CENS

CENTRO NACIONAL EN SISTEMAS DE INFORMACIÓN EN SALUD

Introduction to Interoperability and Standards

Basics to understand interoperability

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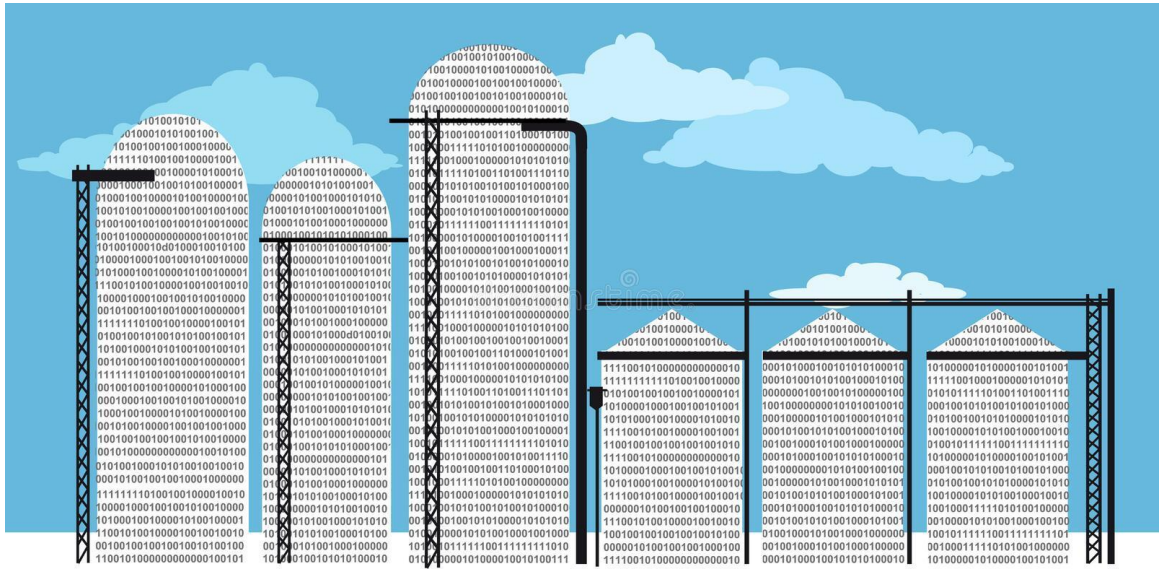
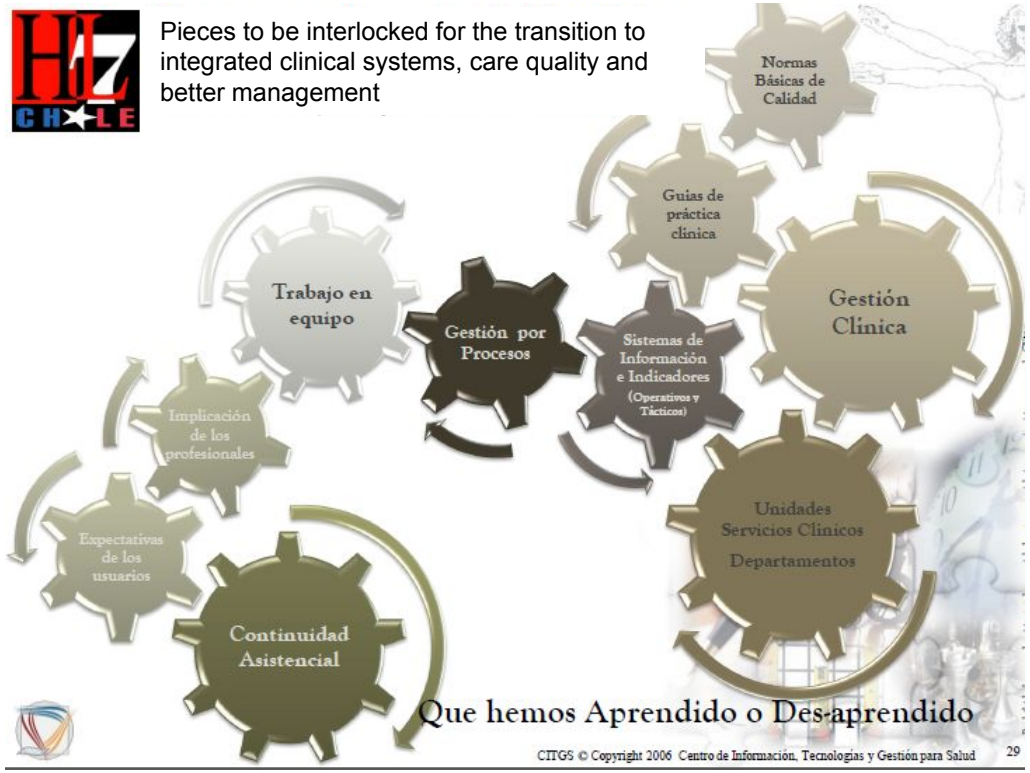
Basic concepts

The big problems

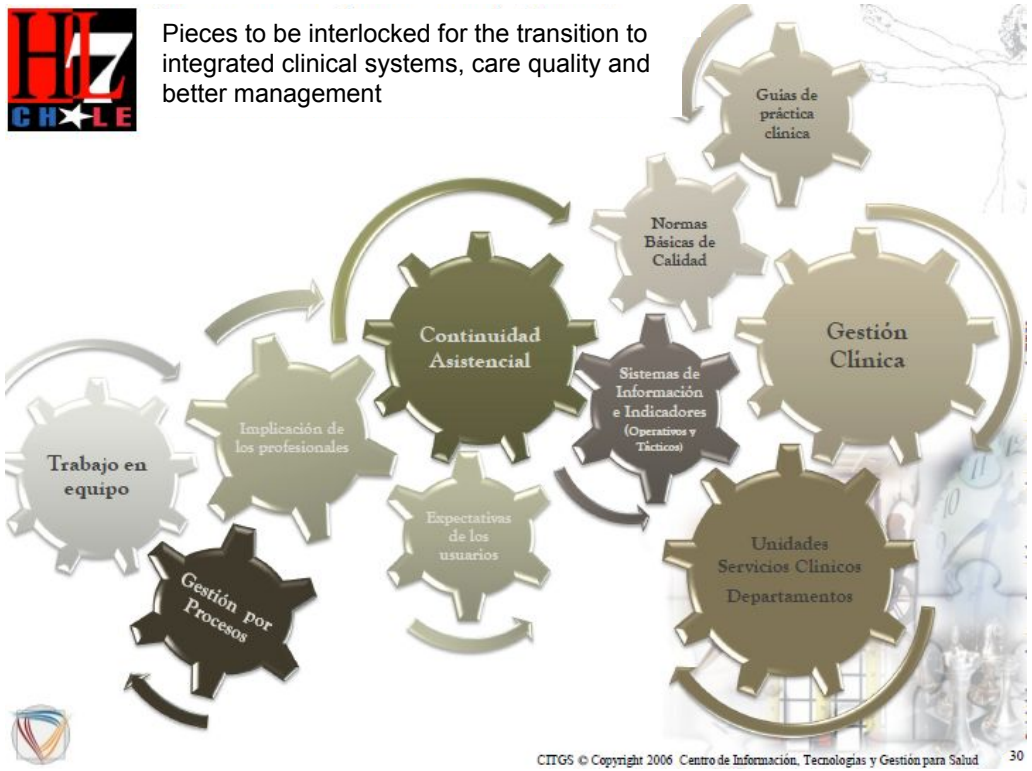


The change of paradigm

Pieces to be interlocked for the transition to integrated clinical systems, care quality and better management



Pieces to be interlocked for the transition to integrated clinical systems, care quality and better management



Why do we integrate

Data governance

Basic Data

Small Data

Data architecture

Big Data

Data integration & interoperability

Data modeling & design

Data is a shared asset

Data storage

Documents & contents

Data warehousing & BI

Meta-data

Data security

Data quality

Reference & master data

Definitions

- **Integration, Interoperability**
  - **Integration:** Inclusion of apparently separate applications to build a homogeneous system.
  - **(Semantic) Interoperability:** Capacity to share information between heterogeneous systems (and to automatically process/use it).
  - “Integrating” sometimes is illusory (100% homogeneity?)
  - “Reaching Interoperability” is usually possible.

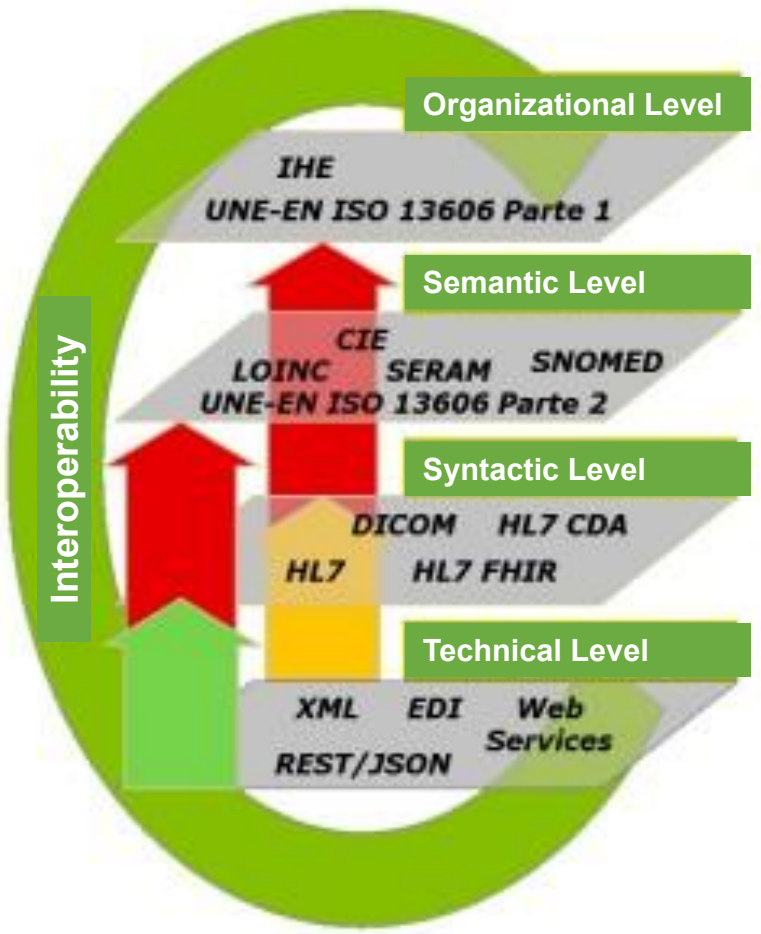
More definitions

Organizational — *Relating to the entities' capacity and the processes for collaboration in order to achieve mutually agreed outcomes related to the provided services.*

