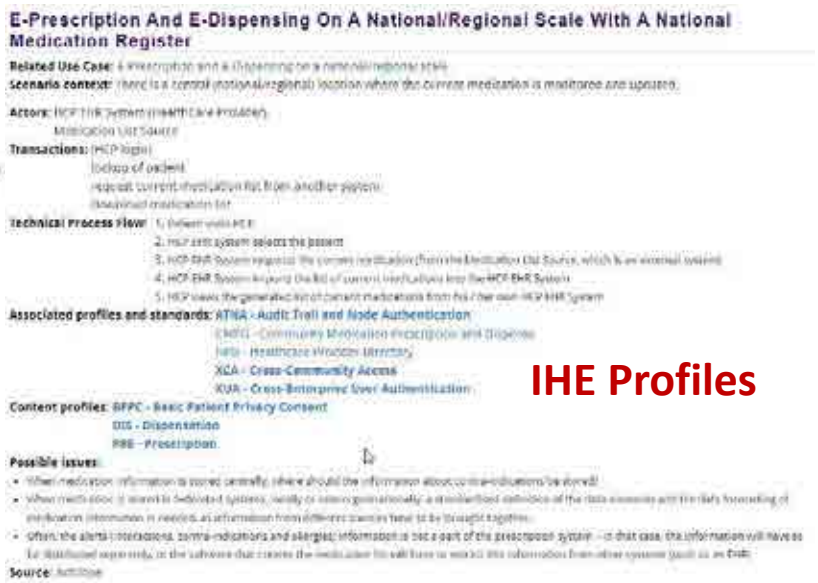
- Cross Enterprise Document Workflow (XDW)
- Inter-Laboratory Workflow (ILW)

Use cases repository

IHE has set up a repository of reusable use cases with the links to the profiles



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



IHE Profiles

From use case to profiles

Recognized and adopted: IHE Methodology

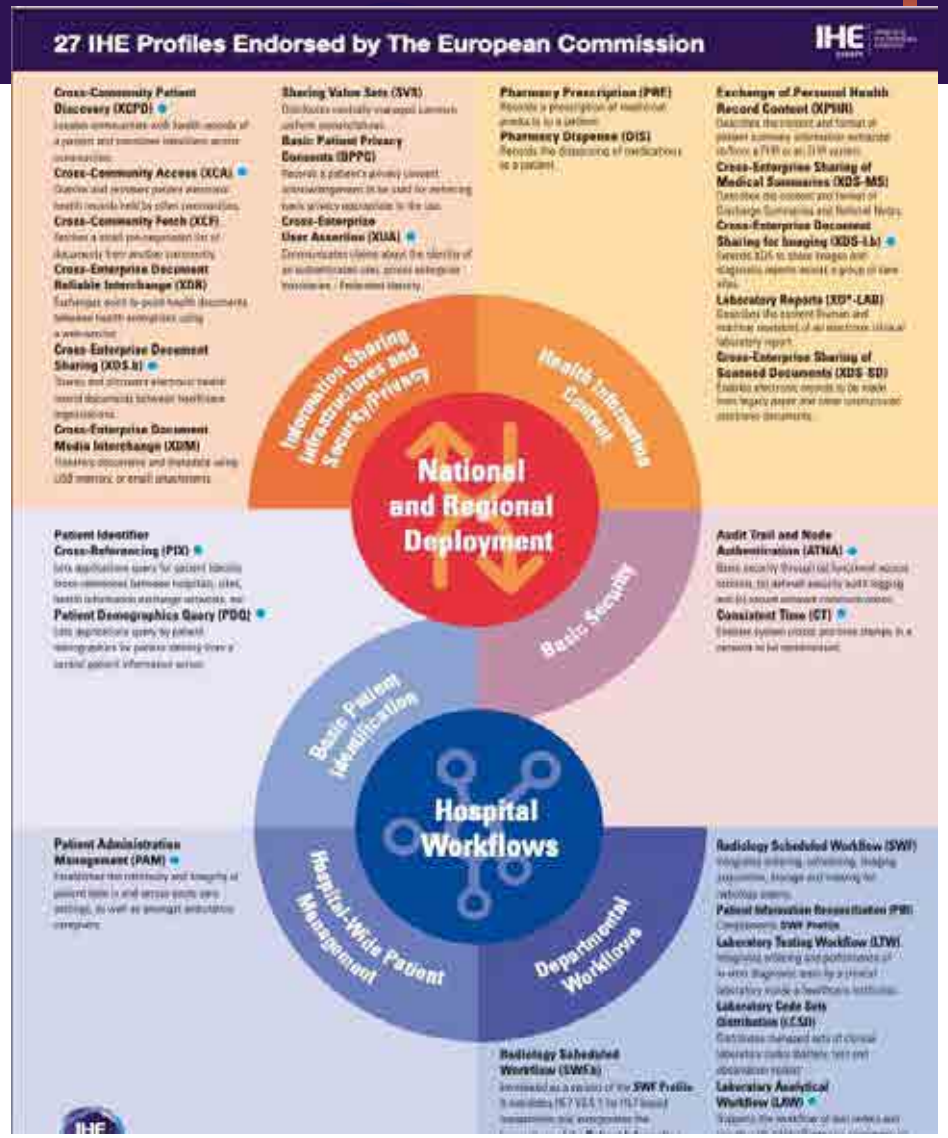
Recognition

ISO:

- ISO TC15: TR 28380 Global Interoperability Standards Adoption – IHE profiles
  - Part 1: Process
  - Part 2: Profiles
  - Part 3: Deployment

EU commission:

- 27 IHE profiles identified for public procurement (July 2015)
- Recommandations for EHR exchange format (February 2019)



http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:JOL_2015_199_R_0011

National e-Health Interoperability Framework - NeHIF

Now, we have all the basis to work on a National e-Health Interoperability Framework – NeHIF

- IHE methodology
- Set of reusable and integrable use cases
- Set of "reusable / sellable" IHE integration profiles
- Norms and Standards if needed
  - Specific needs not address by IHE integration profiles

What is a NeHIF?

- National e-Health Interoperability Framework
- National Specific health interoperability needs / business cases
- Business case / Use case driven methodology (“Inspired IHE”)

Why a NeHIF?

- Technical specifications to support digitalization of health use cases
  - Supported by e-Health National Initiatives / MOH
  - Defined in collaboration with end-users / vendors
  - Implemented by vendors
  - Tested / validated by independent entities (testing tools implemented regarding the NeHIF)
  - Implementations are deployed on the end-users side

National e-Health Interoperability framewok (NeHIF)

Point of attention:

- Interoperability use cases can share same concepts and/or overlap needs
  - Similar actors
  - Similar exchanged information

