ART-DECOR

for Specification Developers

ART-DECOR Developer Day @ IHIC 2015
9th February 2015, Prague, Czech Republic

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Heitmann Consulting and Services
ART-DECOR expert group
Template WG co-chair,
HL7 International
Past chair HL7 Germany
HL7 Germany / Netherlands

heitmann consulting and services
competence in Healthcare IT worldwide

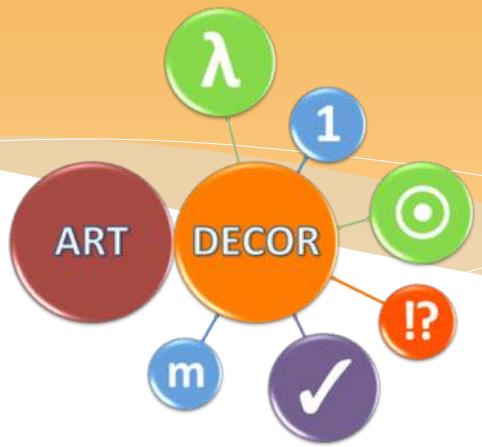
Agenda

ART-DECOR for Specification Developers

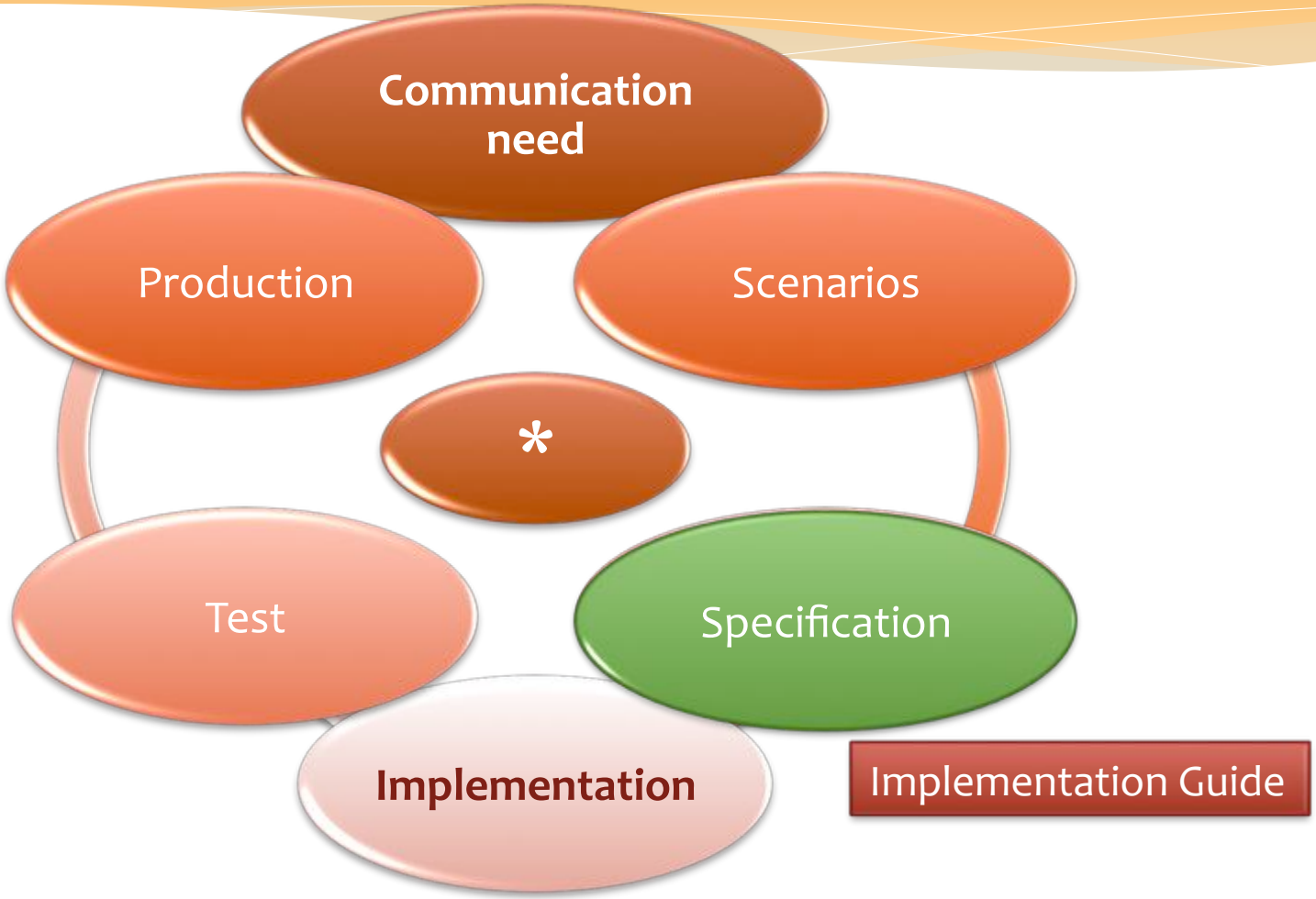
- Implementation Guideline Rationale
- Building Block Repositories
- Editing and maintaining Templates
- Editing and maintaining Value Sets
- Existing Specifications
- Implementation Guideline Publication and the REST
- FHIR with ART-DECOR

Use Case: Vaccination Certificate Document

Implementation Guideline Rationale

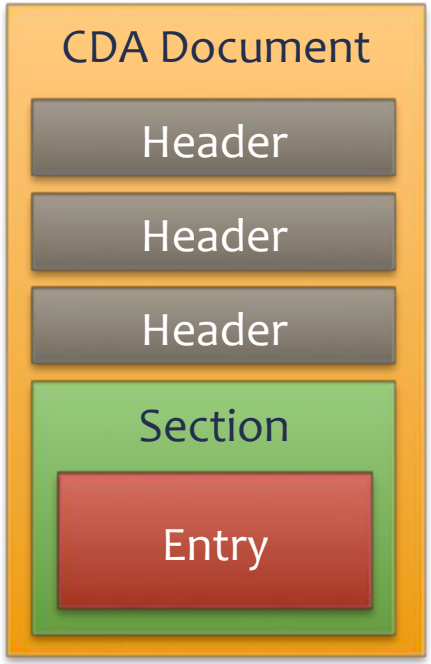


“Life” Cycle


Communication need
Production
Scenarios
*
Test
Specification
Implementation
Implementation Guide

Implementation Guides

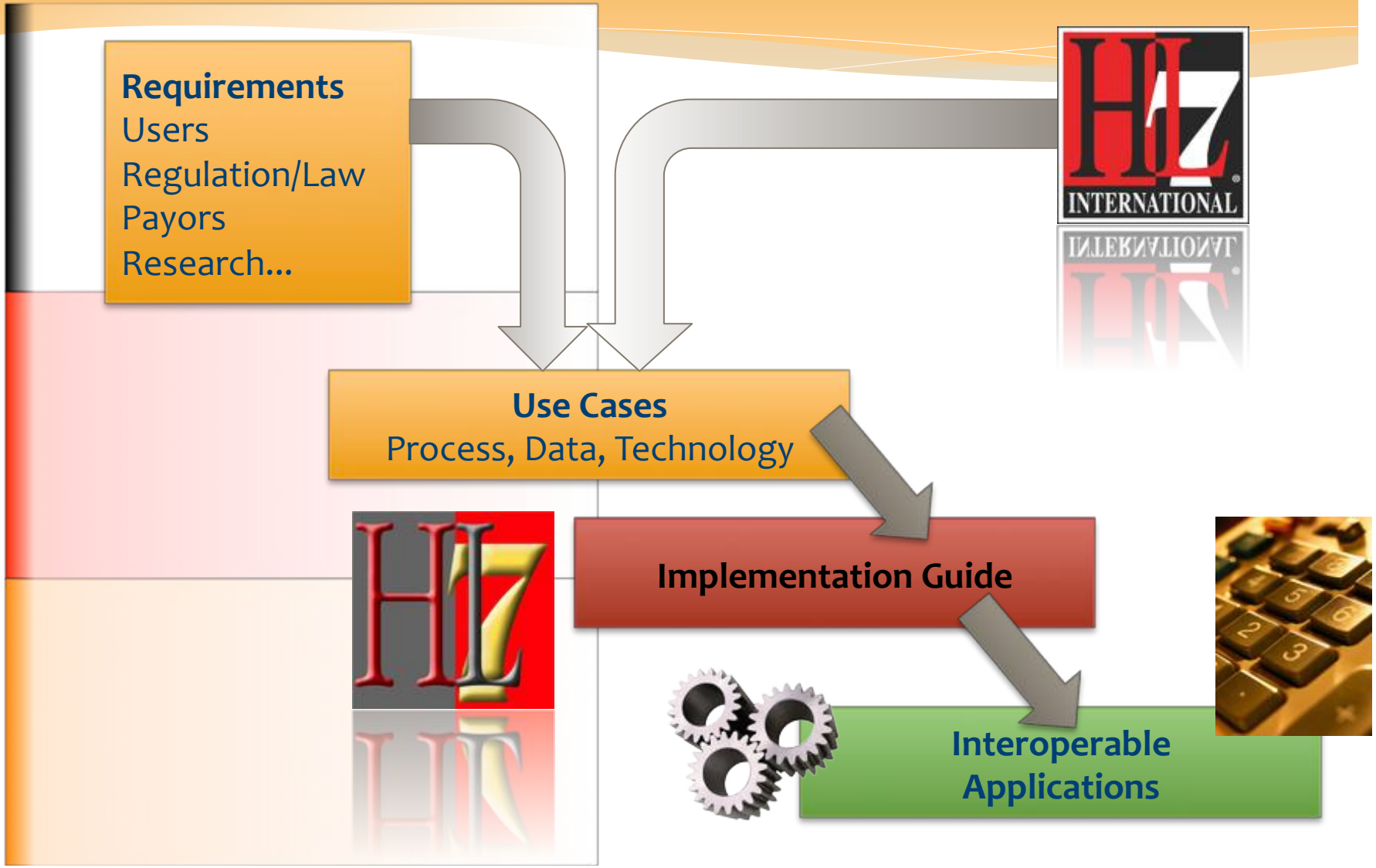
- A CDA Implementation Guide specifies
  - A document type
  - Mandatory and optional header parts
  - Mandatory and optional sections
  - Level 2 codes for those sections
  - Mandatory and optional Level 3 entries
  - Terminologies, identification schemes
  - Other constraints, e.g. based on business rules



Implementation Guides

- CDA Implementation Guides and Profiles
  - Discharge Letter
  - Patient Summary
  - Operation Note
  - EKG Report
  - Lab Results
  - Medication List
  - Prescription

Implementation Guides



ART-DECOR for Specifications Tool and Methodology

- Comprehensive collaboration tool to support governance groups:

DECOR

Concept, model, conversion, cooperation, documentation, publication

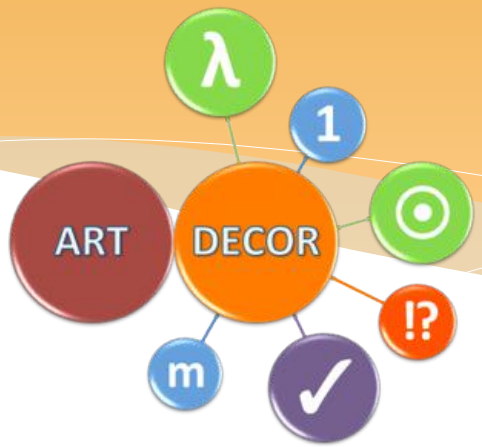
ART

User interface, rules, test framework, RESTful services, terminology browser, demo and sandbox applications

Overview DECOR

Concept	Scenario	Rules	Identifiers	Codes	Issues
• Concept Group / Item • Data type • Concept list • Properties	• Actor • Transaction • Cardinality • Conformance • Test suite	• Templates • Elements • Attributes • Constraints • Validation	• OID registry • Summary of IDs	• Value Sets • Terminology Associations • Coded Concepts	• Change Management • Status • Assignment

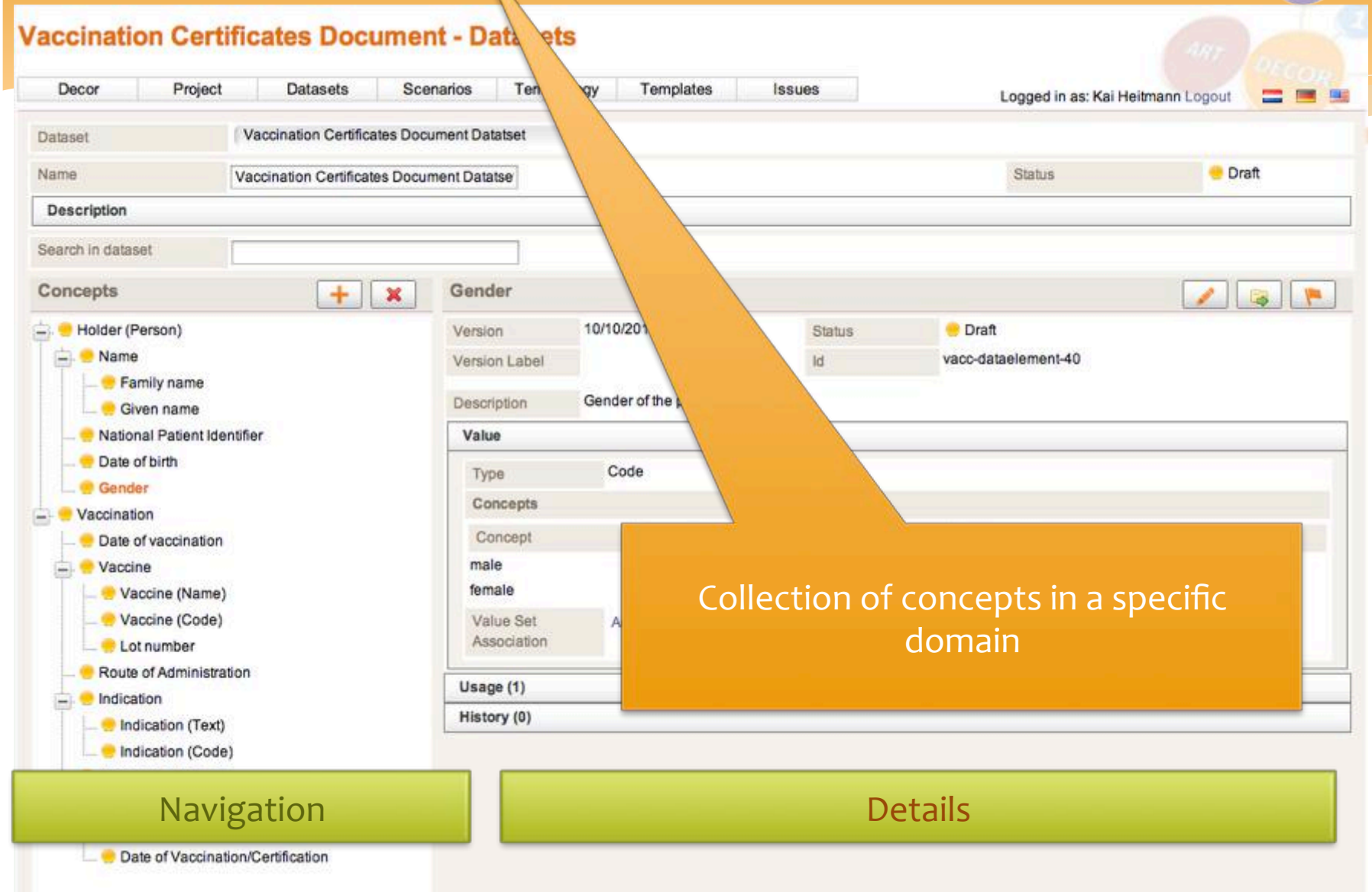
Datasets



ART-DECOR: tasks +definitions

- Data sets
  - Concepts and their properties
    - descriptions, data types, choice lists, ranges, operationalizations, rationale etc.
- Scenarios
  - Use Case based
  - Actors
  - Transactions
  - Concepts from Dataset with Cardinalities and Conditions

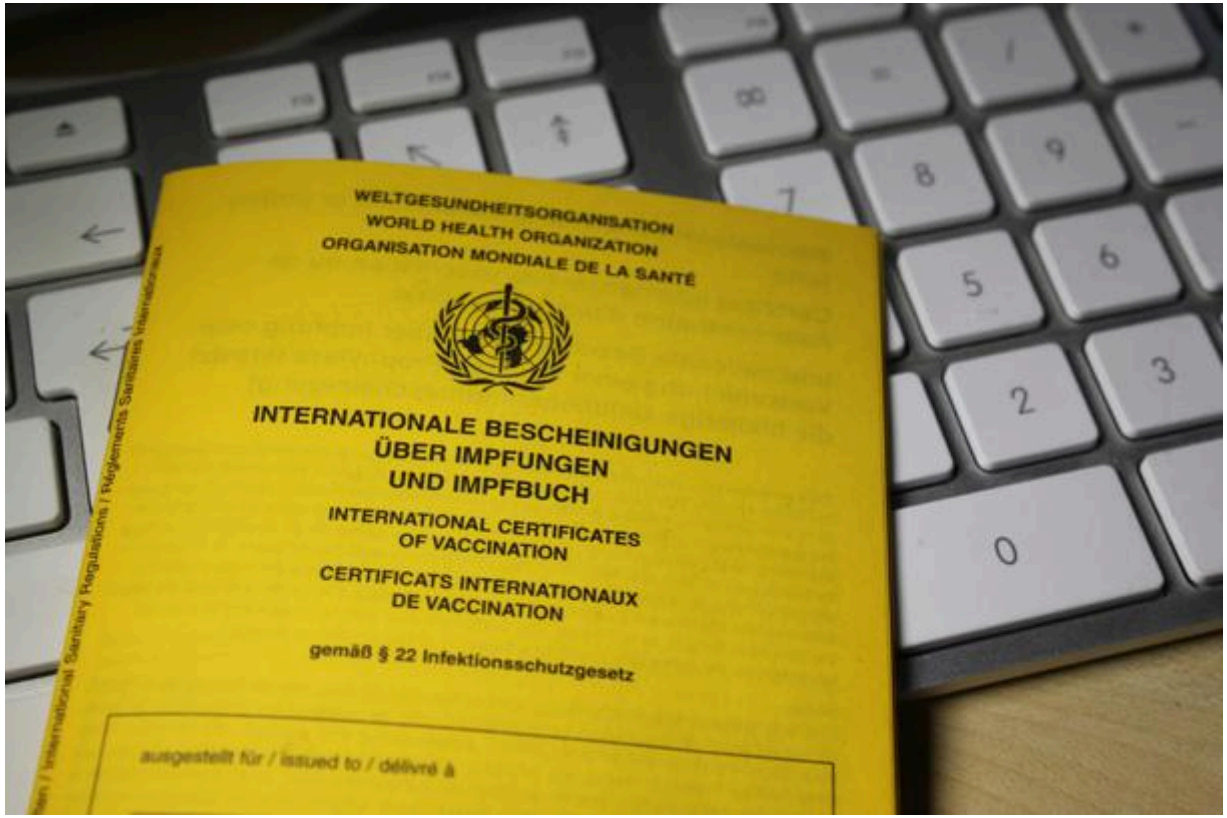
Dataset and scenario



Collection of concepts in a specific domain

An example: Vaccinations

WHO Document: International Certificates of Vaccination



Example

4

INTERNATIONAL CERTIFICATE* OF VACCINATION OR PROPHYLAXIS

This is to certify that [name] .....

date of birth ..... sex .....

nationality .....

national identification document, if applicable .....

whose signature follows .....

has on the date indicated been vaccinated or received prophylaxis against: (name of disease or condition)

.....

in accordance with the International Health Regulations.

5

CERTIFICAT* INTERNATIONAL DE VACCINATION OU DE PROPHYLAXIE

Nous certifions que [nom] .....

né(e) le ..... de sexe .....

et de nationalité .....

document d'identification national, le cas échéant .....

dont la signature suit .....

a été vacciné(e) ou a reçu des agents prophylactiques à la date indiquée contre: (nom de la maladie ou de l'affection)

.....

conformément au Règlement sanitaire international.

Vaccine or prophylaxis Vaccin ou agent prophylactique	Date Date	Signature and professional status of supervising clinician Signature et titre du clinicien responsable	Manufacturer and batch no. of vaccine or prophylaxis Fabricant du vaccin ou de l'agent prophylactique et numéro du lot	Certificate valid from: until: Certificat valable à partir du : jusqu'au :	Official stamp of the administering centre Cachet officiel du centre habilité
1.					
2.					
3.					

Data “set”

4

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1.					
2.					
3.					