Semantic — *Relating to the ability for the exchanged information to be automatically interpreted and reusable by applications that didn't contribute to their creation.*

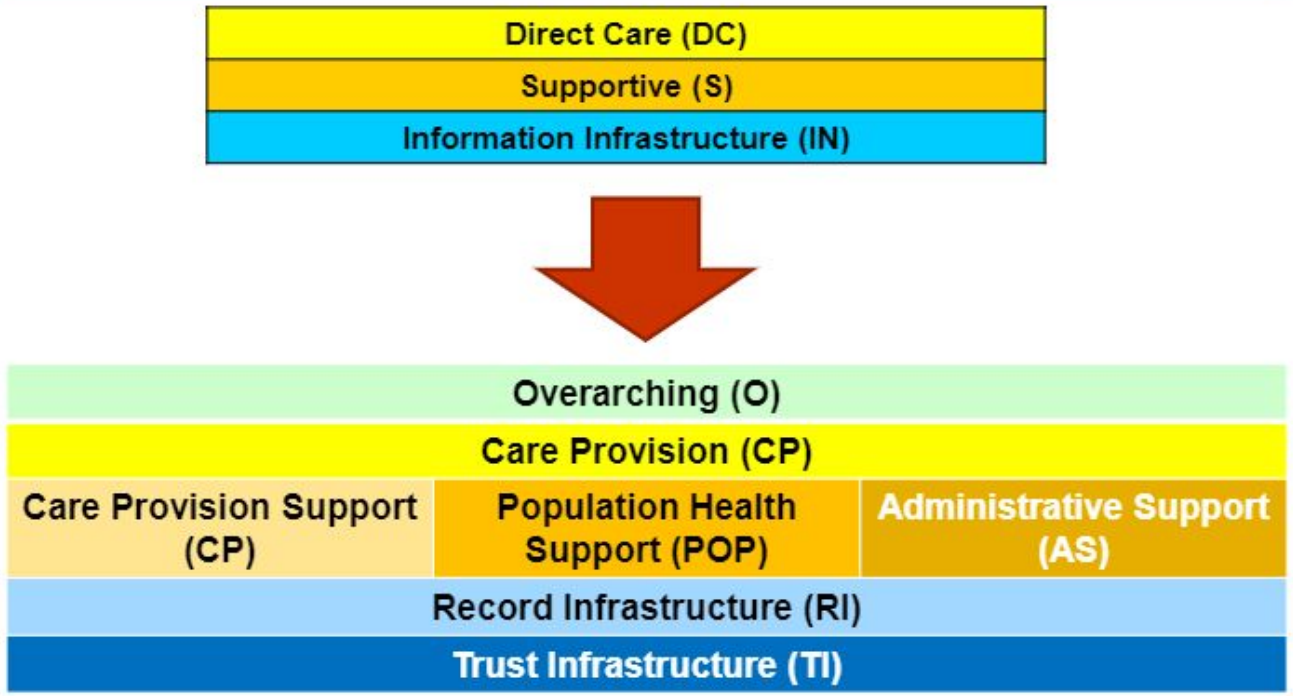
Technical — *Relating to the interaction of the technological systems, including aspects like interfaces, interconnection, integration of data and services, provision of the information, accessibility and security.*

Time — *Relating to the interaction between elements which correspond to different technological waves. They are manifested particularly in the conservation of the information in electronic form.*

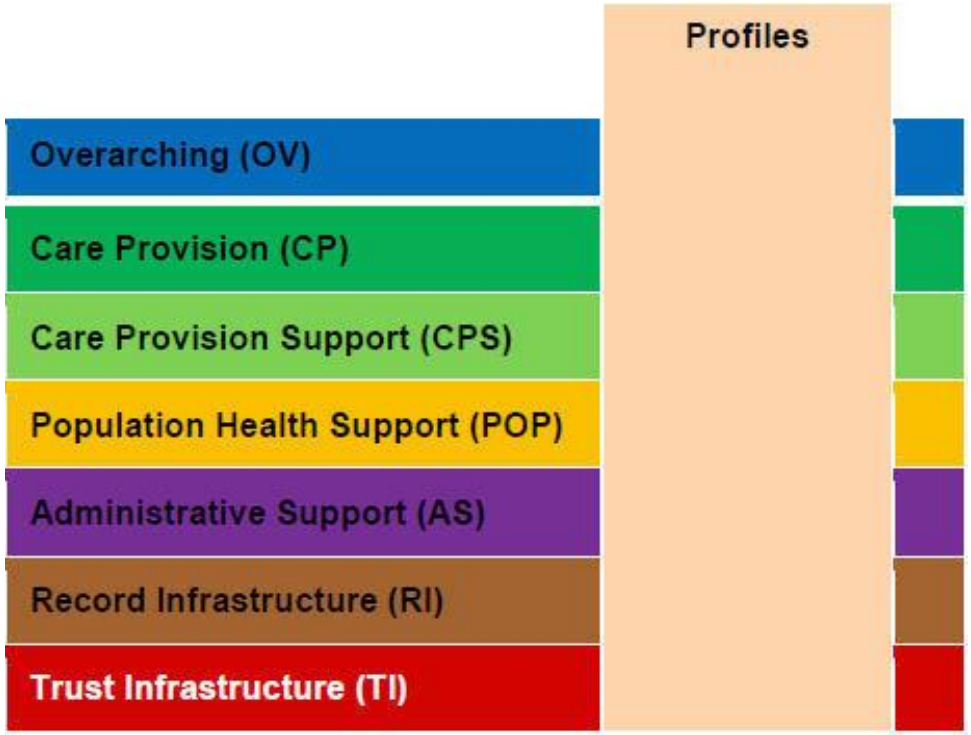


When everything seems the same, but it isn't

Functional model

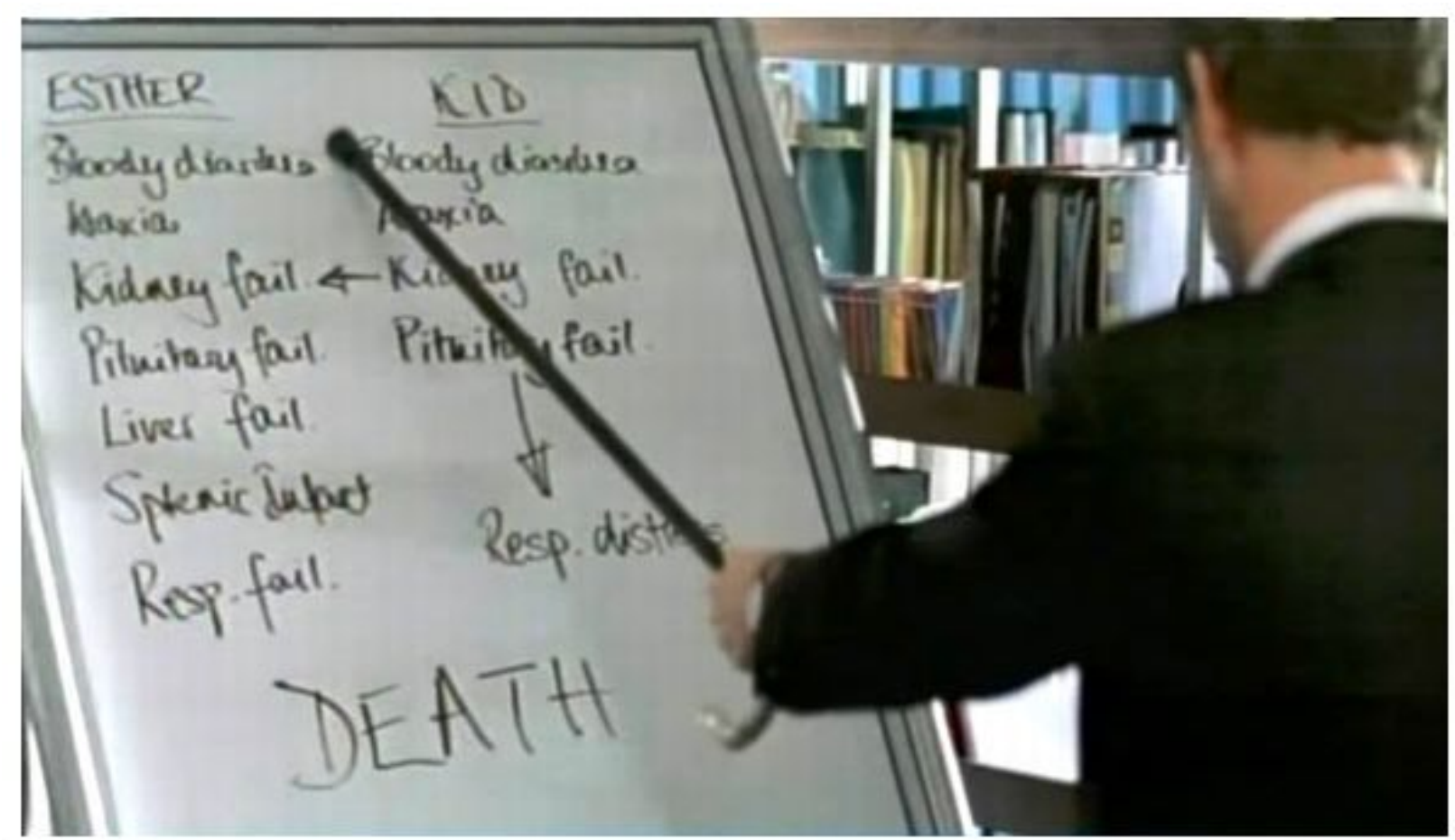


Journey to integration



The problem and challenge of transport focuses on maintaining the essential functions of the protocol, but in a way that every entity is free to prioritize which group of specific functions it will use and in which proportion. Currently this is achieved by giving users a scheme.