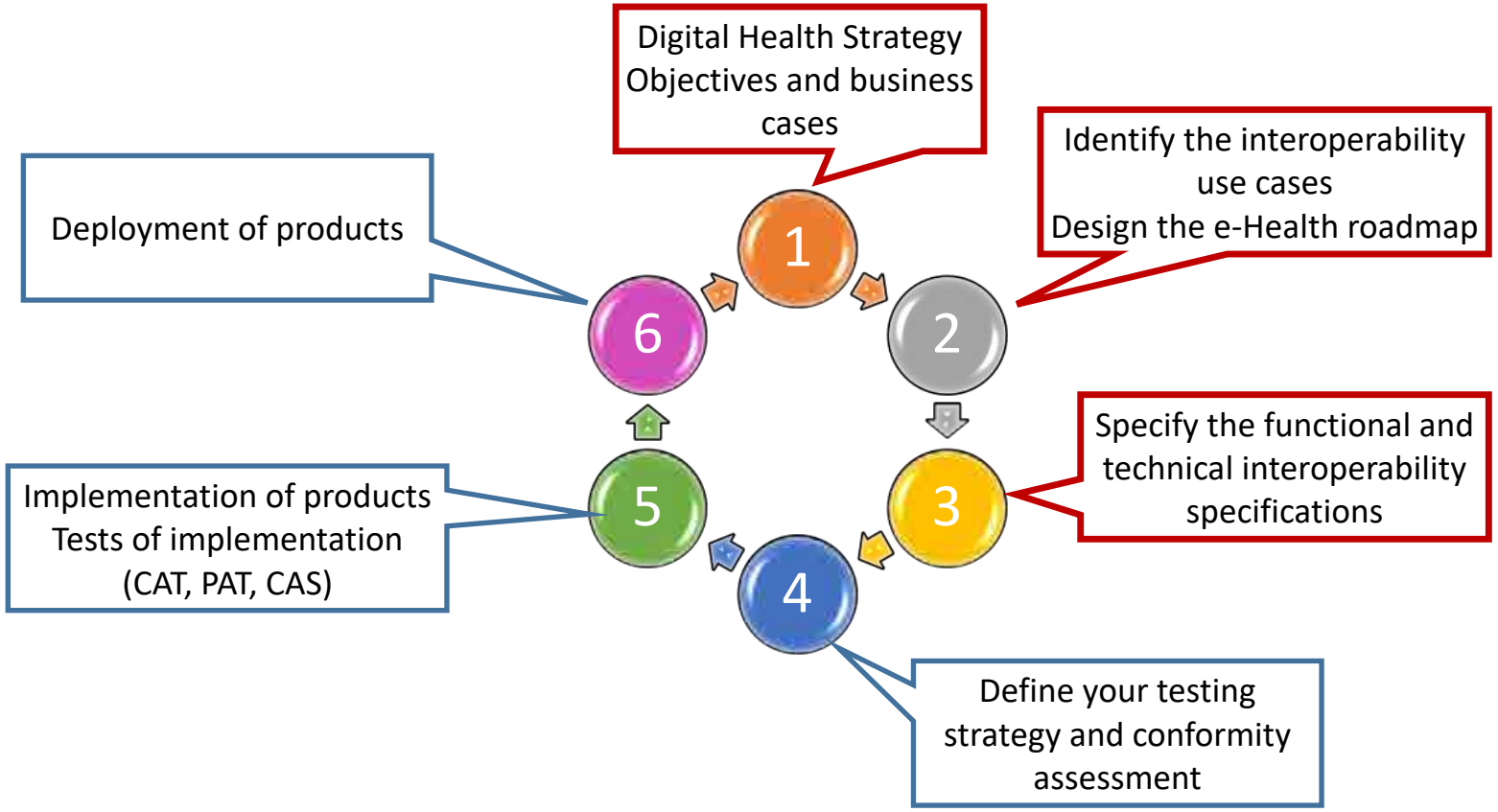
Be careful not to duplicate concepts (interoperability problems) but **reuse** them

- Example: FHIR patient resource profiled within a national project, answering different business needs / use cases (different versions of the profiled resource)

Methodology: should follow IHE methodology

1. Define national e-Health strategy and business needs
2. Identify interoperability use cases and define e-Heath roadmap
3. Functional and technical specification for use cases
    1. Identify IHE profiles to answer national interoperability use cases
        - Write national profiles if needed (profiling of IHE profiles based on existing extensions, e.g. PAM-FR, CH-PIXm)
    2. If not, identify norms and standards that could answer national use cases
        - Write national profiles based on identified norms and standards (profiling of norms and standards, e.g. FHIR resource FR-Patient)

Methodology proposed by IHE to produce a National e-Heatlh Interoperability Framework



National e-Health Interoperability framewok (NeHIF)

Big picture

Digital Heatlh Strategy
Objectives and business cases

Digital Health Roadmap
E-Health use cases

Functional and Technical Specifications
(based on IHE profiles, norms and standards)

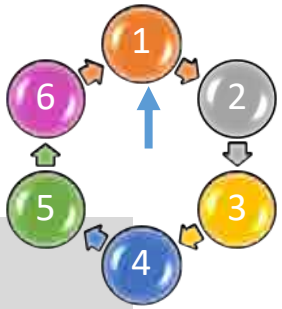
NeHIF

GAZELLE
eHealth test framework for interoperability

Products implementation

Testing Plans and Testing tools

National digital health strategy **Big picture**



- The national digital health strategy has the goal to improve the quality of health (quality of patient care). To reach this main goal, several objectives must be identified, and they are supported by concrete activities that can be implemented such as business cases.
- Business case: high level description of a domain that illustrates the business need for the use of health information technology (HIT) in an organisation including the cost-effectiveness analysis of health IT and interoperability solutions use.

Business cases:

- Patient care pathways
- ePrescription (in hospitals, community, cross border, etc.)
- Home care
- Patient monitoring at home
- Patient summary for unplanned care
- Chronic diseases care: diabetes or heart failures
- Workflows in hospitals (radiology, laboratory, pharmacy, …)
- Telemedecine

Example from France

Business cases

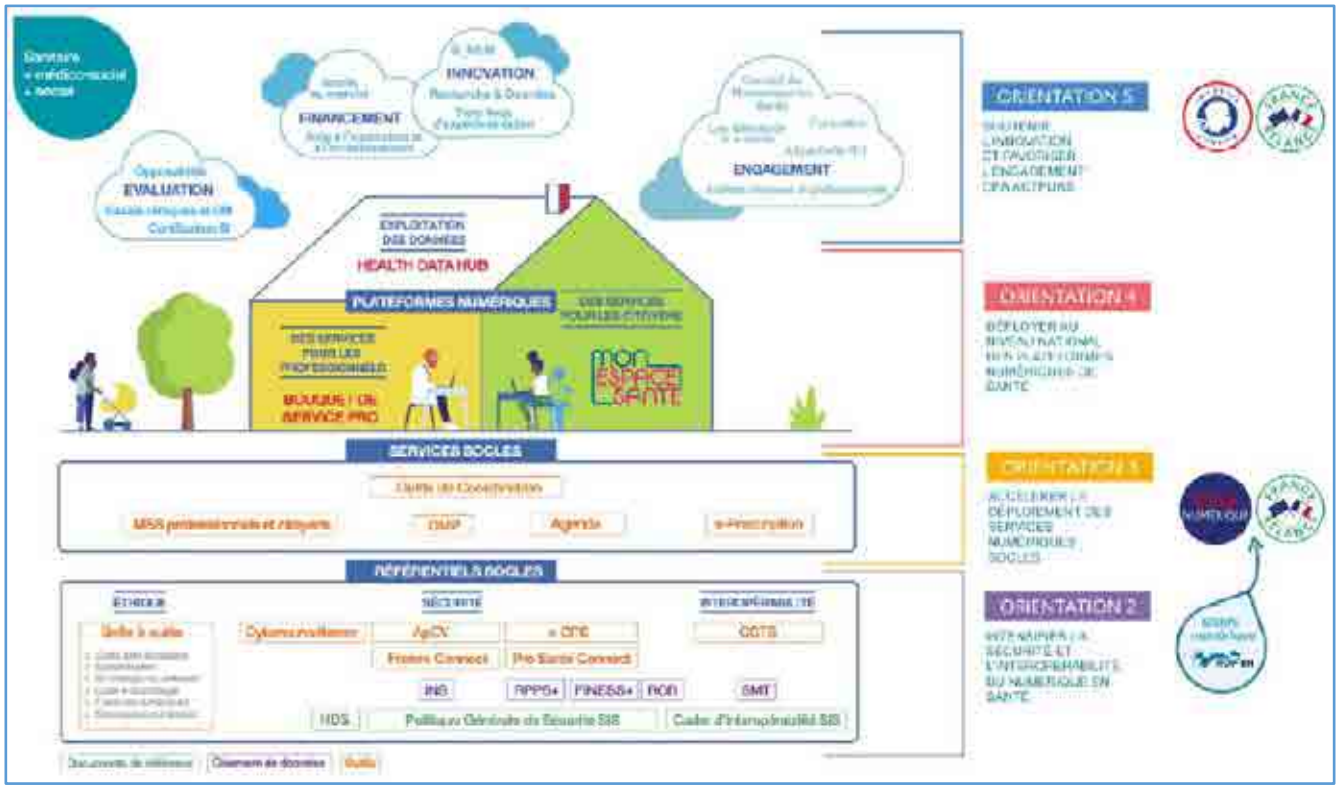
- e-Prescription
- Electronic Patient Record