Dataset in ART-DECOR

Vaccination Certificates Document - Datasets

Decor | Project | Datasets | Scenarios | Terminology | Templates | Issues

Logged in as: Kai Heitmann Logout

Dataset: Vaccination Certificates Document Datatset

Name: Vaccination Certificates Document Datatse

Status: Draft

Description

Search in dataset

Concepts

- Holder (Person)
  - Name
    - Family name
    - Given name
  - National Patient Identifier
  - Date of birth
  - Gender
- Vaccination
  - Date of vaccination
  - Vaccine
    - Vaccine (Name)
    - Vaccine (Code)
    - Lot number
  - Route of Administration
  - Indication
    - Indication (Text)
    - Indication (Code)
  - Reason for Refusal
  - Performing physicians
    - Name
    - Date of Vaccination/Certification

Gender

Version	10/10/2013	Status	Draft
Version Label		Id	vacc-dataelement-40
Description	Gender of the person		

Value

Type: Code

Concepts

Concept	Description	Code	Codesystem
male		M	AdministrativeGender
female		F	AdministrativeGender

Value Set Association: AdministrativeGender (dynamic)

Usage (1)

History (0)

Dataset in ART-DECOR

- Dataset with concepts and proper descriptions
  - Hierarchical list
  - Properties ~ understood by Healthcare Professionals
- Inheritance, also from foreign Repositories
- Concept and dataset versioning
- Multiple views on datasets, scenarios (and value sets, templates)

Dataset in ART-DECOR

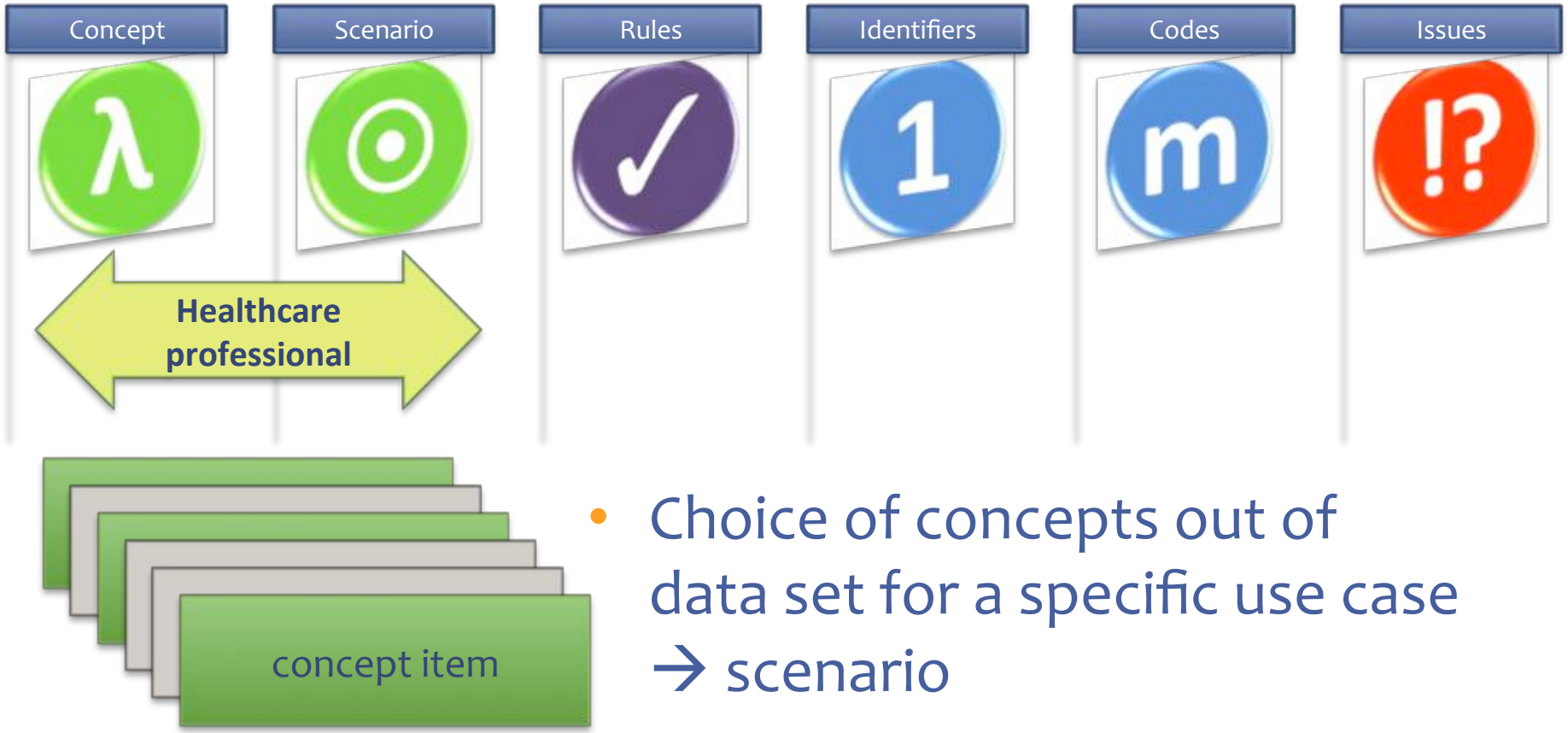
- Datatypes
  - count, decimal
  - quantity, duration, currency
  - code
  - identifier
  - string, text
  - date, datetime
  - ratio, ordinal, boolean, blob
- Properties
  - Unit
  - Ranges
  - Precision
  - Default Value
  - Fixed Value

live connection

Vaccinations Certificate Document

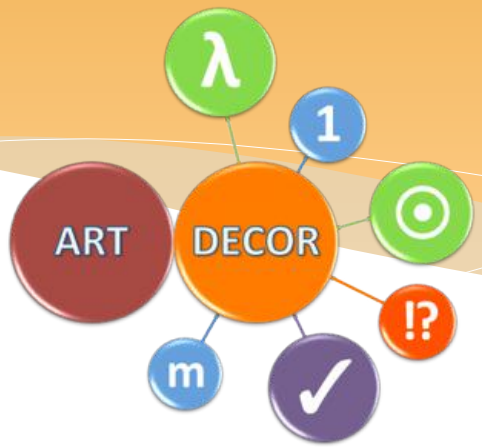
Dataset

Overview



- Choice of concepts out of data set for a specific use case → scenario

Scenarios



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  - Actors
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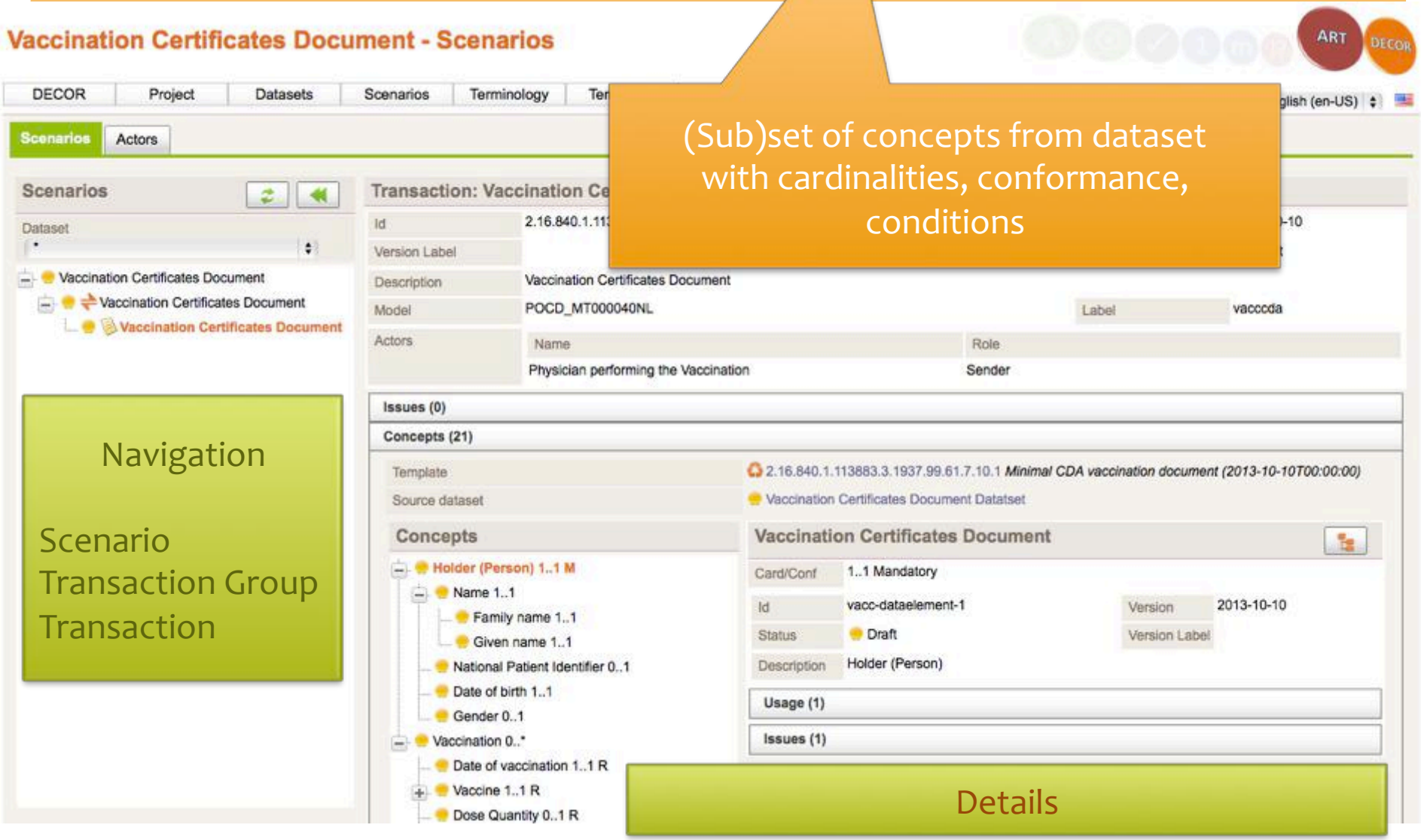
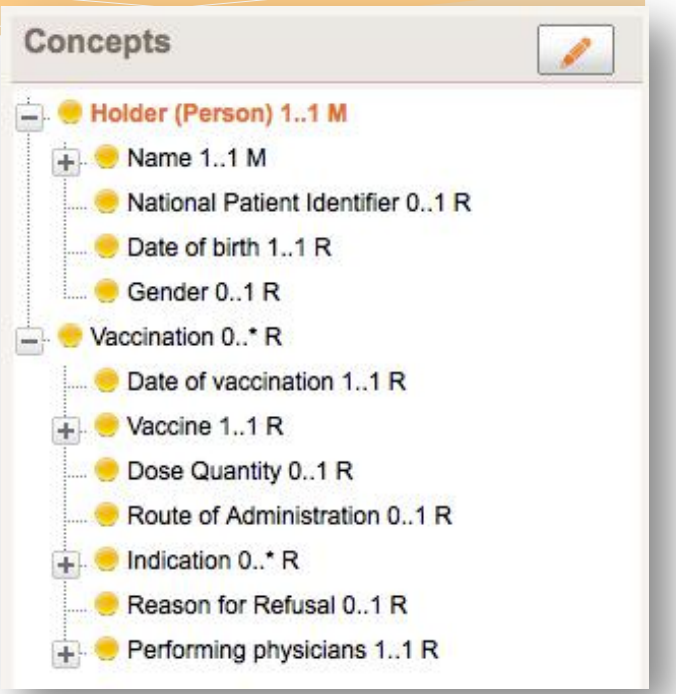
Dataset and scenario