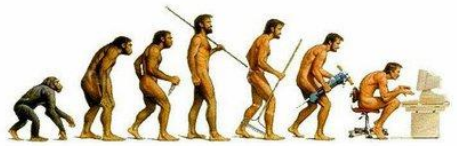
Problems arise



Useful aspects

- Definition of **Semantic Interoperability**

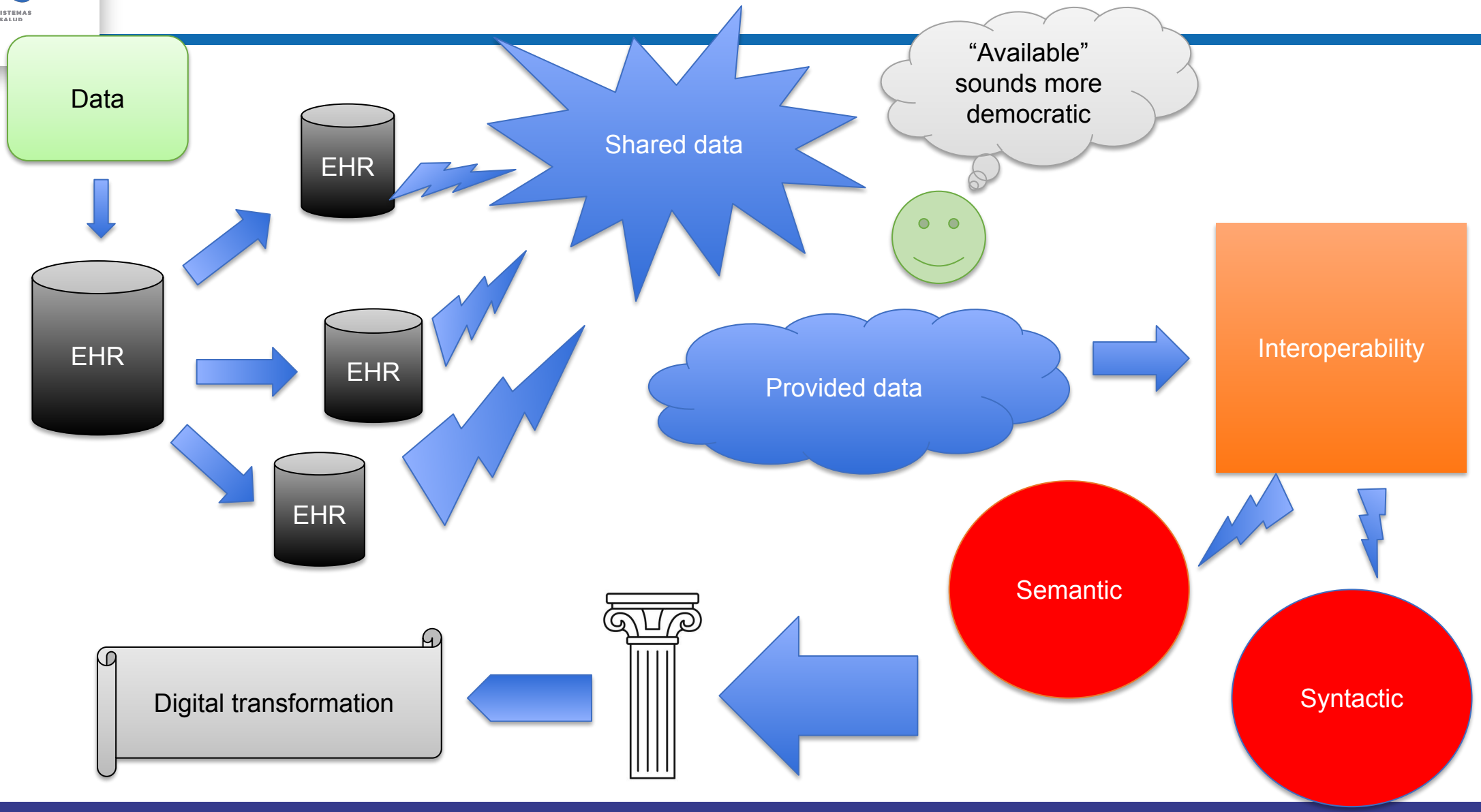
Capacity to share information between heterogeneous systems and to automatically process/use it



Evolutionary semantic interoperability

Capacity of two or more systems to exchange information in a way that it can be stored and processed, and that it can be understood without ambiguities