Five orientations / main objectives

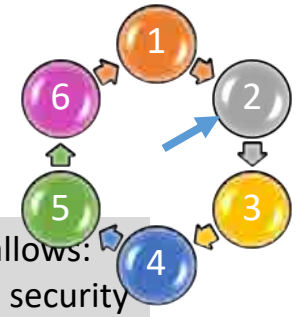
- Orientation 2: enforce cybsersecurity & interoperability

Twenty-six actions

- Action 4: Generalisation of the digital identification of health system actors



National ditigal health interoperability roadmap



- Strategic high-level plan for the implementation and deployment of the interoperability use cases
- The criteria support the selection of the use cases, and their deep analysis provides justification for the definition of a transparent and consensual e-Health roadmap
- The plan will provide an overview on “what will be implemented in short (1-2 years), mid (3-5 years) and long term (>+ 5 years), major steps and milestones

The plan will serve to define projects, activities and tasks

Benefits

- Consensual and pragmatic approach
- Progressive education for all type of stakeholders
- Management for future improvement and development of the quality in healthcare
- Guidance for the involved stakeholders and help the coordination

At the end, satisfaction for all ; it’s a matter of timing !

Building a coherent and consistent e-Health ecosystem. It allows:

- To increase the governance of the interoperability and security
- To develop electronic exchanges from healthcare organization, national level and cross-border