(Sub)set of concepts from dataset with cardinalities, conformance, conditions

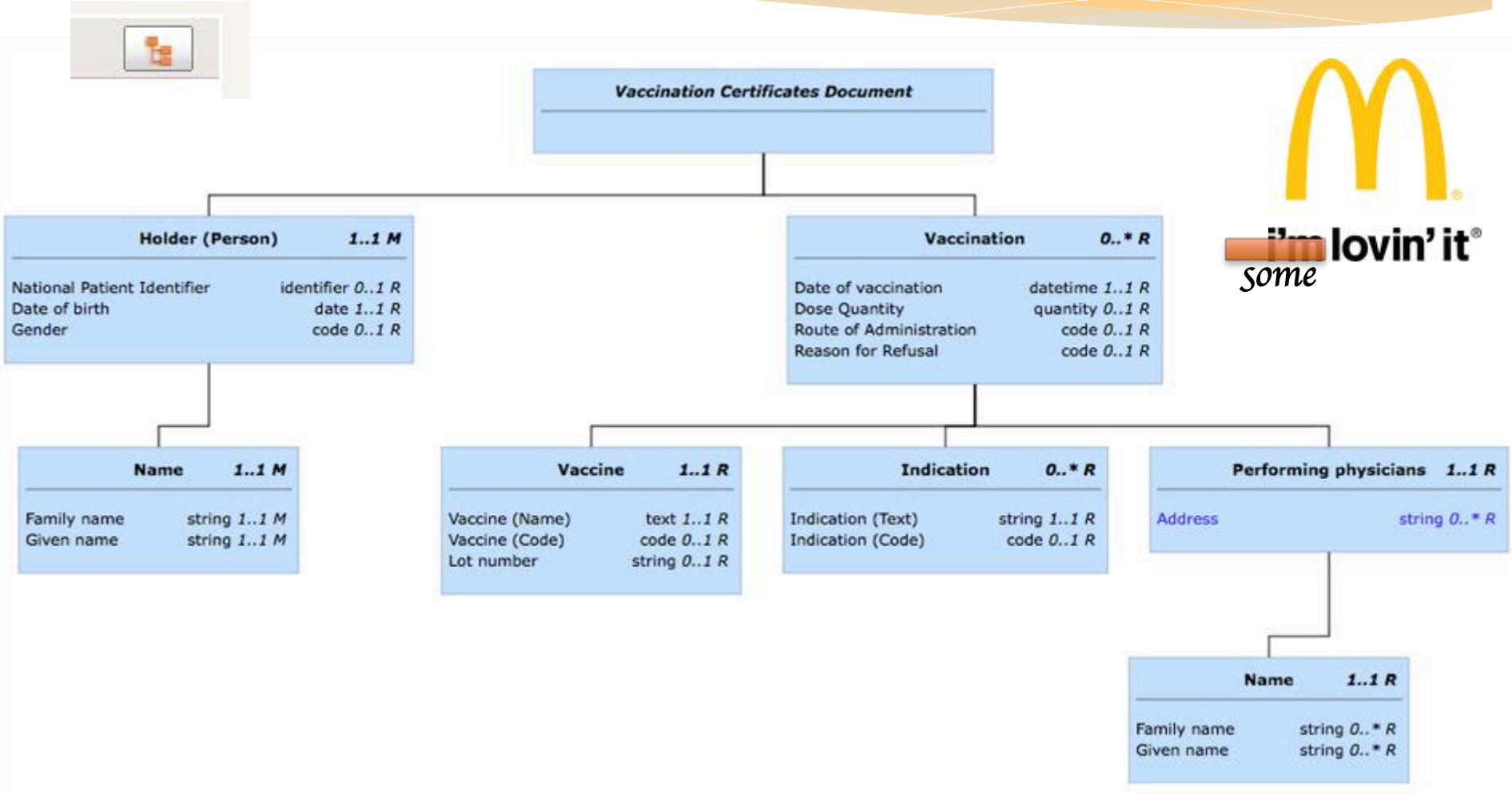
Scenario

- (sub)-set of dataset concepts
  - Cardinalities, conformance, conditions
  - Source dataset
  - Representing Template

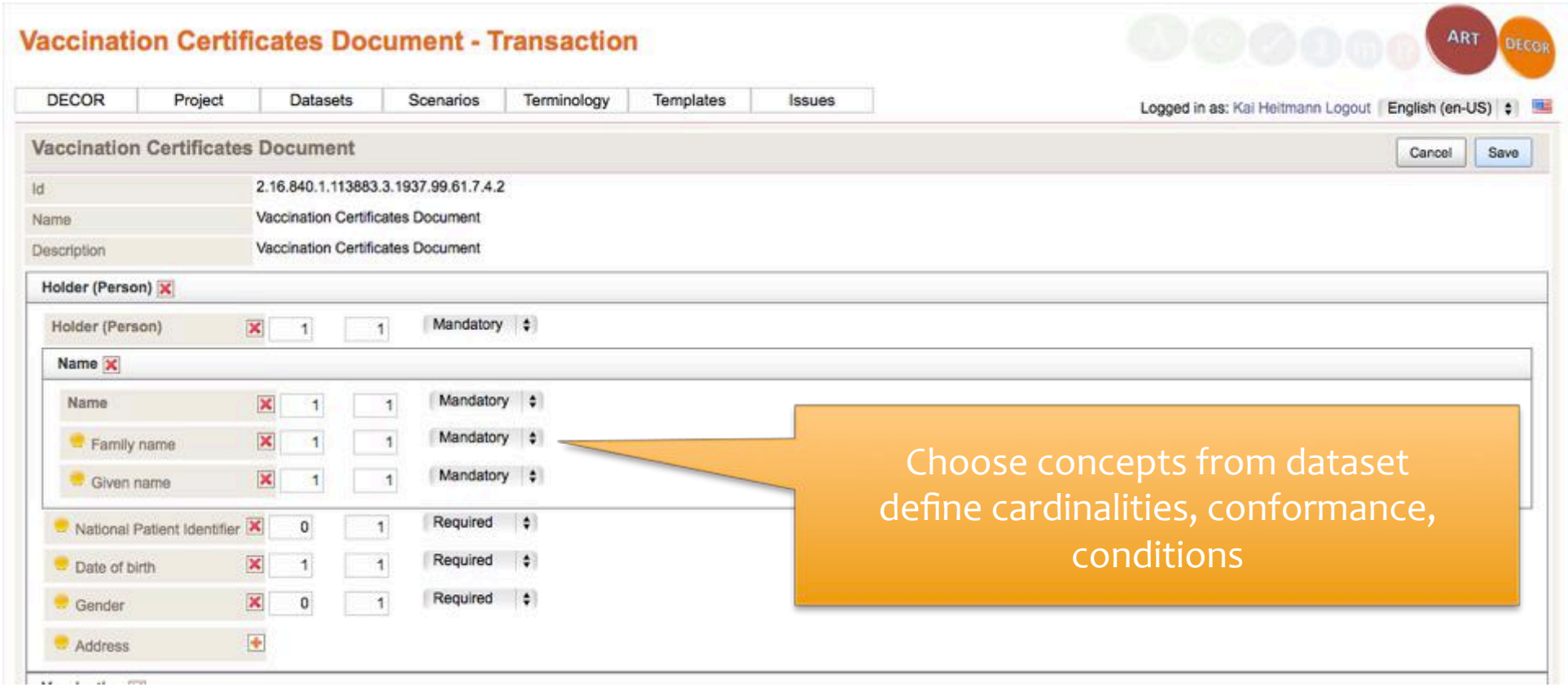


Template	2.16.840.1.113883.3.1937.99.61.7.10.1 *Minimal CDA vaccination document (2013-10-10T00:00:00)*
Source dataset	Vaccination Certificates Document Datatset

Graphical Representation



Transaction Editor



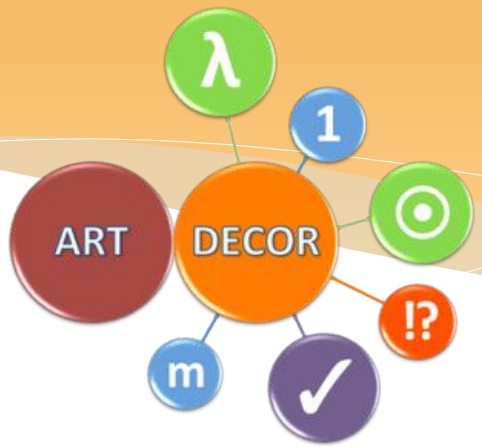
Choose concepts from dataset
define cardinalities, conformance,
conditions

live connection

Vaccinations Certificate Document

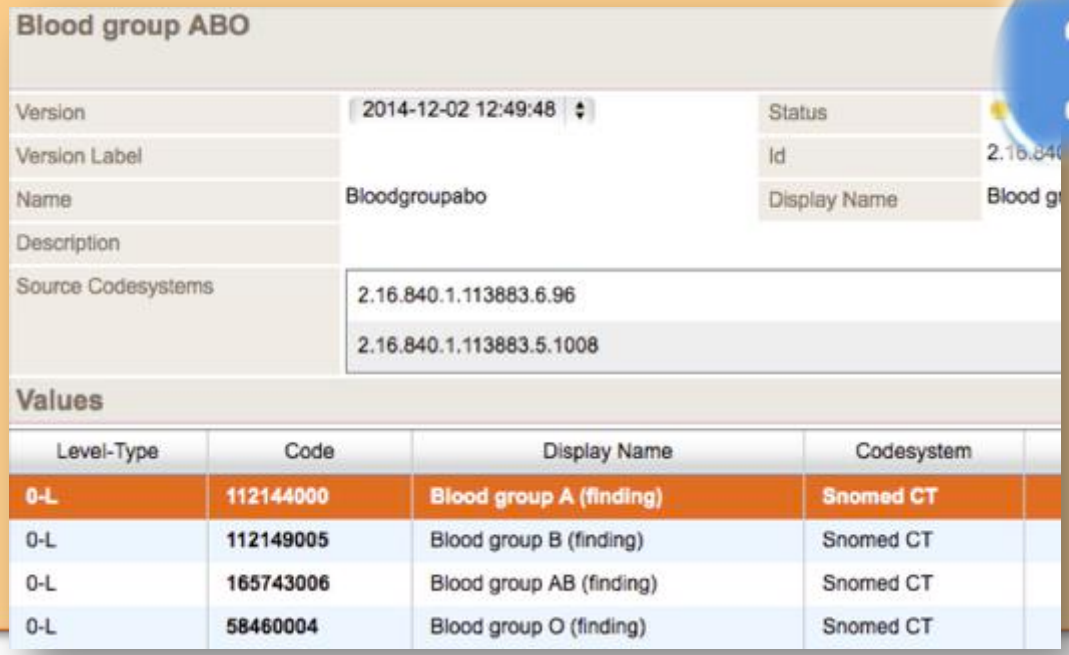
Scenarios

Terminologies



ART-DECOR: tasks +definitions

- Terminology
  - Document proper terminologies
  - Connect concepts with terminologies
  - Create value sets
  - Link value sets to choice lists
  - Identifier manage-ment