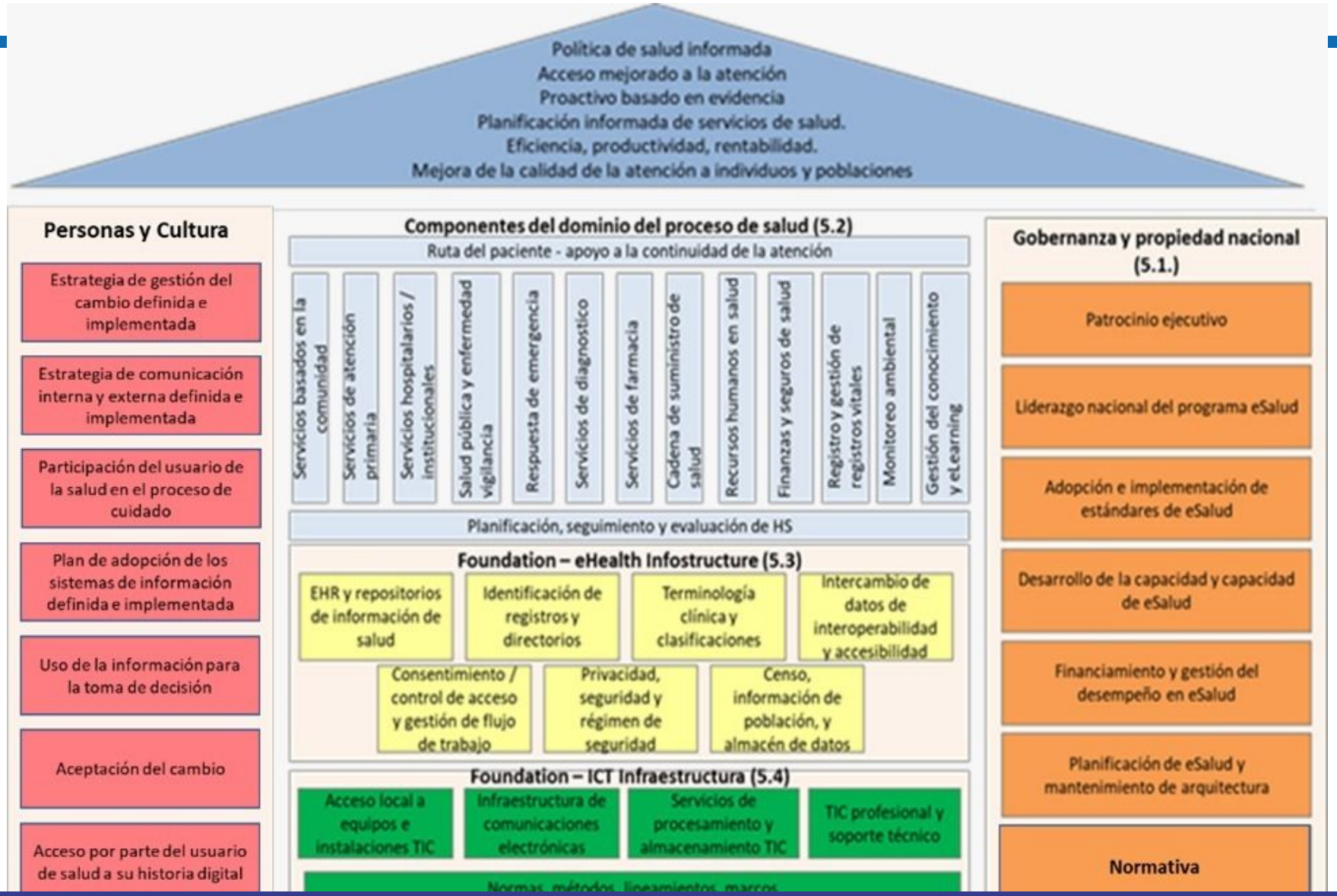
Breathing space: summary



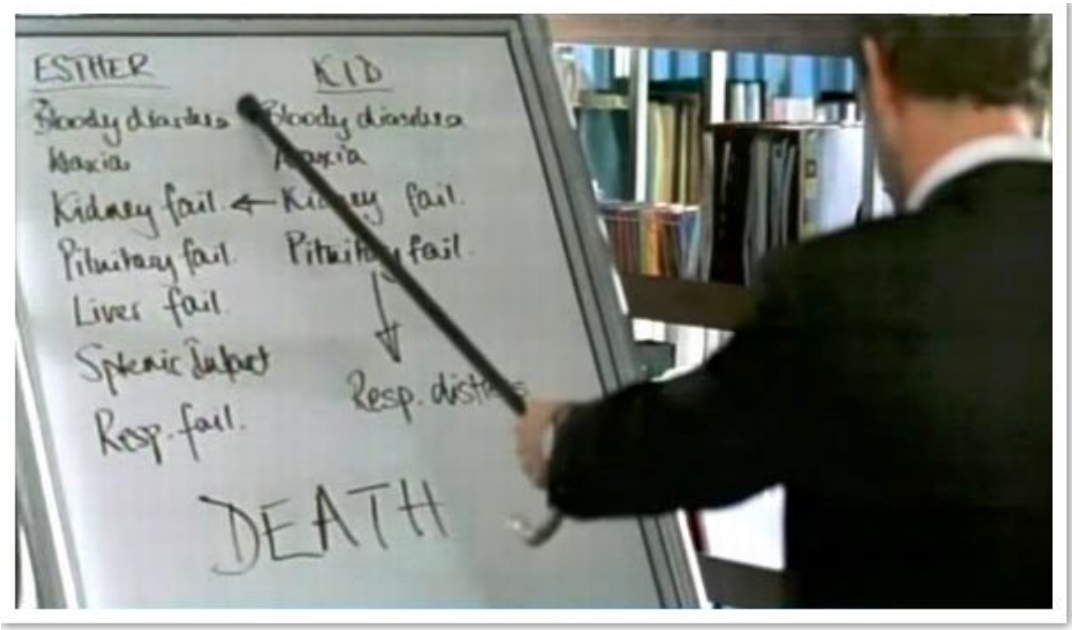
Thinking of interoperation

Interoperability isn't based on designing standards, it's about constructing an architectural work which is as solid as possible.

Digital transformation

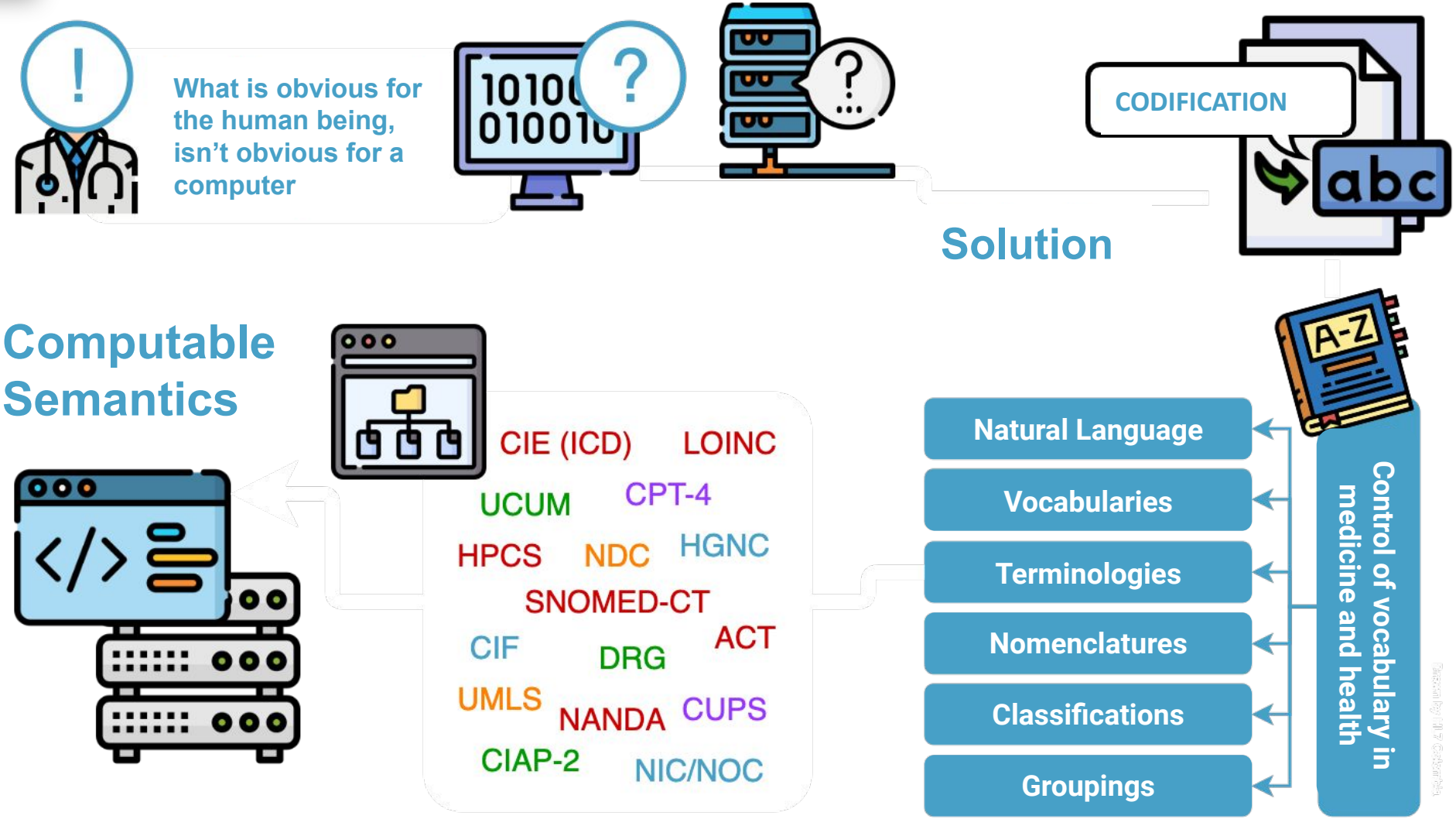


Back to House



One thing is being able to transport the information, and another is that everyone reading the transported information is able to understand it the same way

The problem of language



SNOMED and CIE

*SNOMED CT ISN't a software, it is a **clinical terminology.***

*Allows to introduce clinical information into the systems in a **standardized way and associated to codes.***

***Precision** in the representation of clinical phenomenons.*

*Support of **linguistic diversity.***

Further reading

https://www.youtube.com/w1atch?v=oVG8C_kggf0&t=4s

https://eciemaps.mscbs.gob.es/ecieMaps/browser/index_10_mc.html

LOINC

LOINC is a common language (set of identifiers, names and codes) for identifying the sanitary measurements, observations and documents. You can think of an observation as a “question”, and of the value of the observation’s result as an “answer”.

If necessary the codes of other standards (e.g. SNOMED CT) represent the “answer”. Obviously a code isn’t always necessary for the value of the result. In the case of the quantitative result, the “answer” is just the numeric value with its associated measurement units.

How LOINC works

This is a breakdown of LOINC for a manual white blood cell count in a sample of cerebrospinal fluid, represented by the code LOINC 806-0:

COMPONENT (ANALYTE)	PROPERTY	TIME
Leukocytes (white blood cells)	NCnc (Number concentration)	Pt (Point in time)

SYSTEM (SPECIMEN)	SCALE	METHOD
CSF (Cerebral spinal fluid)	Qn (Quantitative)	Manual Count

More information regarding LOINC

Access to
LOINC

Access to search engine
and downloads

Syntactic standards

The information in health: **Wherever** it is necessary, **whenever** it is necessary and the necessary **information** in a **usable** way.

HL7 International

How to group HL7

Exchange standards

Primary HL7® standards

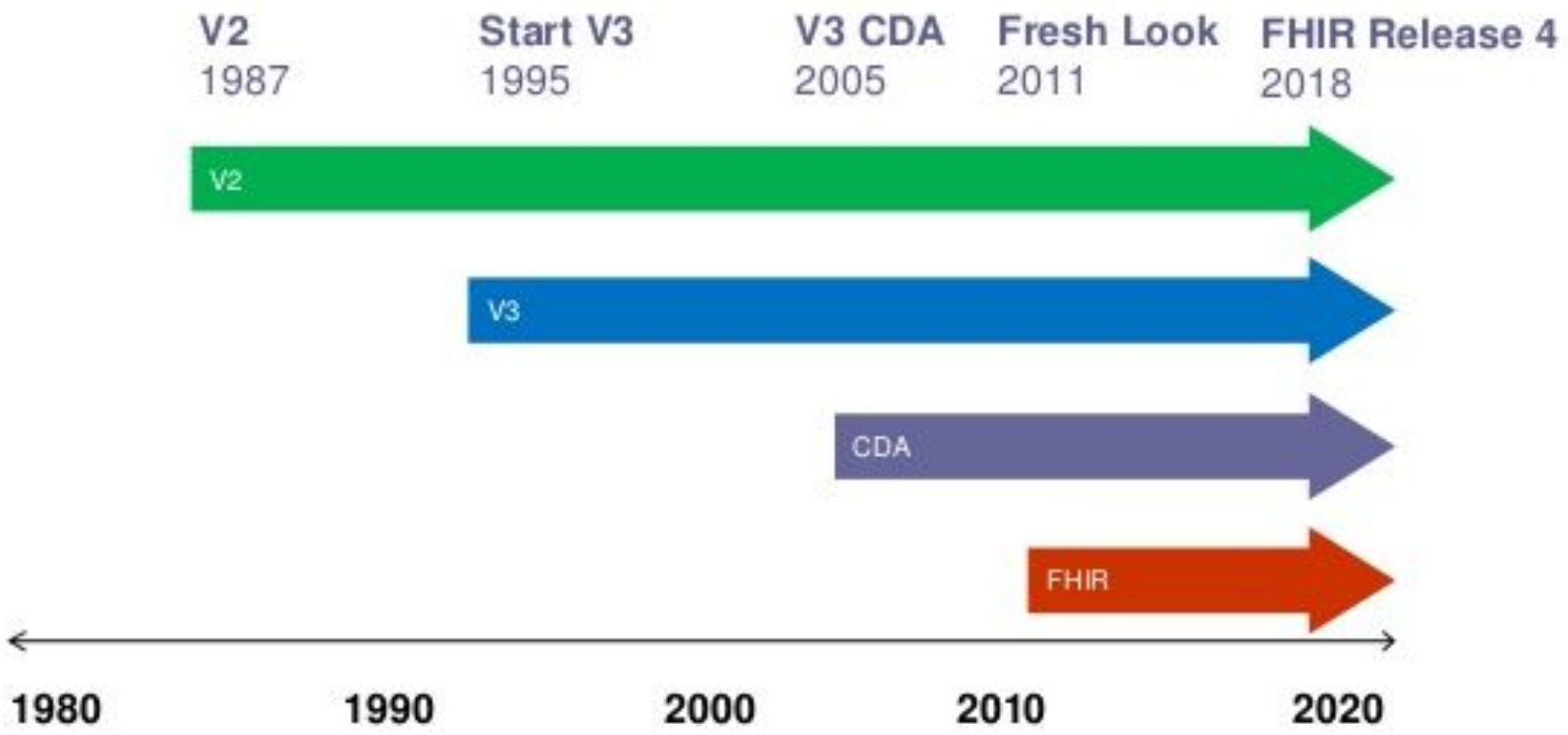
The primary HL7 standards are the most widely used standards for the integration of systems and the interoperability in health.