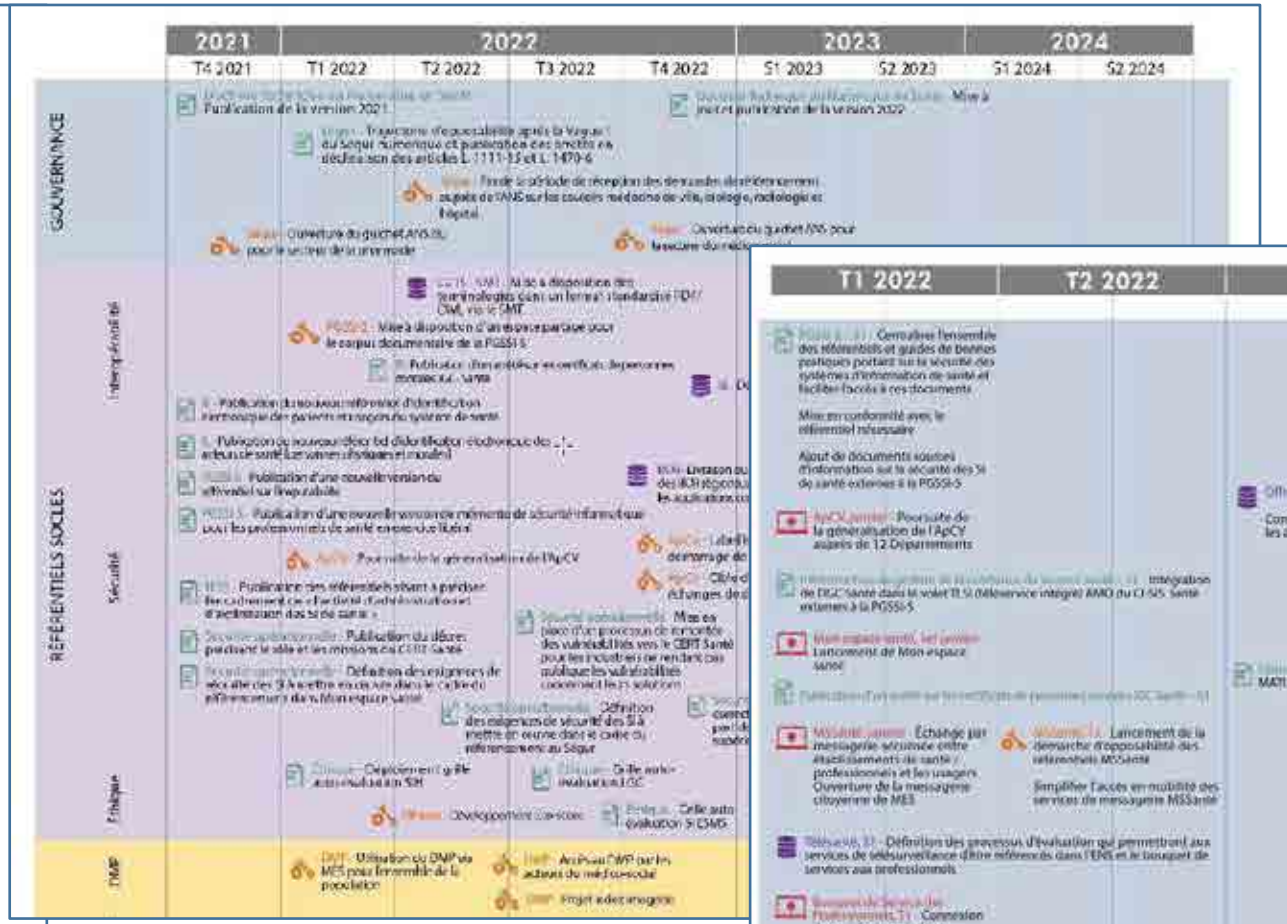
In practical

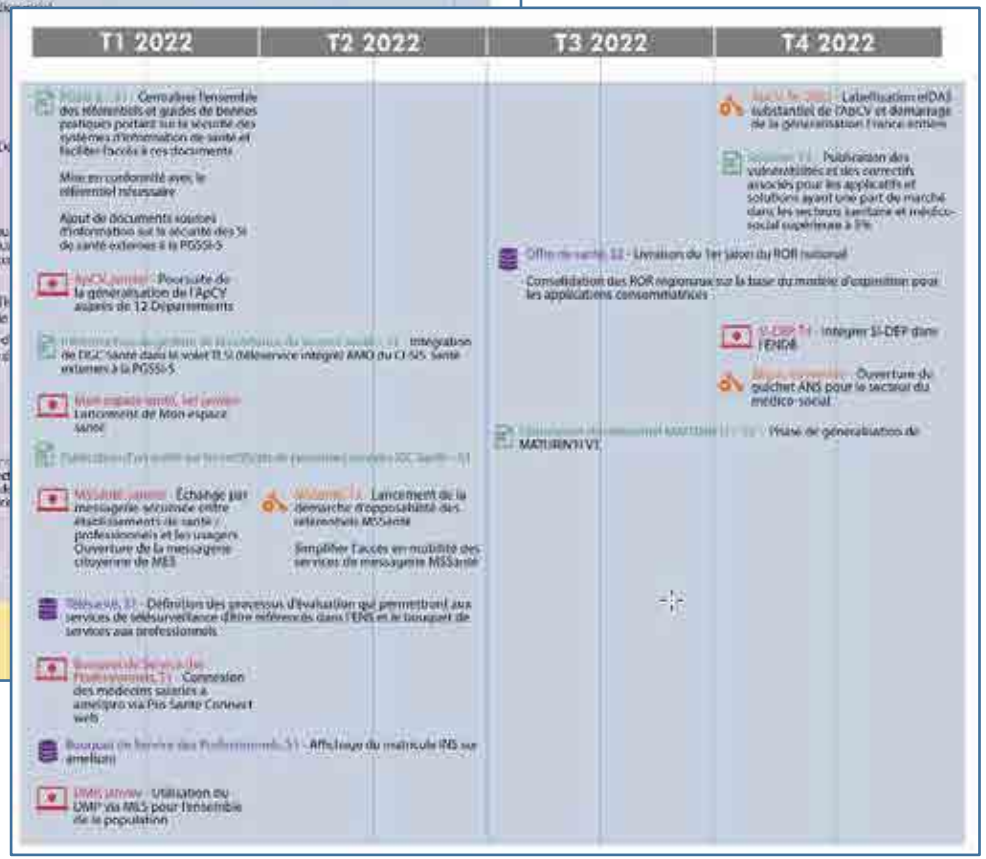
- Assemble building blocks (➔ interoperability framework)
- Start by what will be useful for other use cases
- Identify dependencies between use cases
- Be realistic in term of timeline, budget, resources and identified risks for each of the milestones

Plan and define indicators to follow the progress of the roadmap

The e-Health interoperability roadmap is a communication tool aligned with the strategic goal !!!