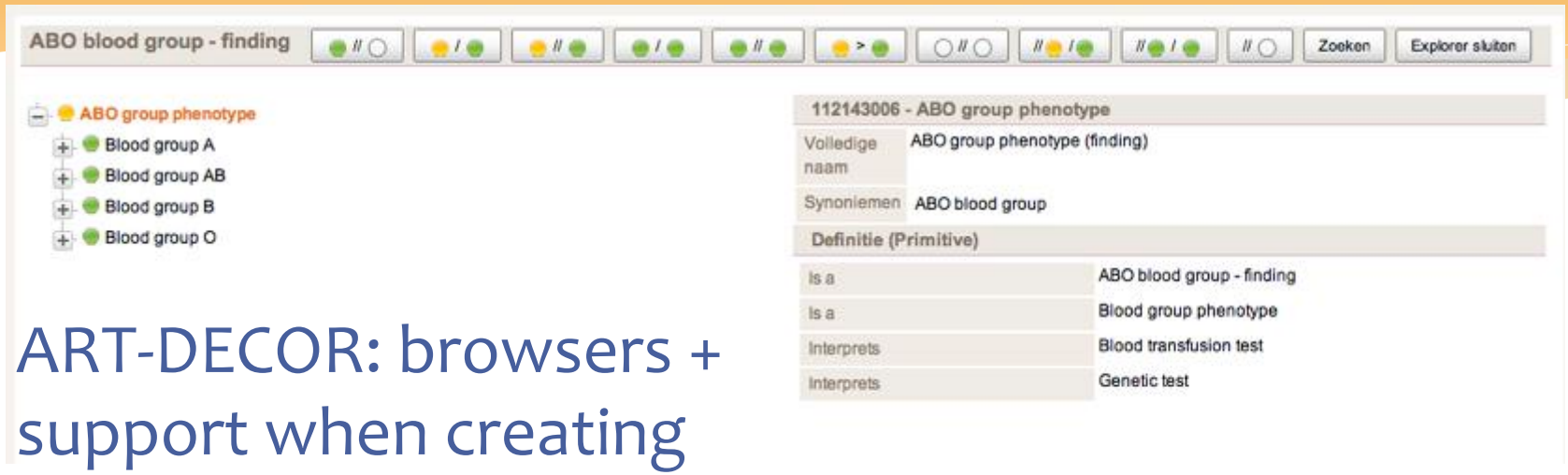
Blood group ABO

Version	2014-12-02 12:49:48	Status	
Version Label		Id	2.16.840
Name	Bloodgroupabo	Display Name	Blood gr
Description			
Source Codesystems	2.16.840.1.113883.6.96 2.16.840.1.113883.5.1008		

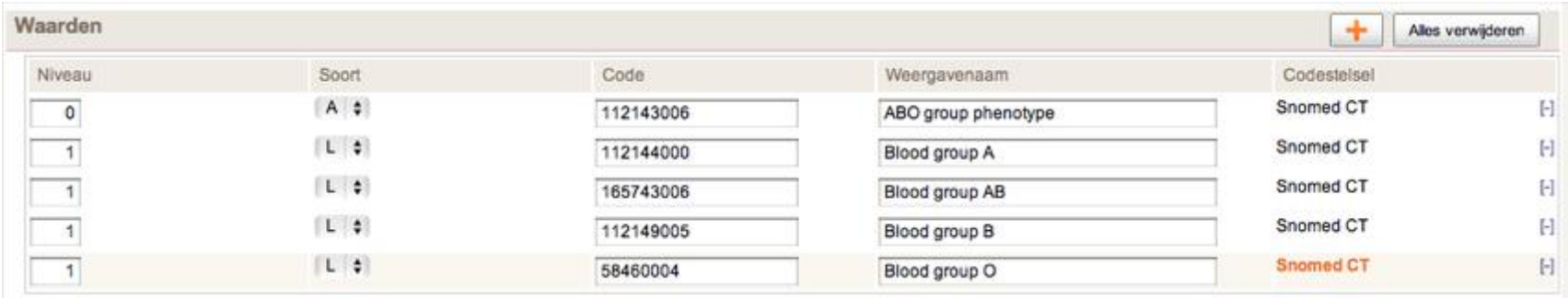
Values

Level-Type	Code	Display Name	Codesystem
0-L	112144000	Blood group A (finding)	Snomed CT
0-L	112149005	Blood group B (finding)	Snomed CT
0-L	165743006	Blood group AB (finding)	Snomed CT
0-L	58460004	Blood group O (finding)	Snomed CT

Terminology



ART-DECOR: browsers + support when creating Value Sets



Terminology

- Snomed CT
- LOINC
- ICD-10
- HL7 vocabs (e.g. all V3 value sets)
- ATC
- ClaML support (WHO classifications)

Browsers for Terminology

Google-like search engines
for various terminologies

LOINC

DECOR | Terminology | Reference sets | Testing | Tools | Application

LOINC

Logged in as: Kai Heitmann Logout

Search Term(s) erythro

LOINC 2.50 2014-12-22 Help

Results << < 1 / 20 > >> [1 - 50 / 962]

1056-1	Deprecated I (intermediate) subtype [Presence] on Red Blood Cells from donor	I (int) subtype	ACnc	Pt	RBC^donor	Ord	Aggl RBC
1006-6	Direct antiglobulin test.IgG specific reagent [interpretation] on Red Blood Cells	Direct antiglobulin test.IgG specific reagent	Imp	Pt	RBC	Nom	
1004-1	Direct antiglobulin test.complement specific reagent [Presence] on Red Blood Cells	Direct antiglobulin test.complement specific reagent	Pr	Pt	RBC	Ord	
1007-4	Direct antiglobulin test.poly specific reagent [Presence] on Red Blood Cells	Direct antiglobulin test.poly specific reagent	Pr	Pt	RBC	Ord	
1021-5	E Ag [Presence] on Red Blood Cells	E Ag	Pr	Pt	RBC	Ord	
1019-9	E Ag [Presence] on Red Blood Cells from Blood product unit	E Ag	Pr	Pt	RBC^BPU	Ord	
1020-7	E Ag [Presence] on Red Blood Cells from donor	E Ag	Pr	Pt	RBC^donor	Ord	
10379-6	Erythrocytes.dual population [Presence] in Blood by Light microscopy	Erythrocytes.dual population	ACnc	Pt	Bld	Ord	Microscopy.light
1015-7	Ew Ag [Presence] on Red Blood Cells	E little w Ag	Pr	Pt	RBC	Ord	
1013-2	Ew Ag [Presence] on Red Blood Cells from Blood product unit	E little w Ag	Pr	Pt	RBC^BPU	Ord	

Details

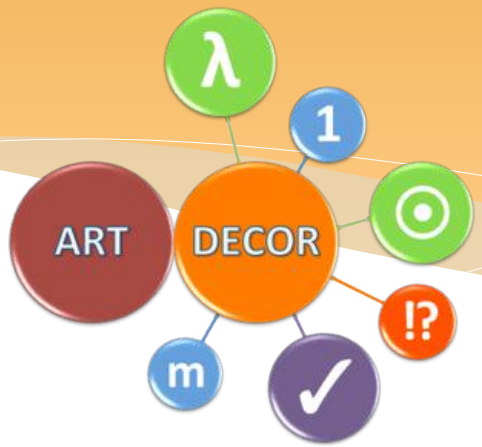
2 Component	E Ag	3 Property	Pr
4 Timing	Pt	5 System	RBC
6 Scale	Ord	8 Class	BLDBK
9 Source	FS	10 Date Last Changed	20130529
11 Change Type	MIN (change to field other than name)	13 Status	ACTIVE
16 Class Type	1 (Laboratory class)	28 Related Names	Antigen; Antigens; BLOOD BANK; Erythrocytes; Ordinal; Point in time; QL; Qual; Qualitative; Random; Red blood cells; Red blood corpusles; Screen
29 Short Name	E Ag RBC Ql	30 Order/Observation	Both
35 Long Common Name	E Ag [Presence] on Red Blood Cells	44 Change Reason Public	The Property has been changed from ACnc to Pr (Presence) to reflect the new model for ordinal terms where results are based on presence or absence.
45 Common Test Rank	0	46 Common Order Rank	0
47 Common SI Test Rank	0		