Health Level Seven® International

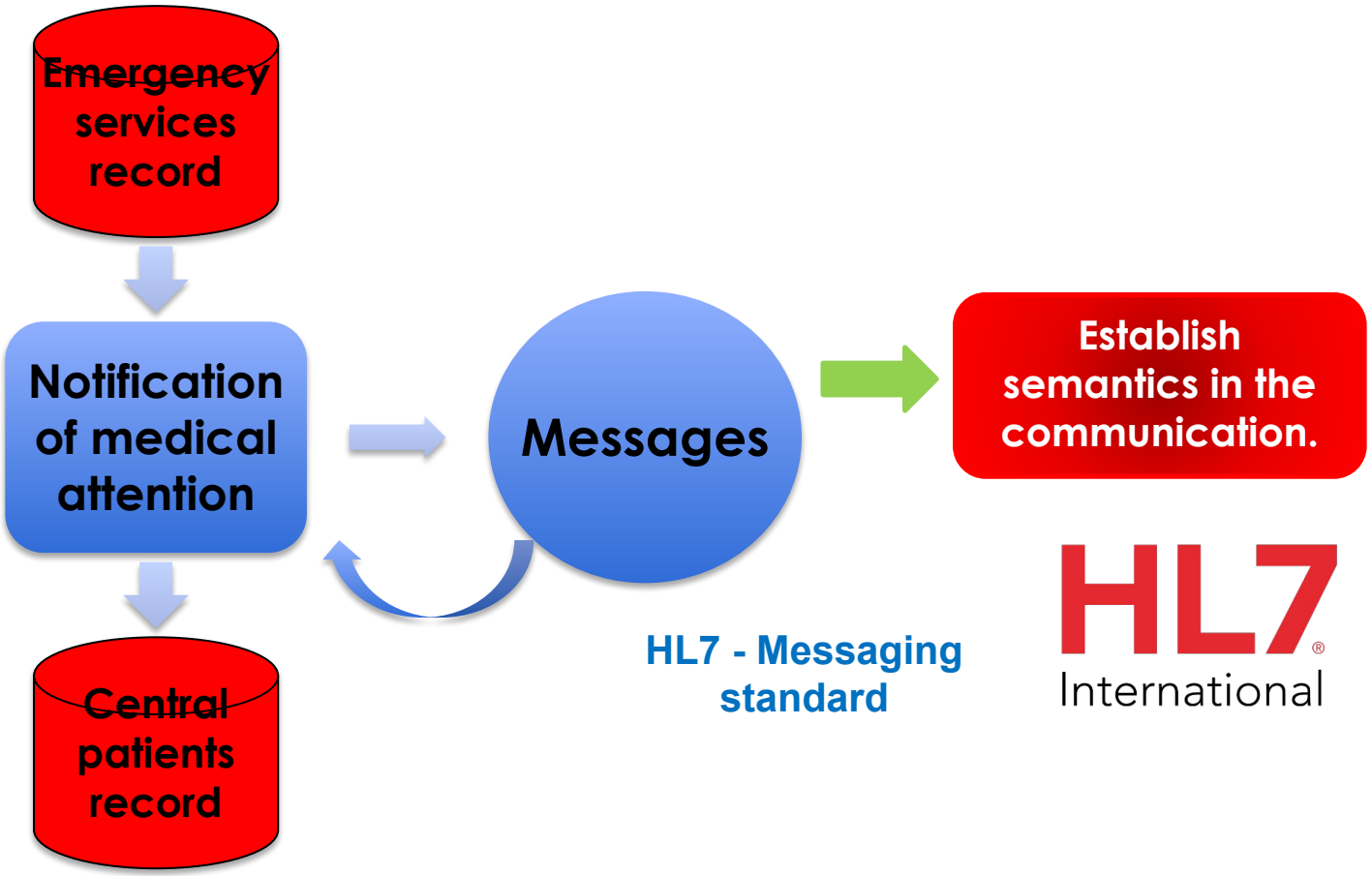
HL7® Versión 2	HL7® Versión 3	CDA® Release 2	HL7 FHIR®	CCOW
The messaging standard HL7 V2.X is the most widely used standard for exchanging clinical information in the world. This standard is supported by the vast majority of the existing systems in health care.	The standard HL7 V3 covers the terminologies, the types of data and the messaging which are necessary for a complete implementation. It is based on the reference model HL7 RIM, a common reference for the development of the standard.	A document marking standard that specifies the structure and semantics of clinical documents for its exchange between providers and patients. A CDA can contain clinical documents of any type with unstructured content or structured and completely encoded content.	FHIR is a standard that combines the characteristics of HL7 V2, HL7 V3 and CDA to achieve a fast and simple integration. Composed of *resources,* modular components combined in systems for solving real problems in health care.	CCOW is a standard for facilitating the integration of applications at the usage level using a technique called *Context Management*. Allows to synchronize the information of different systems concerning the same patient, procedure or user at the user interface level.

For more information about the HL7 standards visit http://www.hl7.org/implement/standards/

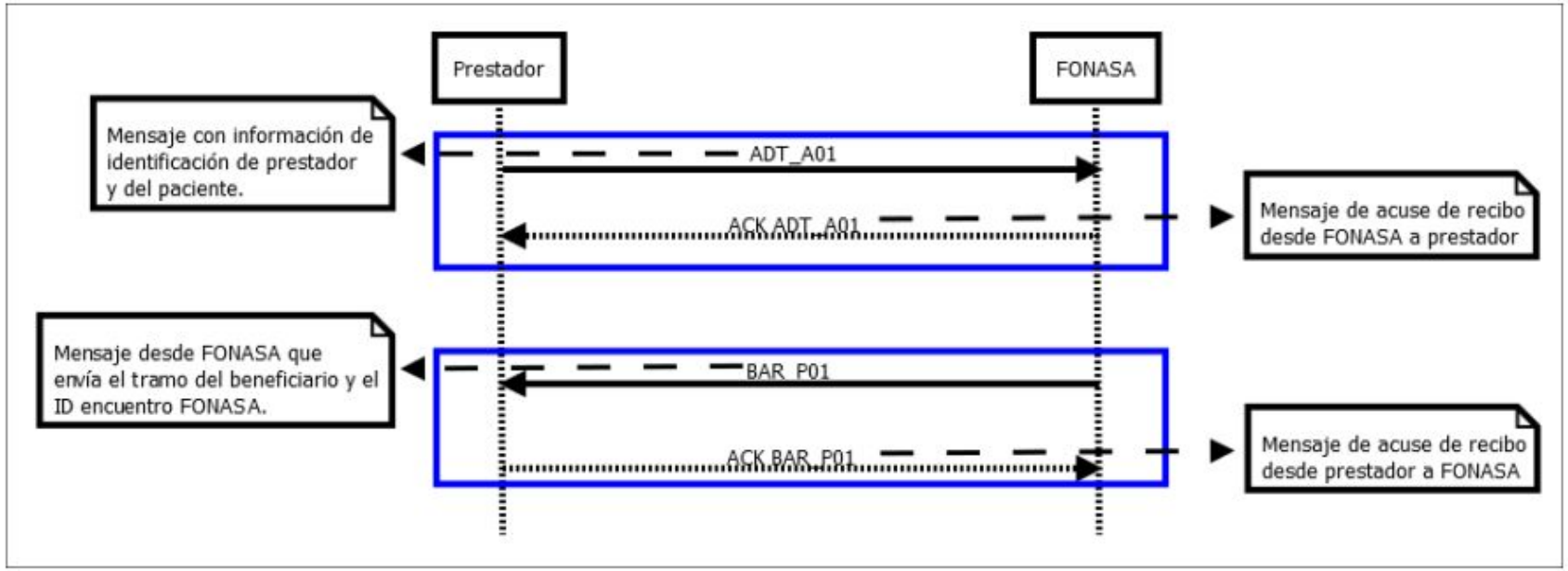
A long story


V2
1987
Start V3
1995
V3 CDA
2005
Fresh Look
2011
FHIR Release 4
2018
V2
V3
CDA
FHIR
1980
1990
2000
2010
2020

Messaging


Emergency services record
Notification of medical attention
Messages
Central patients record
Establish semantics in the communication.
HL7 - Messaging standard
HL7
International