Example from France





Example from France

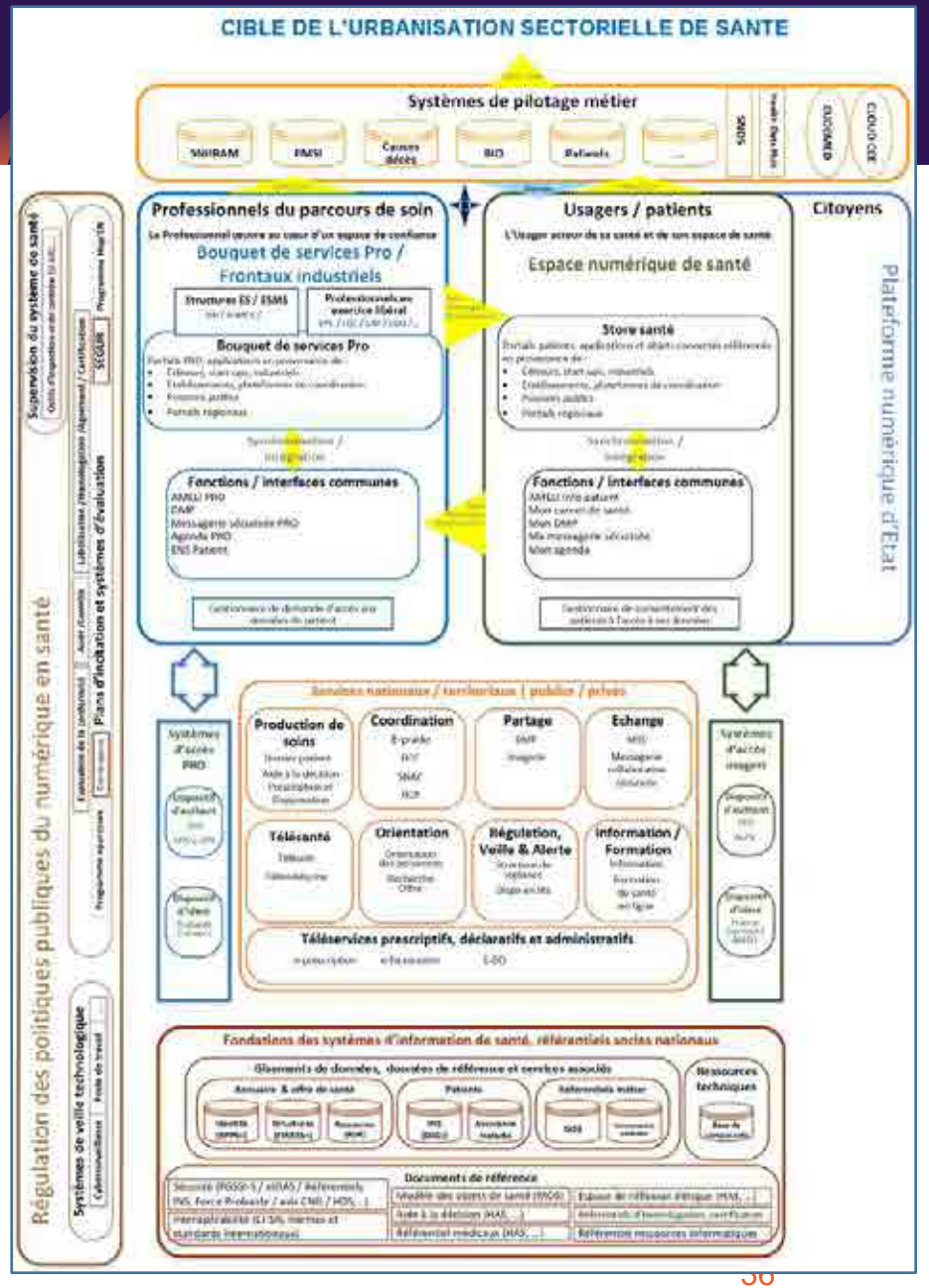
FEUILLE DE ROUTE
DU NUMÉRIQUE EN SANTÉ

Doctrine du
numérique en santé

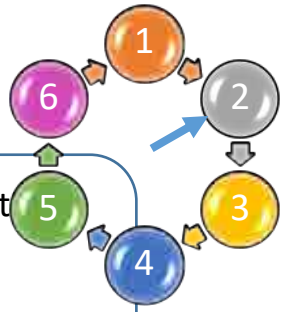
Version 2021

Architectural view

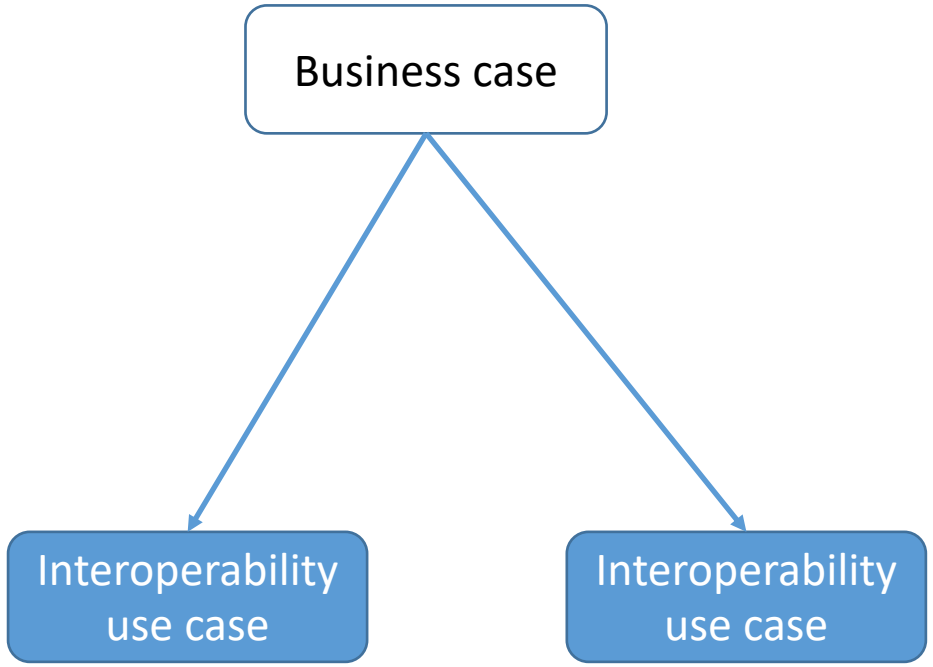
Cross Europe view



From business case to use case

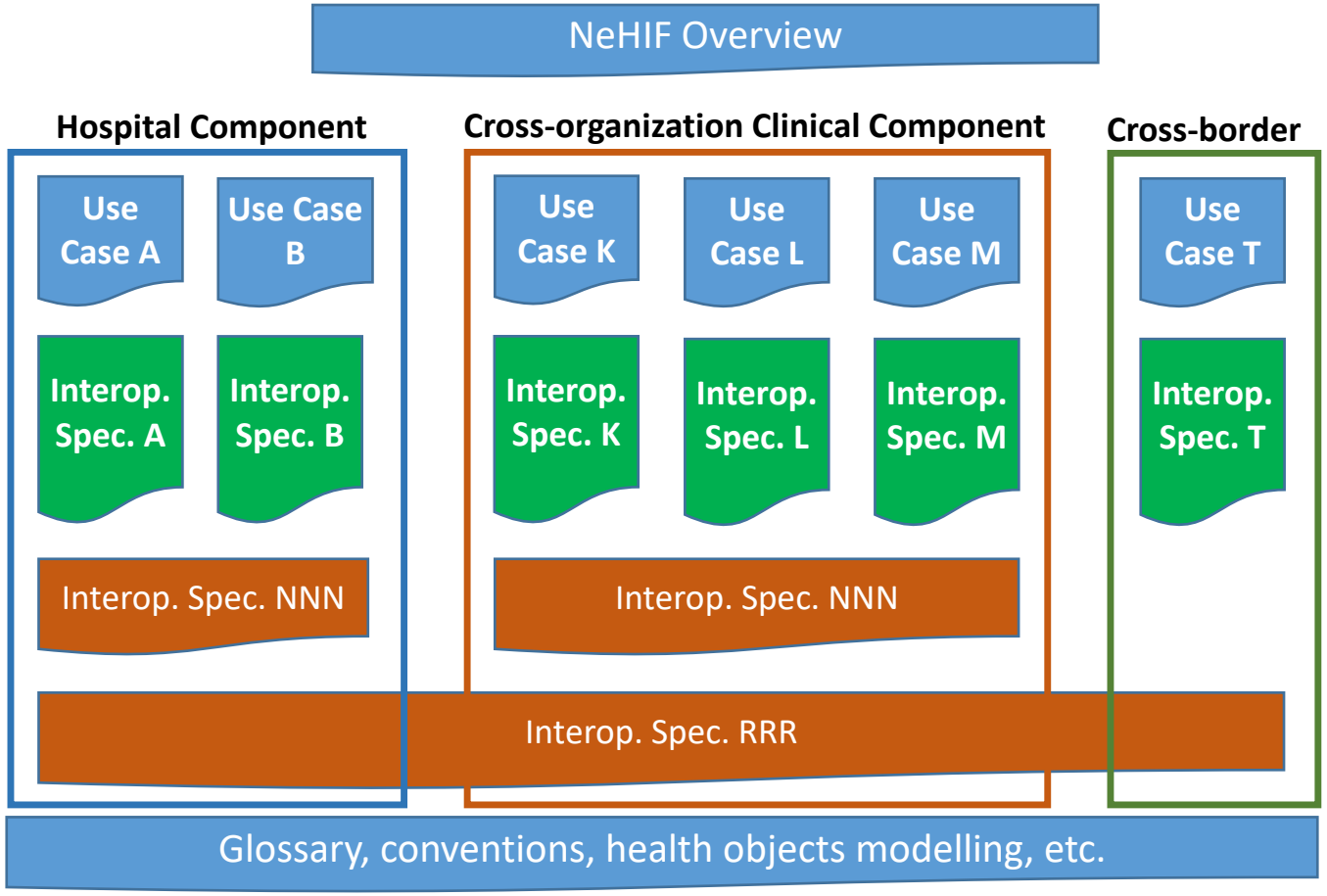


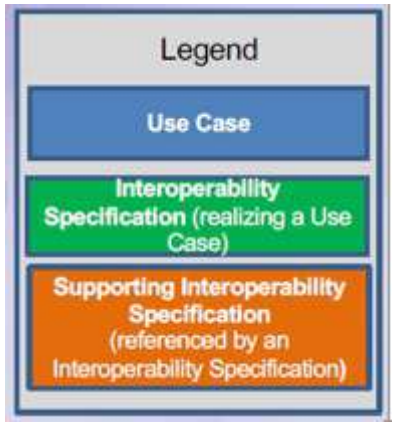
1. Integrated care and self management for long term condit
2. Request and results sharing for radiology/laboratory on National/Regional scale
3. Involvement of chronic patient in electronic documentation of healthcare information



1. Cross-enterprise requesting and viewing of radiology study
2. Telemonitoring of patients with chronic heart failure
3. Mobile services to empower patient with heart failures
4. Medication list of the patient at home
5. Patient summary for unplanned care