live connection

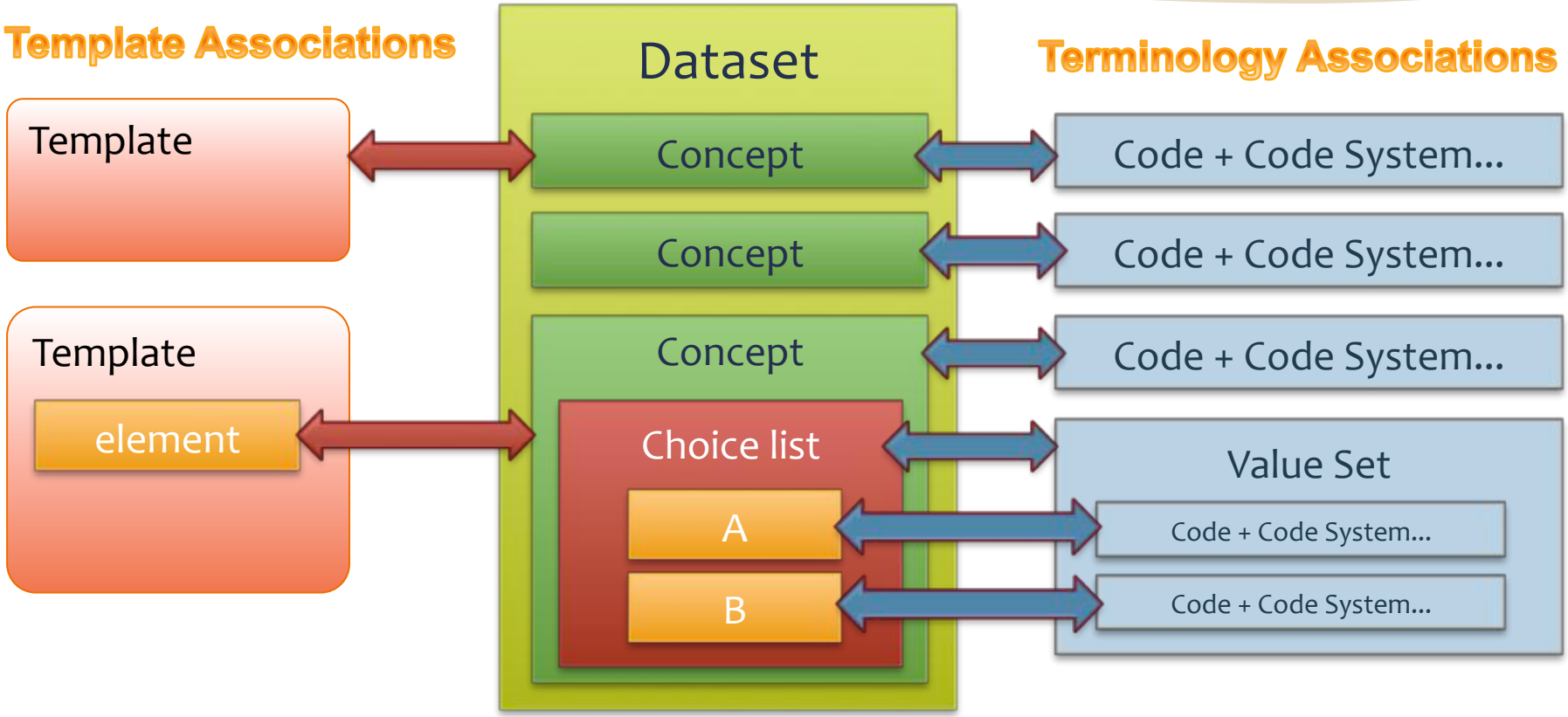
Vaccinations Certificate Document

Terminologies

Associations

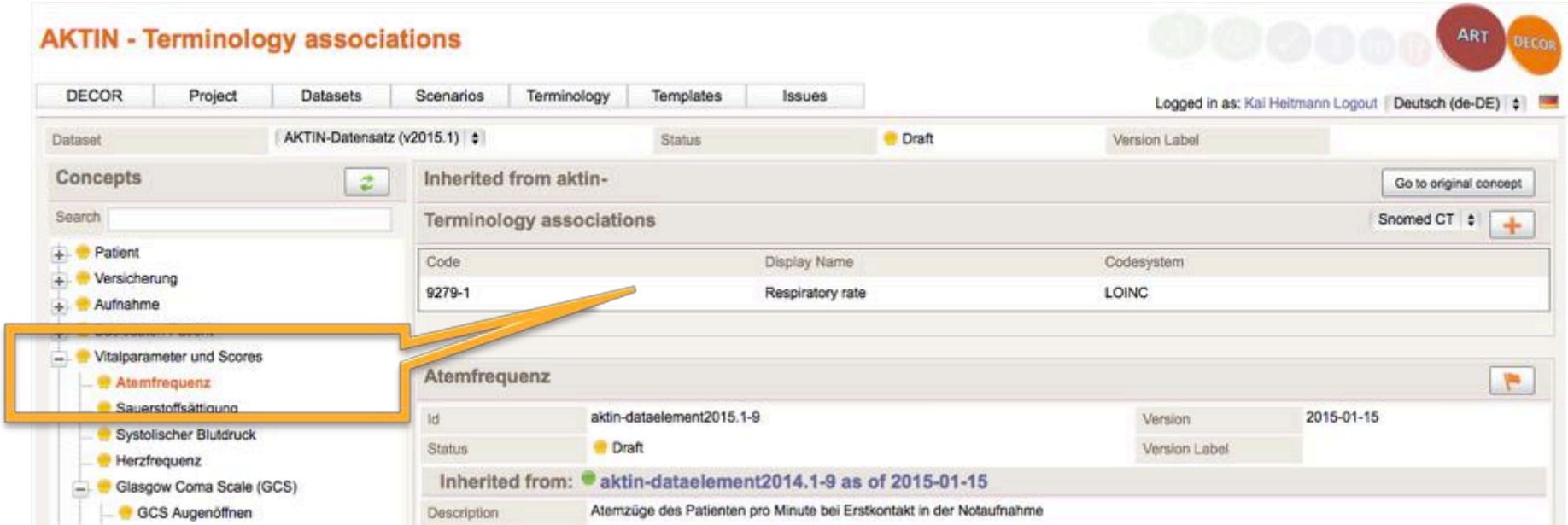


Associations – get more out of your specifications

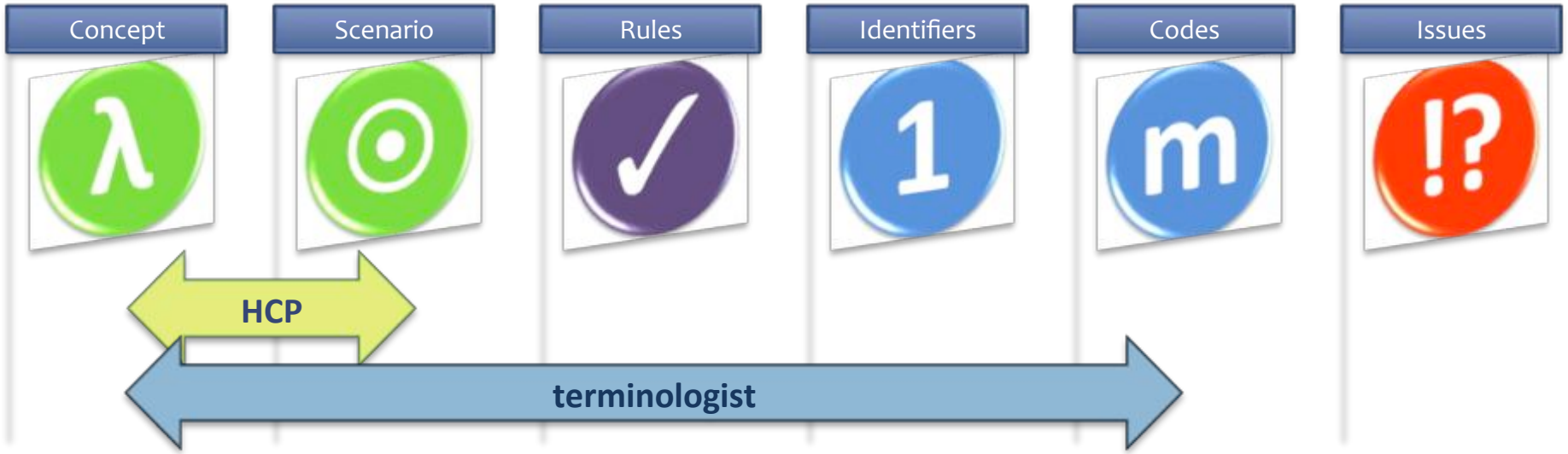


Associations

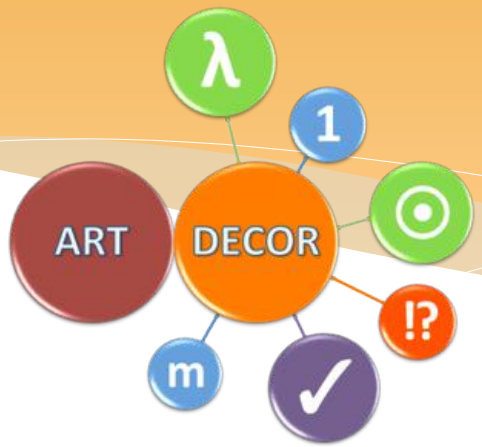
- Dataset concept ←→ coded concept (terminology)
- Concept choice list ←→ coded concept



Overview

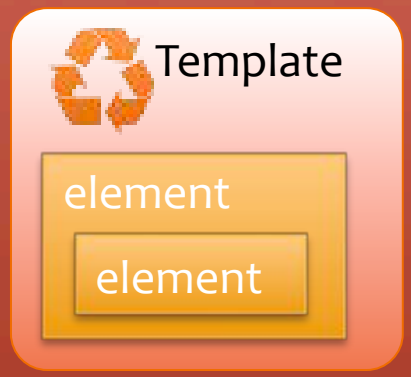

Concept
Scenario
Rules
Identifiers
Codes
Issues
HCP
terminologist

CDA Templates



ART-DECOR: tasks + definitions

- Analyst, modeler, “templater”
  - definitions of items for messages/documents based on data set / scenario
  - Links to
    - The right value sets
    - The right message/document specification (template)
  - Representing concepts with HL7 v3 templates



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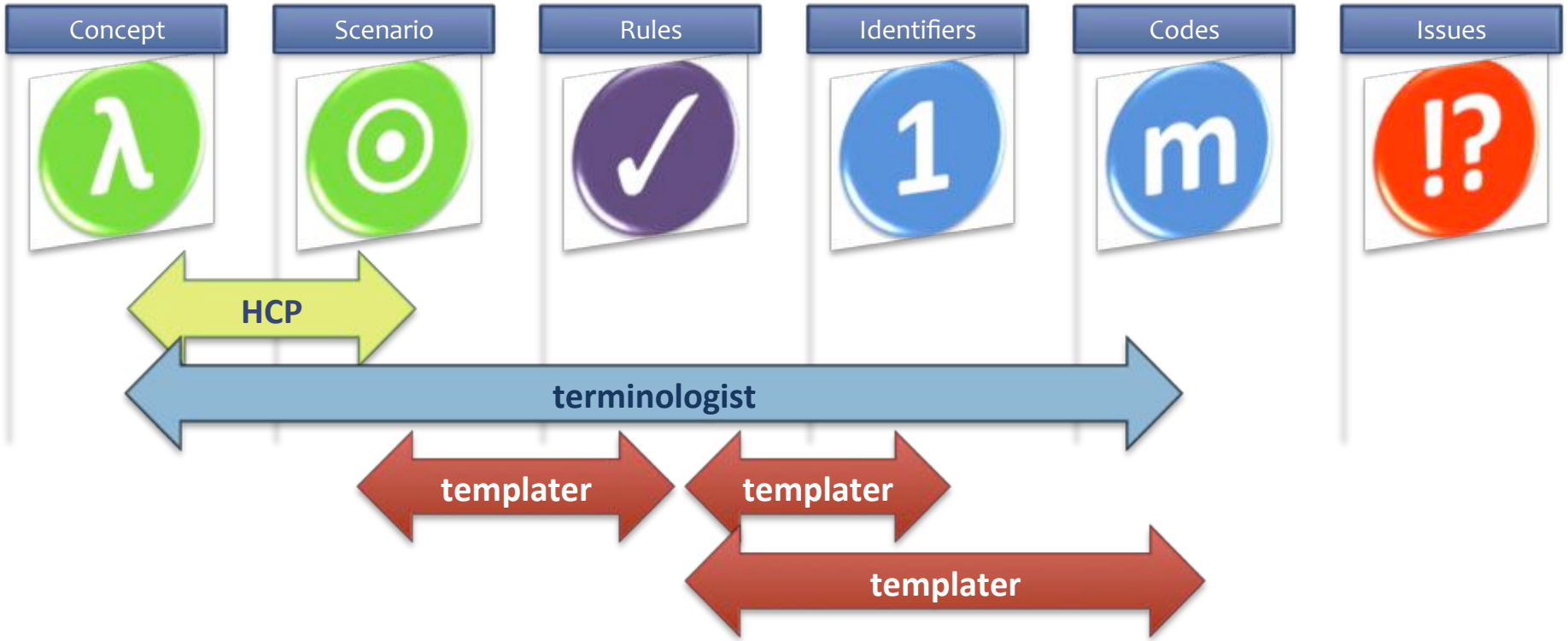
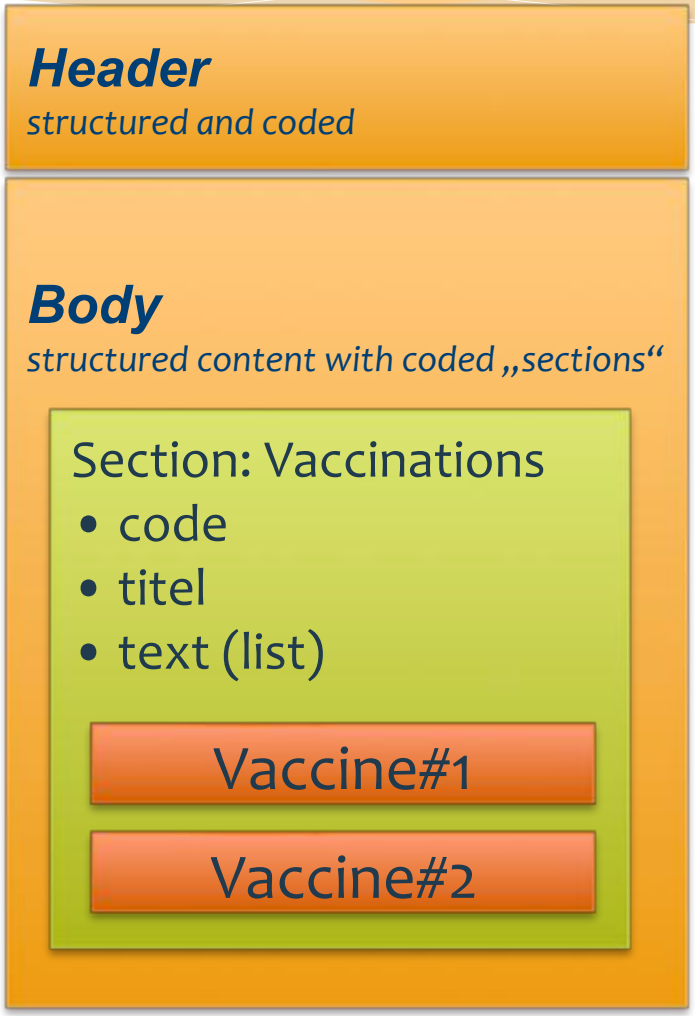