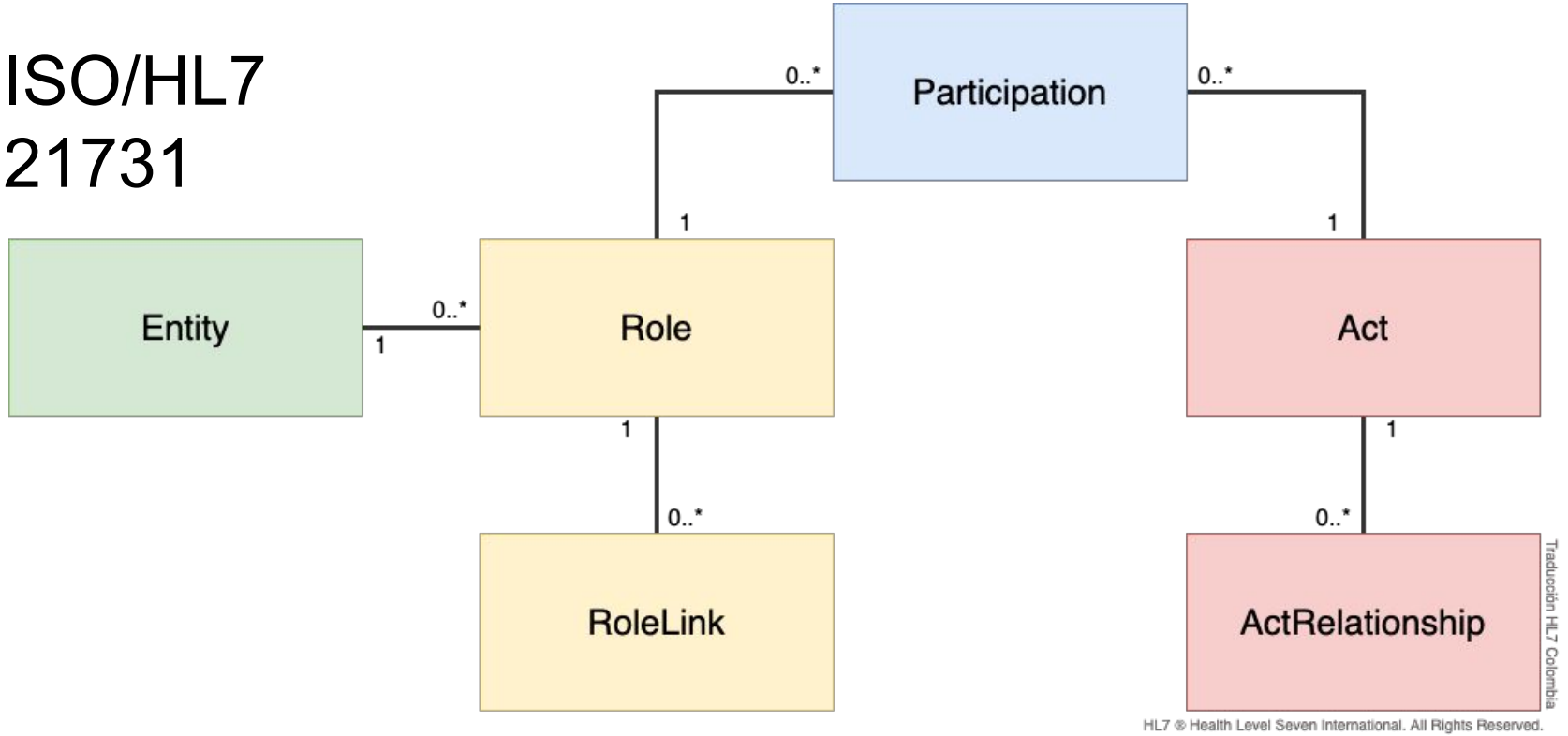
Messaging: Triggering event



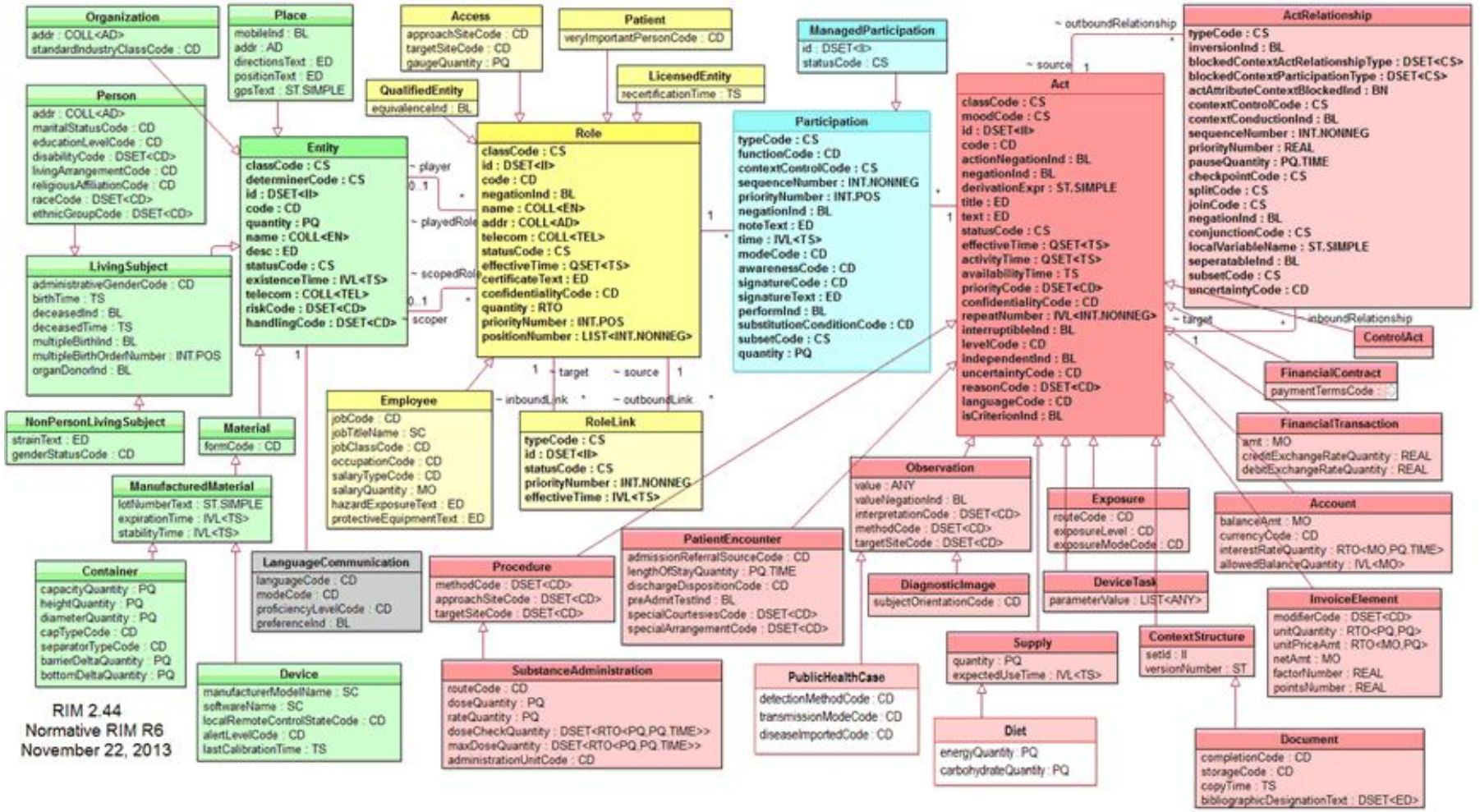

```
MSH|^~\&|ADT1|MCM|LABADT|MCM|198808181126|SECURITY|ADT^A01|MSG00001-|P|2.4
EVN|A01|198808181123
PID|||PATID1234^5^M11||JONES^WILLIAM^A^III||19610615|M-||C
PV1|1|I|2000^2012^01|||004777^LEBAUER^SIDNEY^J.|||SUR||-||ADM|A0
AL1|1||^PENICILLIN||PRODUCES HIVES~RASH~LOSS OF APPETITE
DG1|001|I9|1550|MAL NEO LIVER, PRIMARY|19880501103005|F
PR1|2234|M11|111^CODE151|COMMON PROCEDURES|198809081123
```