Overview of a National e-Health Interoperability Framework





Interoperability use cases

Interoperability use cases: firstly, use IHE use cases repository

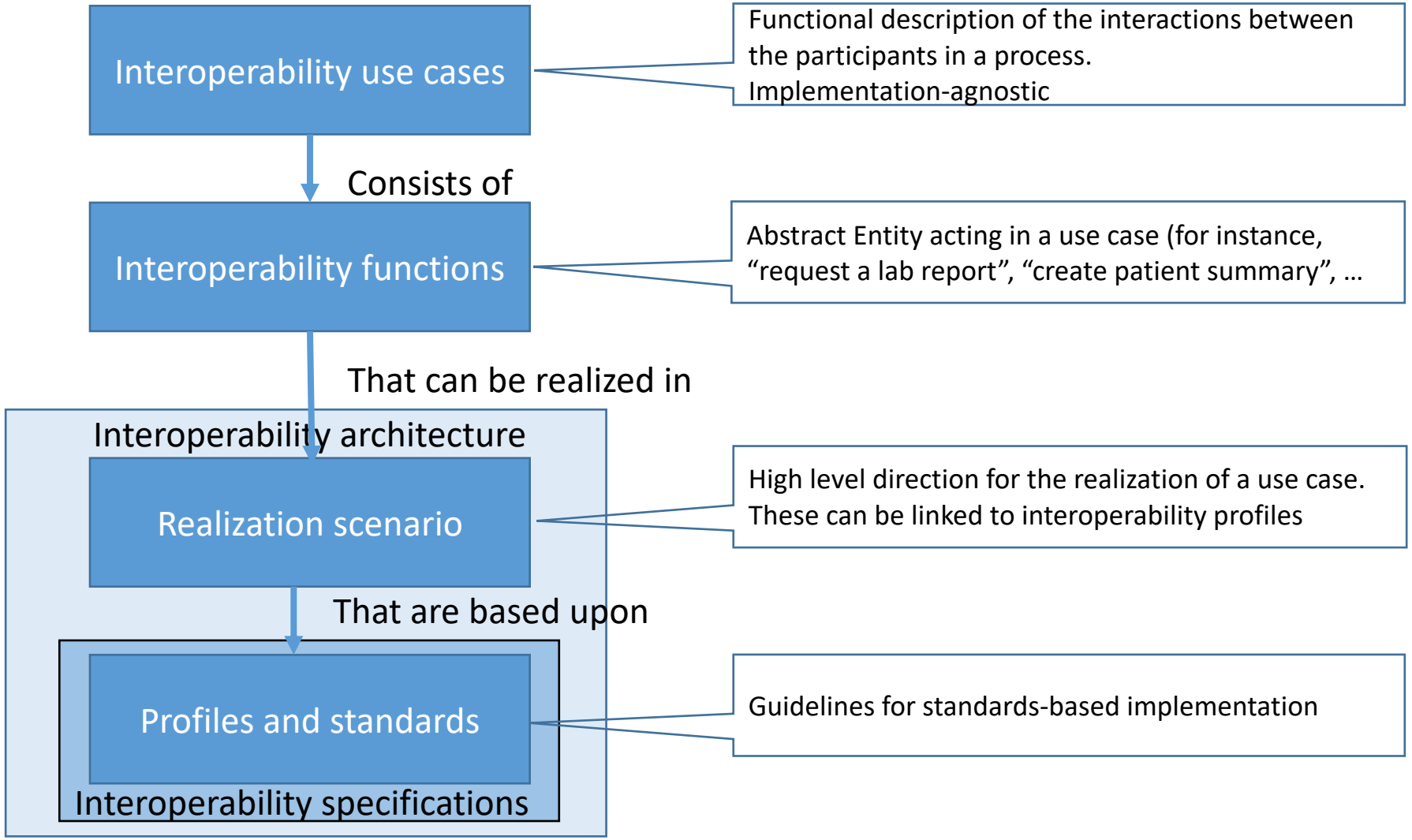
IHE EUROPE

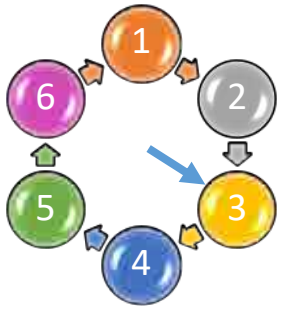
Examples of Interoperability Use Cases

	Medical domain	Description	Scale
1	Medication	e-Prescription and e-Dispensing	1a) Cross-borders 1b) National/Regional 1c) Intra-organisational 1d) Citizens at home
2	Radiology	Request and results sharing workflow for radiology	2a) National/Regional 2b) Intra-organisational
3	Laboratory	Request and results sharing workflow for laboratory	3a) National/Regional 3b) Intra-organisational
4	Patient Summary	Patient Summary sharing	4a) Cross-border/International 4b) National/regional 4c) Citizens at home
5	Referral and Discharge reporting	Cross-enterprise Referral and Discharge Reporting	National /Regional 5a) Referral of patient from primary to secondary care 5b) Discharge report from secondary care
6	Participatory healthcare	Involvement by chronic patients in electronic documentation of healthcare information	Citizens at home
7	Telemonitoring	Remote monitoring and care of people at home or on the move using sensor devices	Citizens at home
8	Multidisciplinary consultation	Medical Board Review	National/Regional
9	Public Health	Immunization	National/regional Intra Organisational
10	Antenatal care	Antenatal care	National/Regional

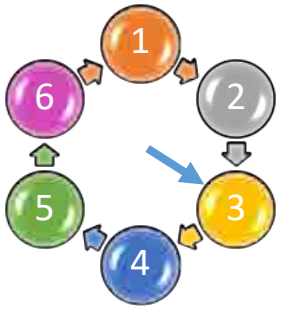
From Antilope Refined European Interoperability Framework adopted

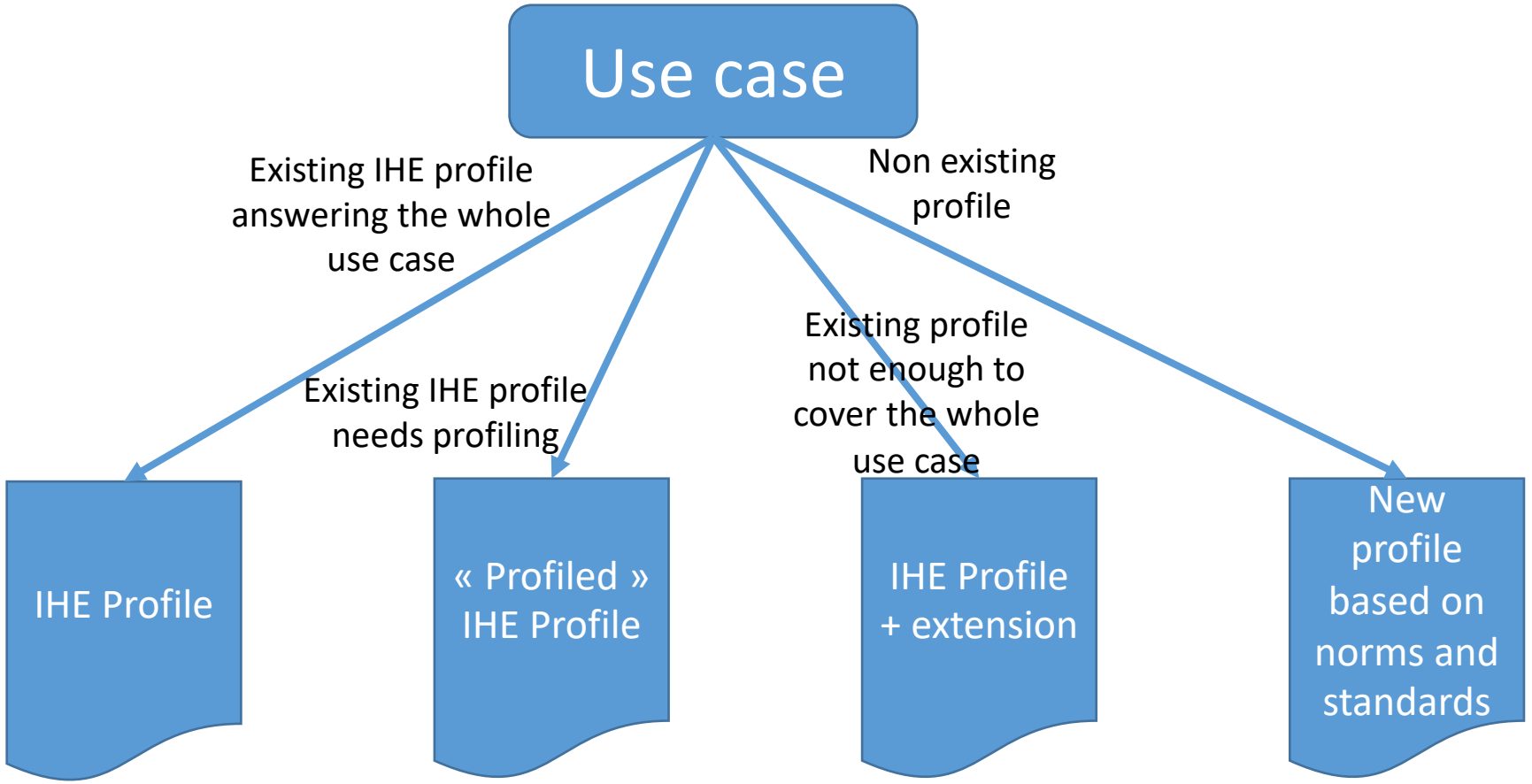
From use cases to interoperability specifications