Concept
Scenario
Rules
Identifiers
Codes
Issues
HCP
terminologist
templater
templater
templater

Advantages of “templates”

- Re-usable blocks
- Semantics clear
- Use in many contexts (scenarios) with link to concepts and terminologies
- Make specification and implementation of messages / documents “much easier”

“Vaccination Certificate”

- Structure of the CDA-Document
  - Section: List of all Vaccinations (human)
  - Entries with Medication Information (computer)



HL7 / CDA Templates

- A template is a set of further constraints on top of an underlying model
- Example: patient
  - **Model:** the patient shall have one or more identifications (id)
  - **Template:** our patients shall have exactly one NHS patient identifier

Patient
id: II 1..1
addr: AD 0..*
telecom: TEL 0..*

- Documentation of "rules" in HL7's Templates Exchange Format (DSTU)

Features of ART-DECOR for HL7 / CDA Templates (1)

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- Template Viewer based on the Templates DSTU R1 exchange format
- Documentation of templates in ART, as HTML or PDF
- Two Template editors for HL7v3 / CDA Templates
- Terminology Browser for various terminologies
- Already seen: Value Set Editor

Features of ART-DECOR for HL7 / CDA Templates (2)

- Building Block Repositories with various "standard" templates and value sets, e.g. C-CDA R 1.1 (2.0 to come), CCD 1, epSOS, IHE
- ISO schematron generator, works with open and closed templates
- RESTful services to get various artifacts
- Under investigation: FHIR profile and value sets import/export functions and profile editor

ART-DECOR templates

Demo 5: Vital Signs CDA Document Templates

DECOR | Project | Datasets | Scenarios | Terminology | Templates | Issues

Login | English (en-US)

Templates

Search

- CDA document level template
  - Vital Signs Summary CDA document
- CDA header level template
  - CDA author
  - CDA typeId
  - CDA title
  - CDA confidentialityCode
  - CDA Organization Elements
  - CDA recordTarget
  - CDA custodian
  - CDA id
  - CDA effectiveTime
  - CDA Person Elements
  - AssignedEntityElements
- CDA section level template
  - Vital Signs Section
- CDA entry level template
  - Vital Sign Observation
  - Mean blood pressure
  - Body Weight
  - HeartRatePeripheral

CDA recordTarget

Version	2014-07-08	Status	Active
Version Label		Id	demo5-template-2001
Name	CDArecordTarget	Display Name	CDA recordTarget

Description, model, context and examples

Description	The patient / client
Classification	cdaheaderlevel
Open/Closed	open

Used by / Uses

Used by Template Id	as	Name	as of
2.16.840.1.113883.3.1937.99.60.5.10.1	Inclusion	VitalSignsCDAdocument *Vital Signs Summary CDA document*	2014-07-08

Uses Template Id	as	Name	as of
2.16.840.1.113883.3.1937.99.60.5.10.900207	Inclusion	NationalPatientIdentifier *Burgerservicenummer*	2014-07-08

Relations

Type	Model / Template	as of
Specialization	2.16.840.1.113883.10.12.101	2005-09-07

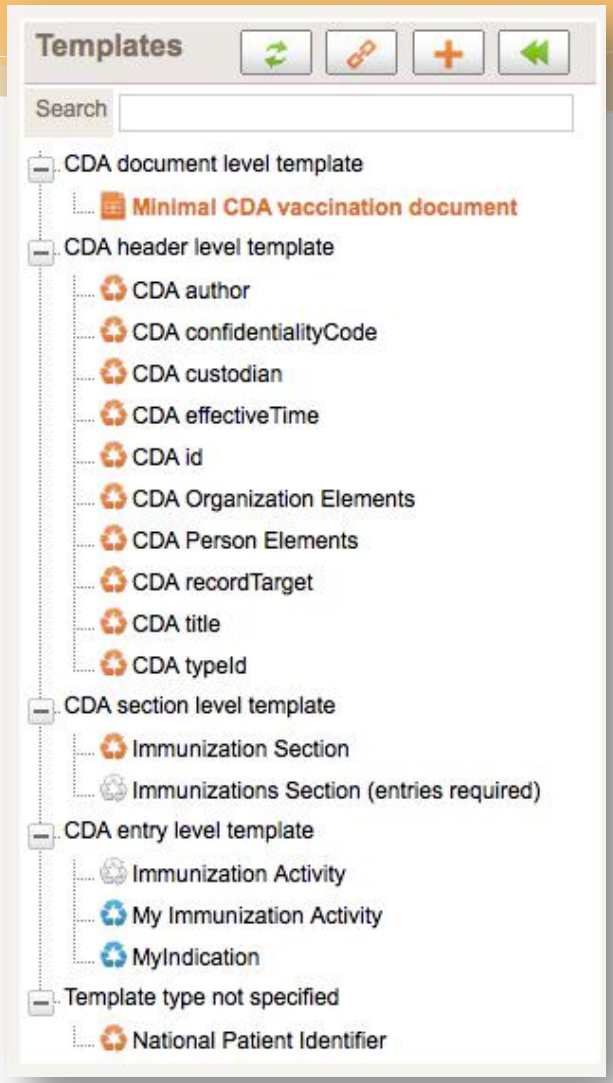
Example

A simple patient, named John Doedidoe

```
<recordTarget>
   <patientRole>
      <id root="2.16.840.1.113883.2.4.6.3" extension="100202020"/>
      <patient>
         <name>
            <given>John</given>
            <family>Doedidoe</family>
         </name>
         <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
         <birthTime value="19620219"/>
```

ART-DECOR templates

- Template Viewer Nagivation
- Also
  - Refresh
  - New Link to a Template in a Repository (later)
  - New Template
  - Hide Navigation Bar



- Items: elements, attributes, hierarchy
- Data types, cardinalities, conformance, constants, containments

Template details

Immunization Sect

Version	
Version Label	
Name	

Description, model, co

Description	Immunization Section
Context	Parent nodes of template element with id 2.16.840.1.113883.3.1937.99.61.7.10.900202
Classification	cdasectionlevel
Open/Closed	open

Used by / Uses

Uses Template Id	as	Name	as of
2.16.840.1.113883.3.1937.99.61.7.10.900203	Containment	MyImmunizationActivity *My Immunization Activity*	2014-11-18 12:26:17

Relations

Type	Model / Template	as of
Specialization	2.16.840.1.113883.10.12.201 *CDA Section* (repository: ad1bbr-)	2005-09-07

Example

```
<section classCode="DOCSECT" moodCode="EVN">
   <templateId root="2.16.840.1.113883.3.1937.99.61.7.10.900202"/>
   <templateId root="2.16.840.1.113883.10.12.201"/>
   <code code="11369-6" codeSystem="2.16.840.1.113883.6.1"/>
   <title>Impfungen</title>
   <text>Ich bin ein Supertext</text>
   <entry typeCode="DRIV">
      <!-- template 2.16.840.1.113883.3.1937.99.61.7.10.900203 (dynamic) -->
   </entry>
</section>
```

Item	DT	Card	Conf	Description	Label
<> hl7:section		0..*	O		ImmunizationSection
@ classCode		0..1	F	DOCSECT	
@ moodCode		0..1	F	EVN	
<> hl7:templateId	II	1..1	M		ImmunizationSection
@ root		1..1	F	2.16.840.1.113883.3.1937.99.61.7.10.900202	

Immunization Sec

Version

Version Label

Name

Description, model, c

- Items: elements, attributes, hierarchy
- Data types, cardinalities, conformance, constants, containments