V3

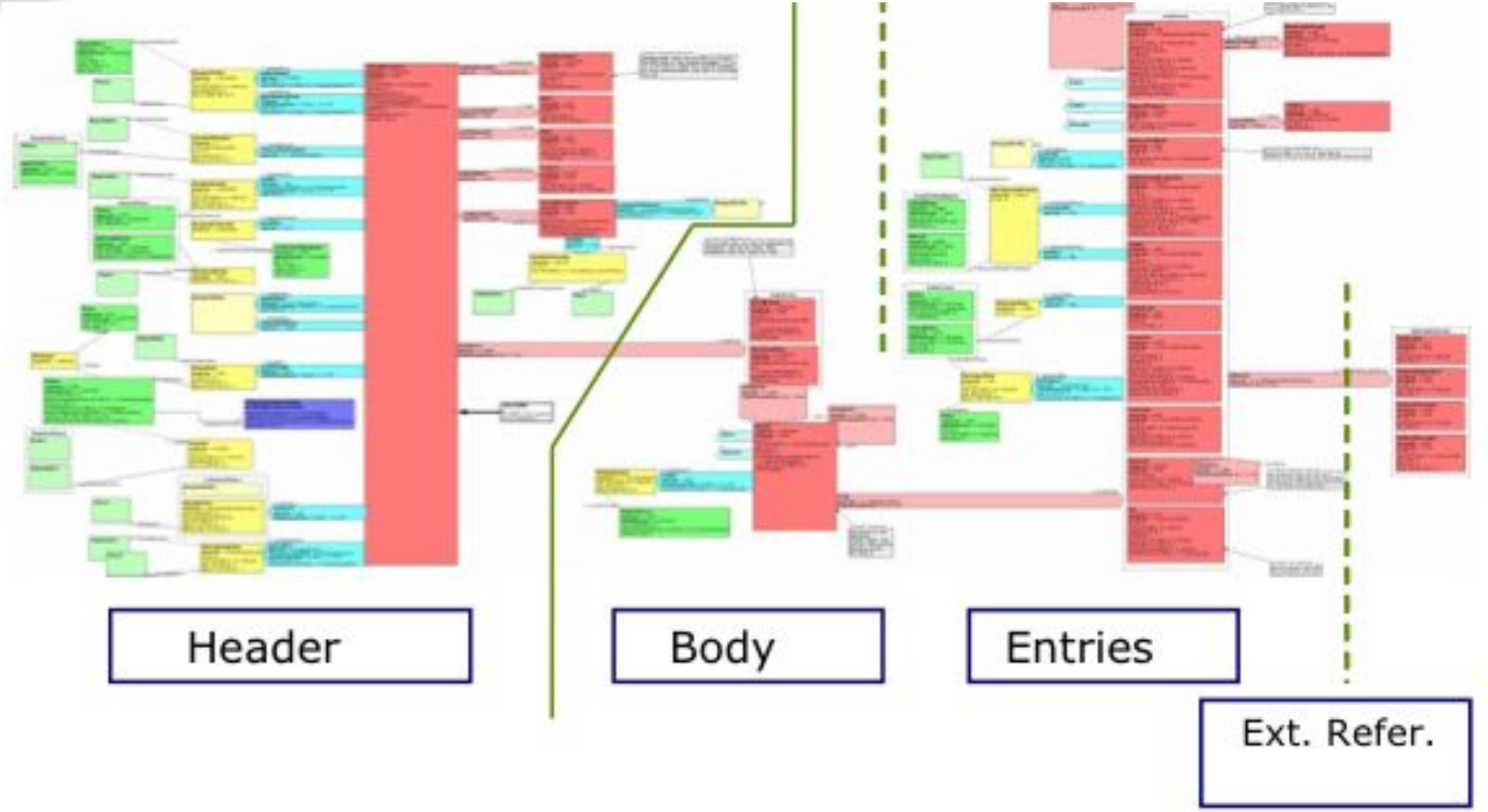
ISO/HL7 21731



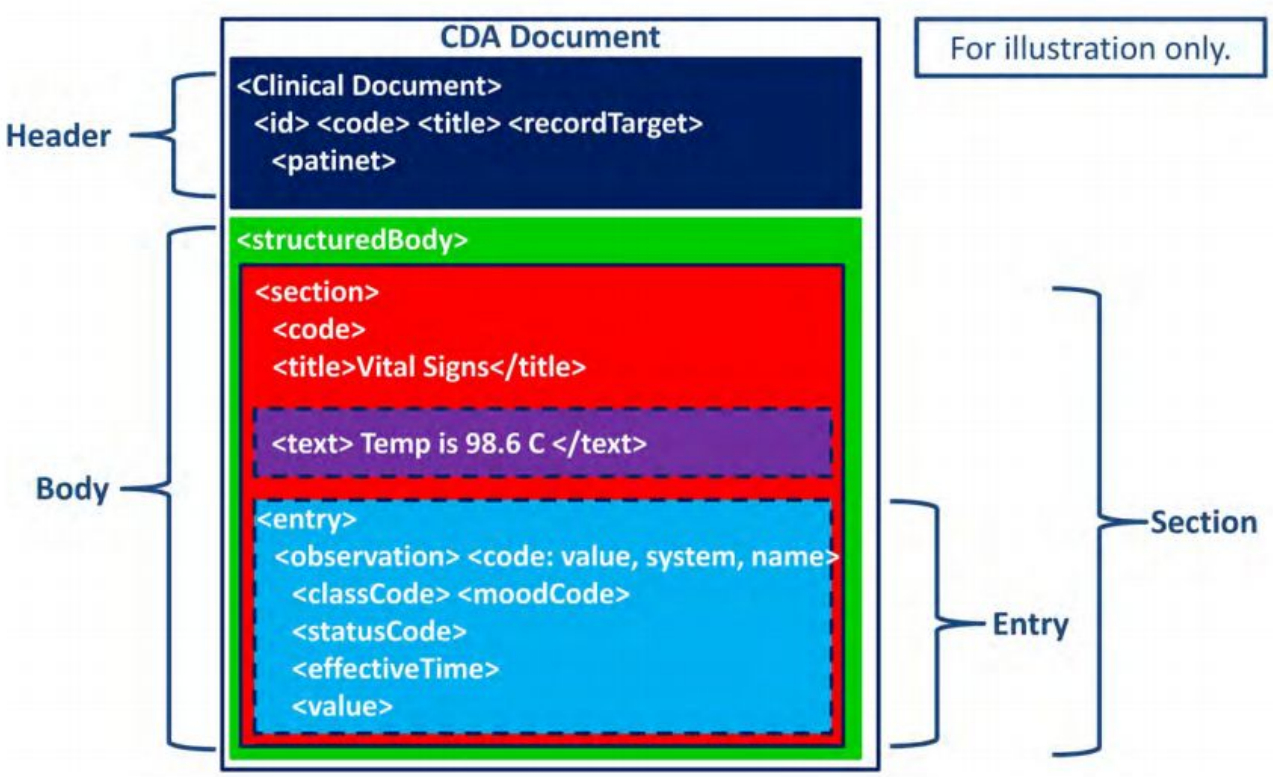
V3 and its complex data model



Documents: CDA-R2



CDA-R2: Simpler



HL7 FHIR

Fast HealthCare Interoperability Resources

FHIR: A standard for data exchange in health, published by HL7. It is a specification which defines a set of capabilities that are used in the entire sanitary process, in all jurisdictions and many different contexts.

Purpose:

- The exchange of data in the network, specifying information of different nature like meta data, representation method and readability for human beings.

Towards:

- Positioning it as THE standard of international use
- Being a transversal framework for the systems that want to communicate

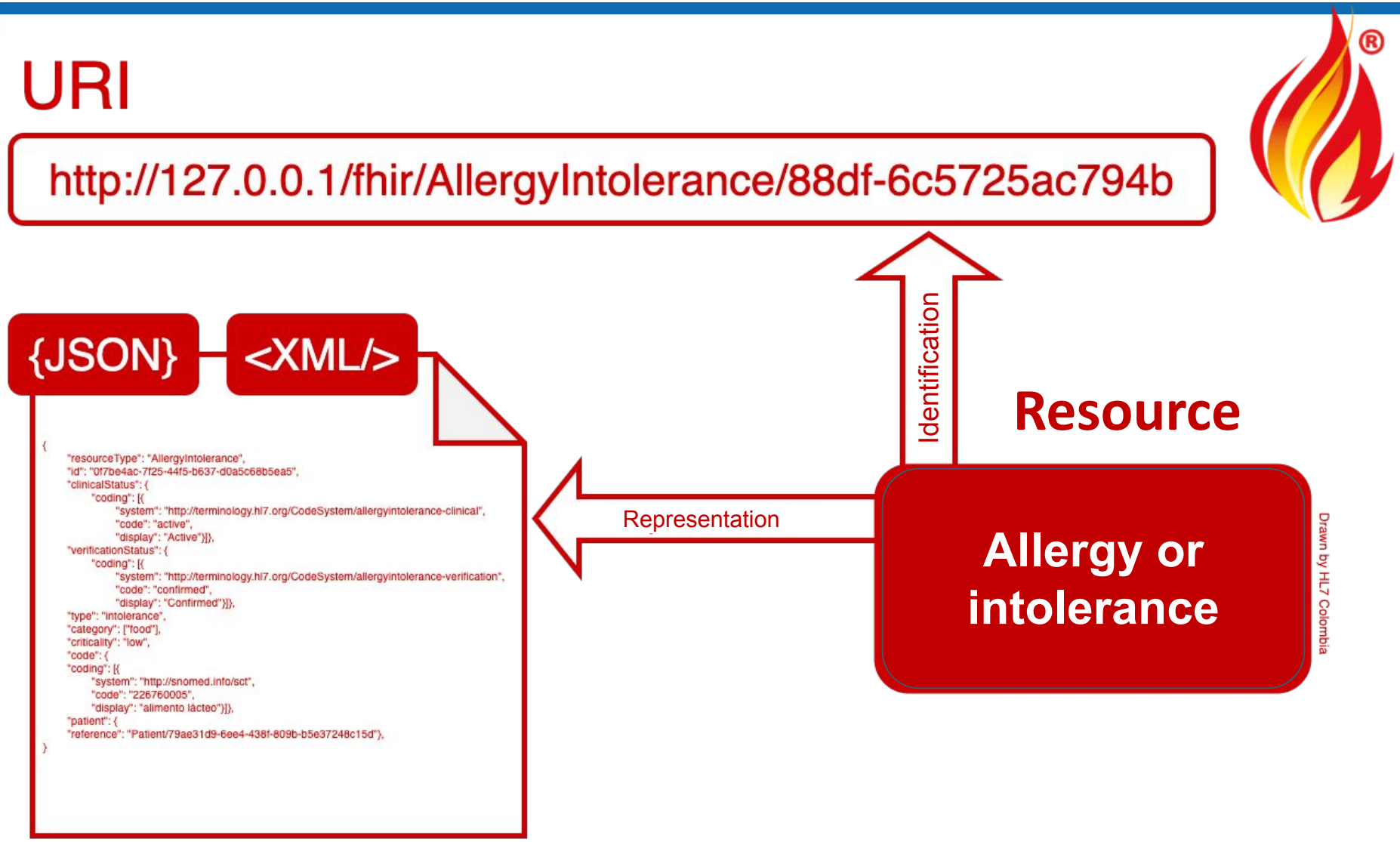
Advantages (among others):

- Easy implementation
- Better capacity for communicating information
- Reduced time of consumption of documents
- Possibility of mapping with previous standard formats

HL7 FHIR


FHIR®
Resources
Interoperability
Healthcare
Fast
WWW
Resources
145
Actual Version
R4
2019
Drawn by HL7 Colombia