From use cases to profiles





Use case: relay of patient documents received by secured messaging

Functional specifications answering the use case

Norms & Standards Study: *which profile / standard better answers the use case?*

- Standard HL7 FHIR – messaging (profiling)
- IHE MHD profile + extension
- Standard HL7 FHIR R4 – RESTful API (profiling)
- IHE XDR profile
- HL7 V2 Standard (profiling)

Best practices regarding the profiling

Profiling is necessary to address specific national needs BUT be careful not to profile too much

- If the profile becomes too specific, he will not be reusable
- Not possible to propose this new profile at IHE level to benefit feedbacks of the IHE community (technical committees) including other National initiatives

From feedbacks, if we use IHE integration profiles, no more than 20% of profiling / national specific interoperability needs is necessary.

“Profiling activities” could be a good way / opportunity to work / be involved in IHE technical committees.

Best practices regarding architecture choices

The choice about the best architecture to answer business needs / interoperability use cases should be a consensus between:

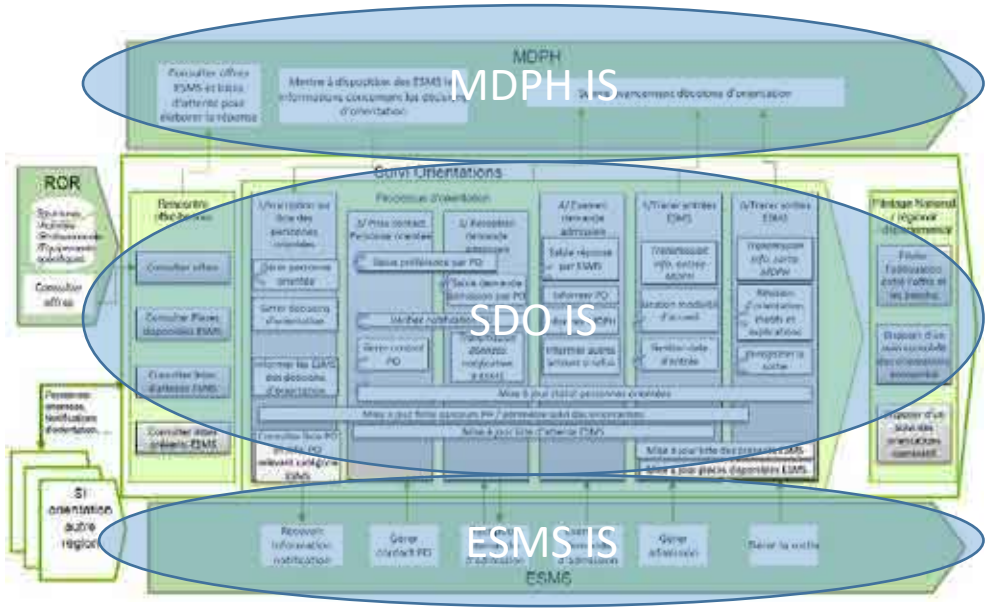
- MoH, end-users, vendors
- Interoperability requirements and added-values
- Already deployed business processes (either manual or digitalized)
- Already deployed products (legacy)

Best practices regarding architecutre choices

Business case: management of disabled persons requests (from the request to the placement of the patient in the right structure) ➔ need of digitalization

Use cases:

- Disabled person request
- Decision of orientation
- Placement of the patient in the structure



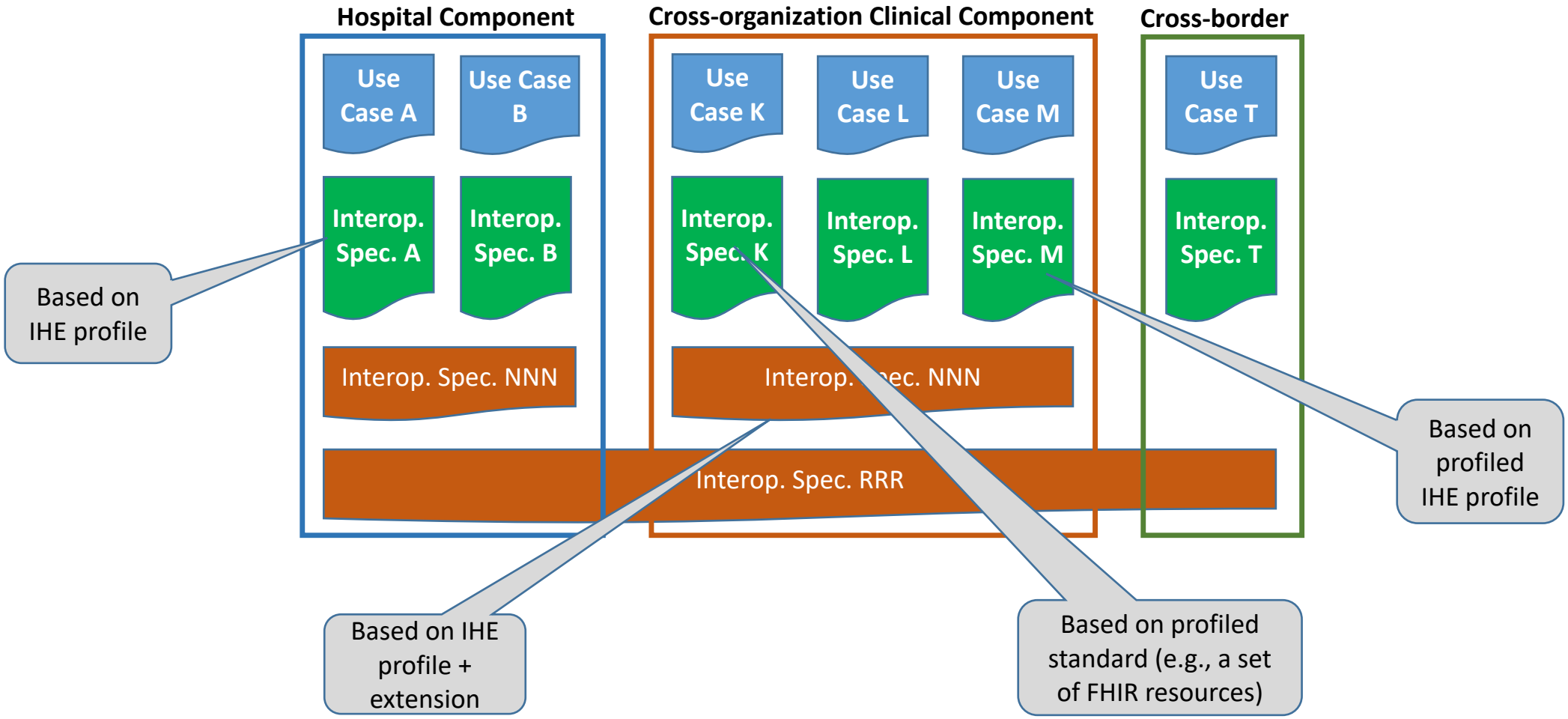
Two choices:

- Choice 1: each Information system has its own Electronic Patient Record with specific information and point to point communication to exchange information about the status of patient orientation
- Choice 2: SDO IS as a document registry and MDPH IS and ESMS IS request documents and documents status to know the status of patient orientation

➔ Need workshops with all stakeholders

First version of our NeHIF

Here is the first version of our NeHIF



Maintenance and evolution of a NeHIF

Maintenance & evolution of a NeHIF

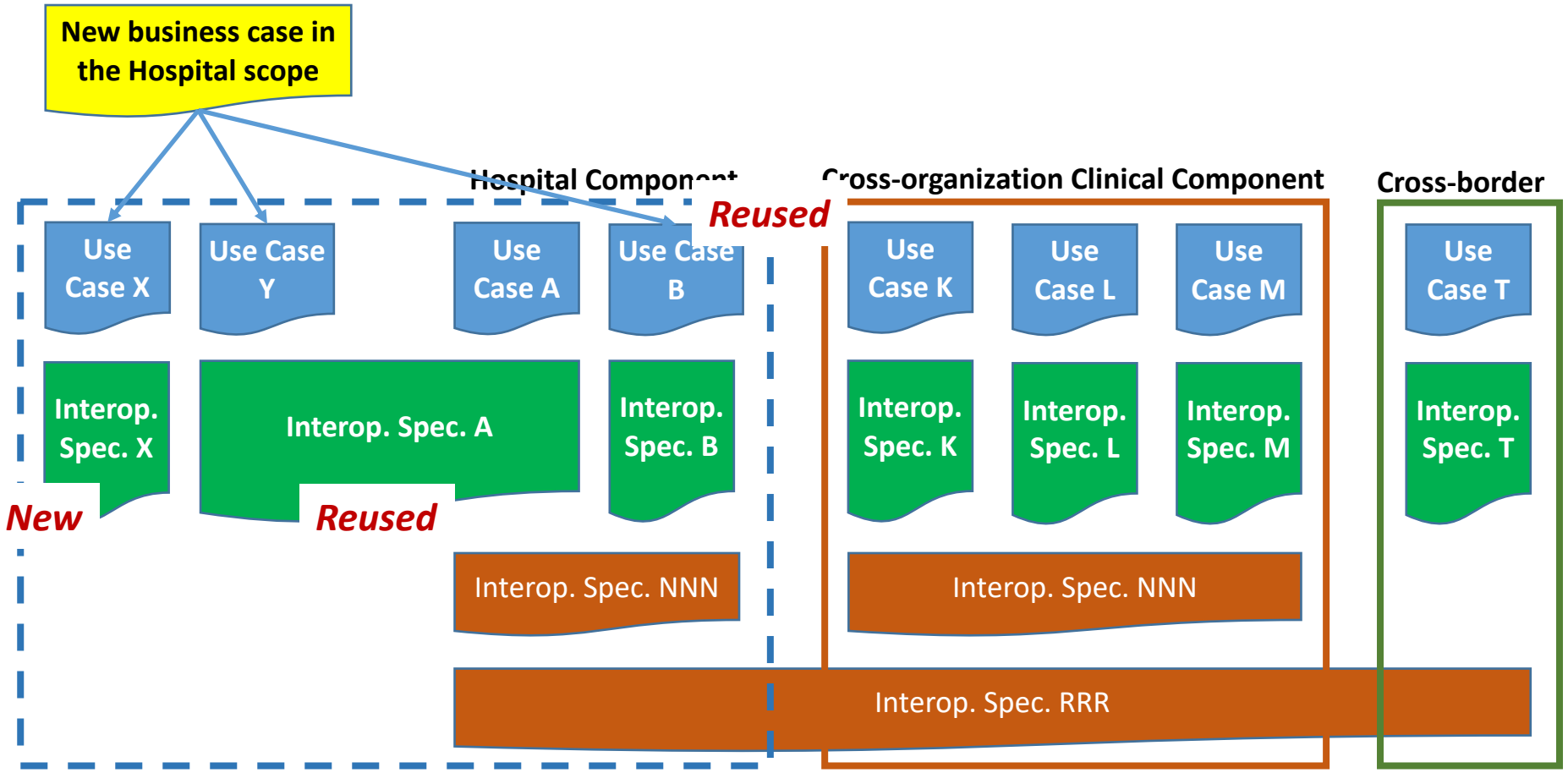
Maintenance and evolution of a NeHIF will occur in any case. A NeHIF is constructed iteratively (according to the roadmap / big picture) and must evolve:

- At business case level
- At interoperability use cases level
- At IHE profiles level
- At national profiles level
- At norms & standards (e.g., FHIR resources) level

New business case

1) Analyze if existing use cases can be reused
2) Analyze if existing functional / technical specifications (profiles) can be used

Maintenance & Evolution: new business case



Maintenance & Evolution: update of a business case

Update of business case / use cases could impact:

- Functional and technical specifications
- Interoperability implementation already deployed
  - Impact on the vendors / end-users side

➔ Need gap analysis & cost estimation

Maintenance & Evolution: new profile

New profile

- Come from new IHE business need / use case
  - Reusable for future national business need / use case
- Come from new National business need / use case
  - Pay attention at its formalization to propose it at IHE level

Maintenance & Evolution: new version of a profile

New version of a profile

- Analysis of the gap between both versions
- Is it necessary to update functional and technical specifications based on this profile?
  - Impact on interoperability? ➔ gap analysis
- Use of this new profile to answer new business need / interoperability use case
  - Impact on existing functional and technical specifications and deployed implementation? ➔ gap analysis
- For example, new version of MHD profile

New version of a standard

- Analysis of the gap analysis between both versions
  - Impact on interoperability if use of the new version
  - Cohabitation of the old and the new versions?
- Update of current NeHIF content
  - Cost?
  - Impacts on NeHIF content, implementations, deployed products
  - Return on investment? (interoperability and business)

Benefits of the use of IHE Methodology:

- Reduce costs and risks by using existing mature materials and guidelines
- Facilitate the training of new-comers and increase the knowledge and expertise on the use case driven approach
- Standardize the way to describe use cases and save time and effort in communication
- Allow the definition of the e-Health interoperability roadmap
- Drive the adoption and reuse of profiles and standards (use of best practices)
- Facilitate access to IHE resources with one single entry point
- Share experiences and feedbacks with other projects

Maintainer of the Gazelle interoperability platform as IHE-Catalyst sub-contractor

- Maintenance
- Evolution
- Deployment
- Support
- Training

Consultant in e-Health Interoperability

Support of the e-Health French Ministry in the development and maintenance of the French National e-Health Interoperability Framework

Support of different other needs (testing strategy, IHE profiles trainings, etc.)

Conformity Testing Lab (ISO 17025 accredited)

- Regarding CAS: IHE Conformity Assessment Scheme
- Regarding National Scheme (SIAS) : Swiss Interoperability conformity Assessment Scheme in Switzerland

Support during Interoperability tests events

- Connectathons (twice a year)
- Projectathons (Canada, DG Santé, France, Gabon, Greece, Ireland, Lacpass, Switzerland, etc.)

References

- IHE international website

www.ihe.net

- IHE Profiles in technical frameworks

wiki.ihe.net/index.php/Frameworks

- IHE Europe website

www.ihe-Europe.net

- Antilope use cases

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

IHE EUROPE EXPERIENCE DAY 13 SEPTEMBER 2022

Thanks for your attention !!!

Any questions?

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IHE CONNECTATHON 2022 BUILDING THE BRIDGE MONTREUX+ATLANTA SEPTEMBER 12-16