HL7 FHIR


URI
http://127.0.0.1/fhir/AllergyIntolerance/88df-6c5725ac794b
{JSON}
<XML/>
{
"resourceType": "AllergyIntolerance",
"id": "0f7be4ac-7f25-44f5-b637-d0a5c68b5ea5",
"clinicalStatus": {
"coding": [{
"system": "http://terminology.hl7.org/CodeSystem/allergyintolerance-clinical",
"code": "active",
"display": "Active"}]},
"verificationStatus": {
"coding": [{
"system": "http://terminology.hl7.org/CodeSystem/allergyintolerance-verification",
"code": "confirmed",
"display": "Confirmed"}]},
"type": "intolerance",
"category": ["food"],
"criticality": "low",
"code": {
"coding": [{
"system": "http://snomed.info/sct",
"code": "226760005",
"display": "alimento lácteo"}]},
"patient": {
"reference": "Patient/79ae31d9-6ee4-438f-809b-b5e37248c15d"},
}
Representation
Identification
Resource
Allergy or intolerance
Drawn by HL7 Colombia

DICOM

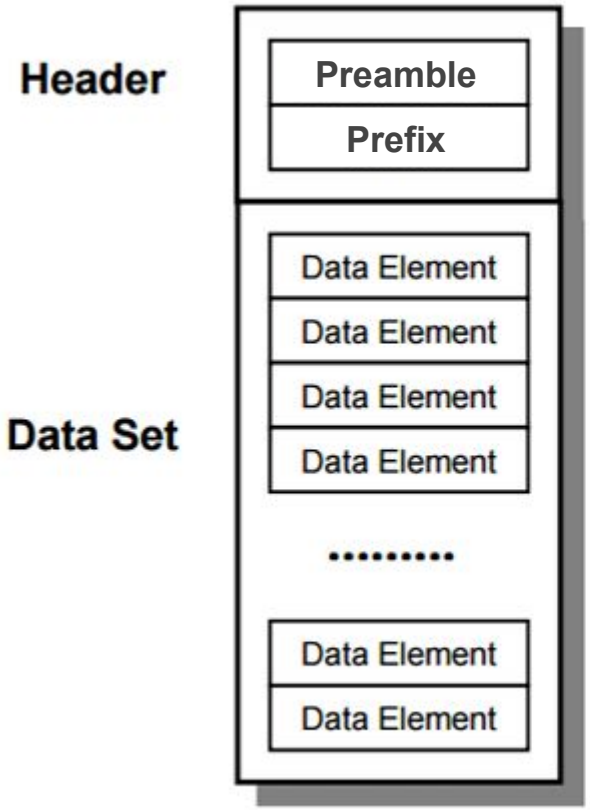


Fig. 2 Structure of a DICOM file

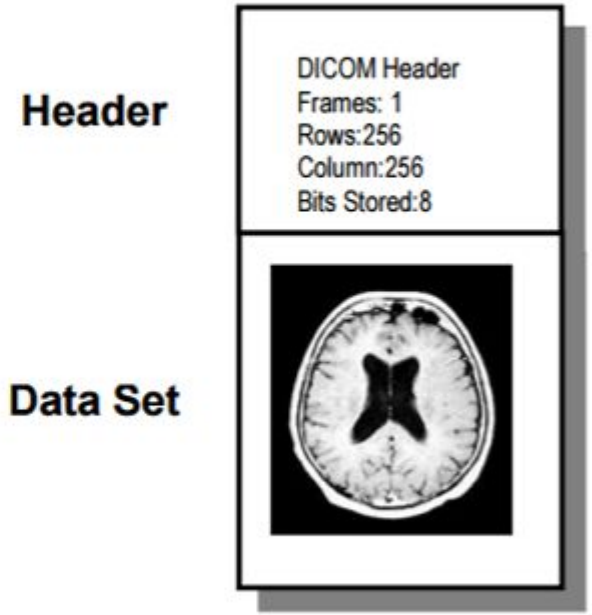
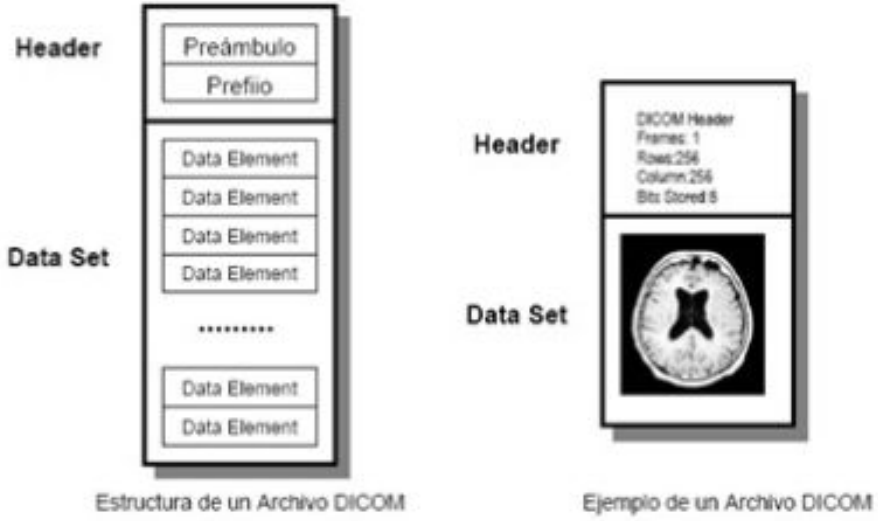


Fig. 3 Example of a DICOM file

DICOM

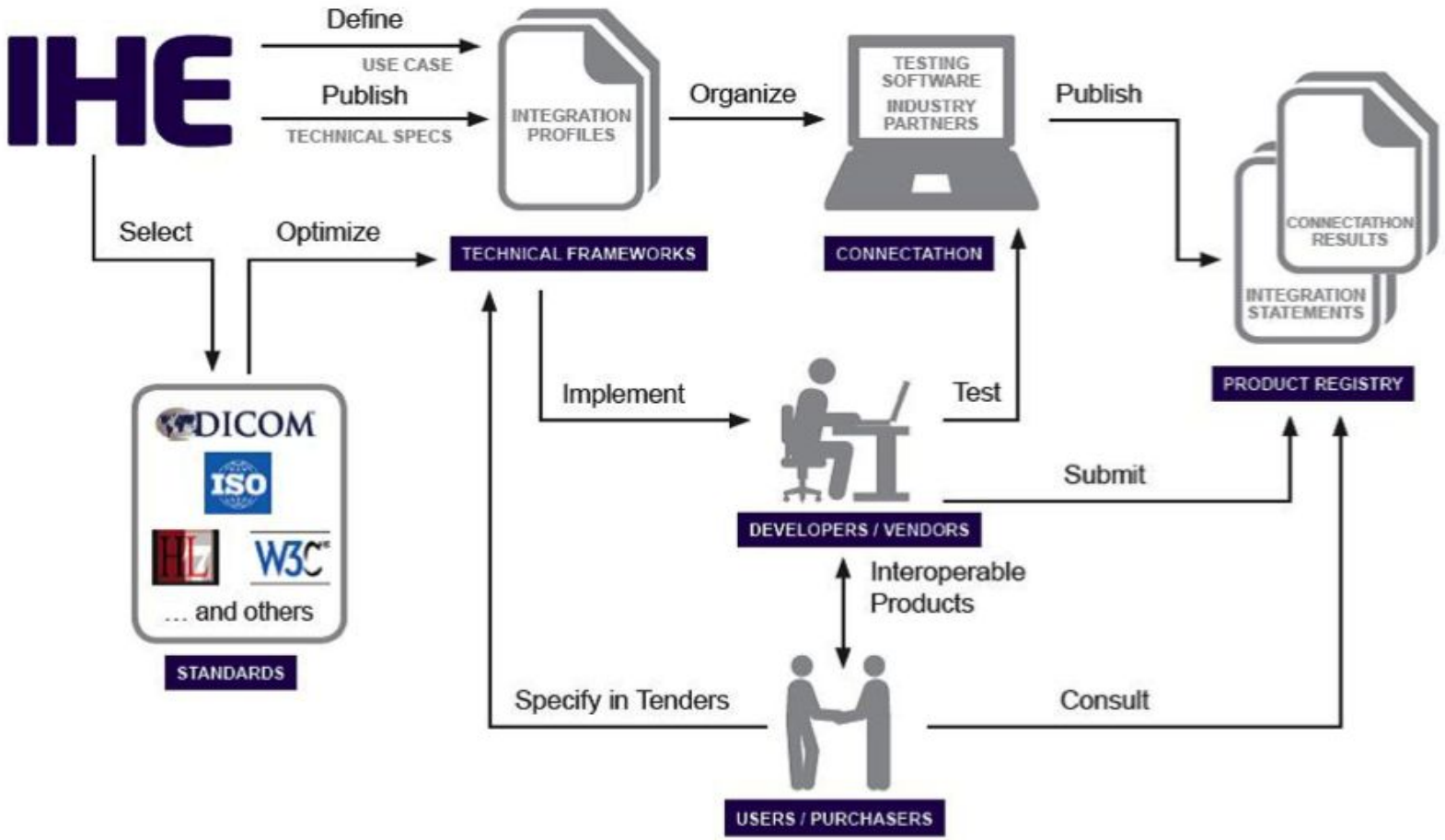
- **Image Format**



Estructura de un Archivo DICOM

Ejemplo de un Archivo DICOM

IHE: High-level



The value of what it costs us

Ambulatory case (Australia)

In this case the diagnostic costs for imagery were reduced, generating Au$6.6M of value for the health care system. The patients gained 140K hours, equal to Au$2.9M in terms of economic output per year.

$6.6 M

140 K Hours

The value of what it costs us

Low administration cost (Canada)

The reduction of emergency units patients admission generated CD$334.95M of value for the health care system, generating a total of 8.5M hours for the patients and 33K hours for the providers, contributing to an improvement of the economic output by CD$68.7M.

In the reduction of readmissions the values were of the same scale.

$335 M

8.5 M Hours

Extensions and profiles

Let's look at success cases!

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