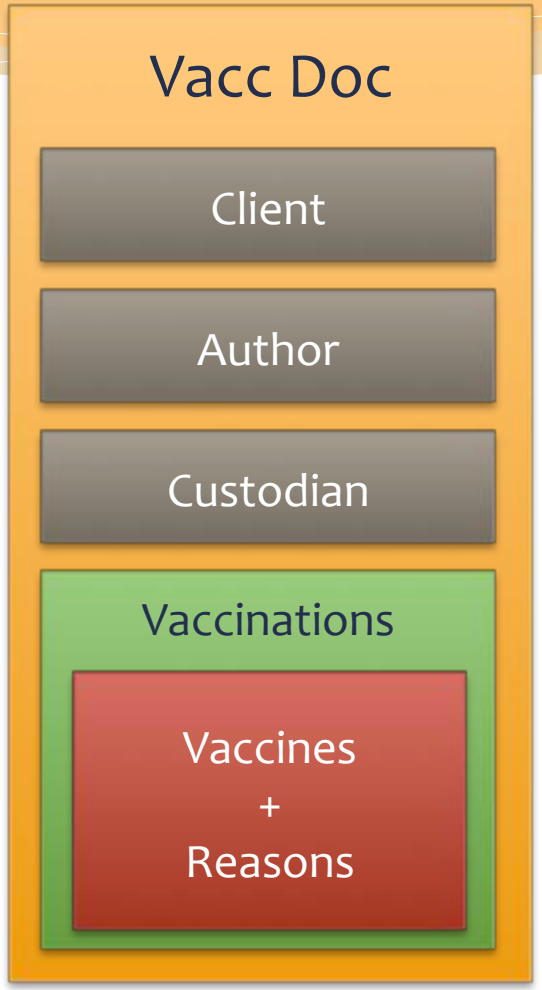
Template details

Item					
<> hl7:section		0..*	O		ion
@ classCode		0..1	F	DOCSECT	ion
@ moodCode		0..1	F	EVN	ImmunizationSection
<> hl7:templateId		1..1	M		ImmunizationSection
@ root		1..1	F	2.16.840.1.113883.3.1937.99.61.5.10.900207	ImmunizationSection
<> hl7:code	CE	1..1	M		ImmunizationSection
@ code		1..1	F	11369-6	
@ codeSystem		1..1	F	2.16.840.1.113883.6.1	
@ displayName		1..1	F	History of Immunization	
<> hl7:title	ST	1..1	M		ImmunizationSection
<> hl7:text	SD.TEXT	1..1	M		ImmunizationSection
<> hl7:entry		0..*	O	contains : ImmunizationActivity *CCDA Immunization Activity* (dynamic)	ImmunizationSection
@ typeCode	cs	0..1	F	DRIV	ImmunizationSection
@ contextConductionInd	bl	0..1	F	true	ImmunizationSection

Templates

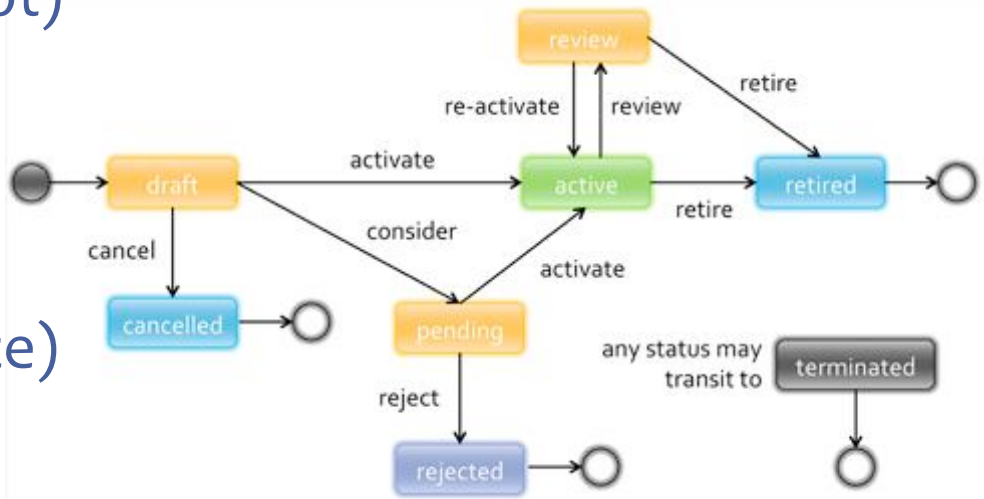
- Document Level Template
- Header Level Templates
- Section Level Template
- Entry Level Templates

From a content perspective it's not all ... ... but it is a start



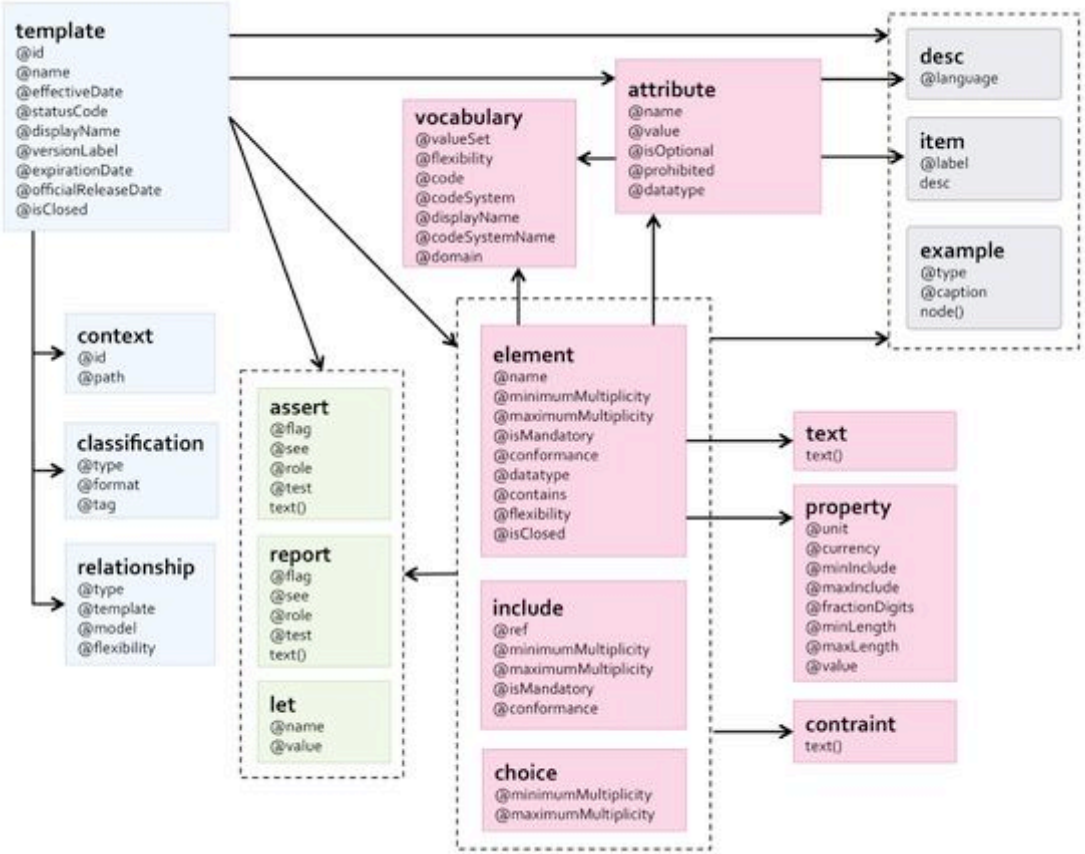
Templates

- Version Management
  - Id (=unique identification of the semantic concept)
  - effectiveDate
  - statusCode
  - versionLabel (label←effectiveDate)



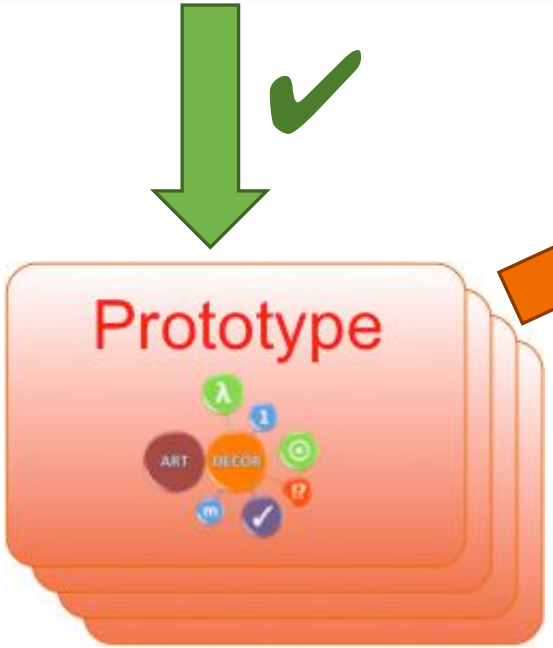
Templates

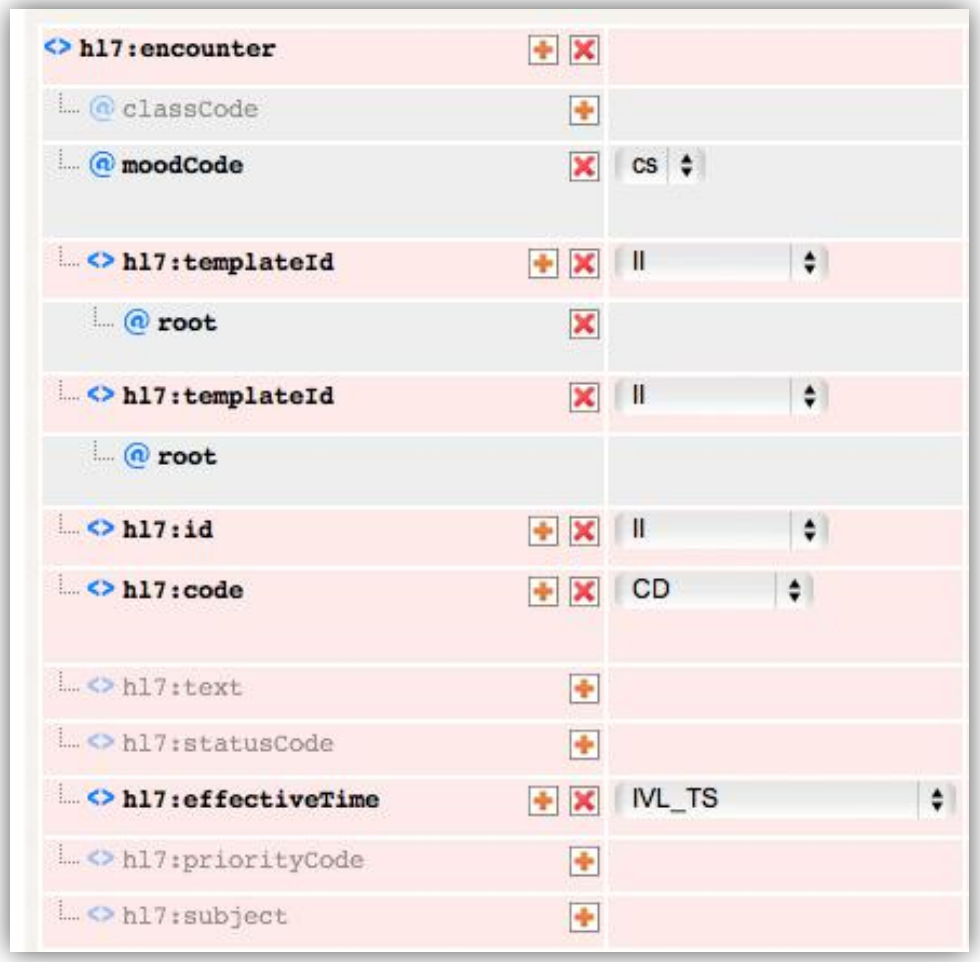
- **HL7 Templates Standard: Specification and Use of Reusable Information Constraint Templates, Release 1**
- September 2014
- HL7 DSTU



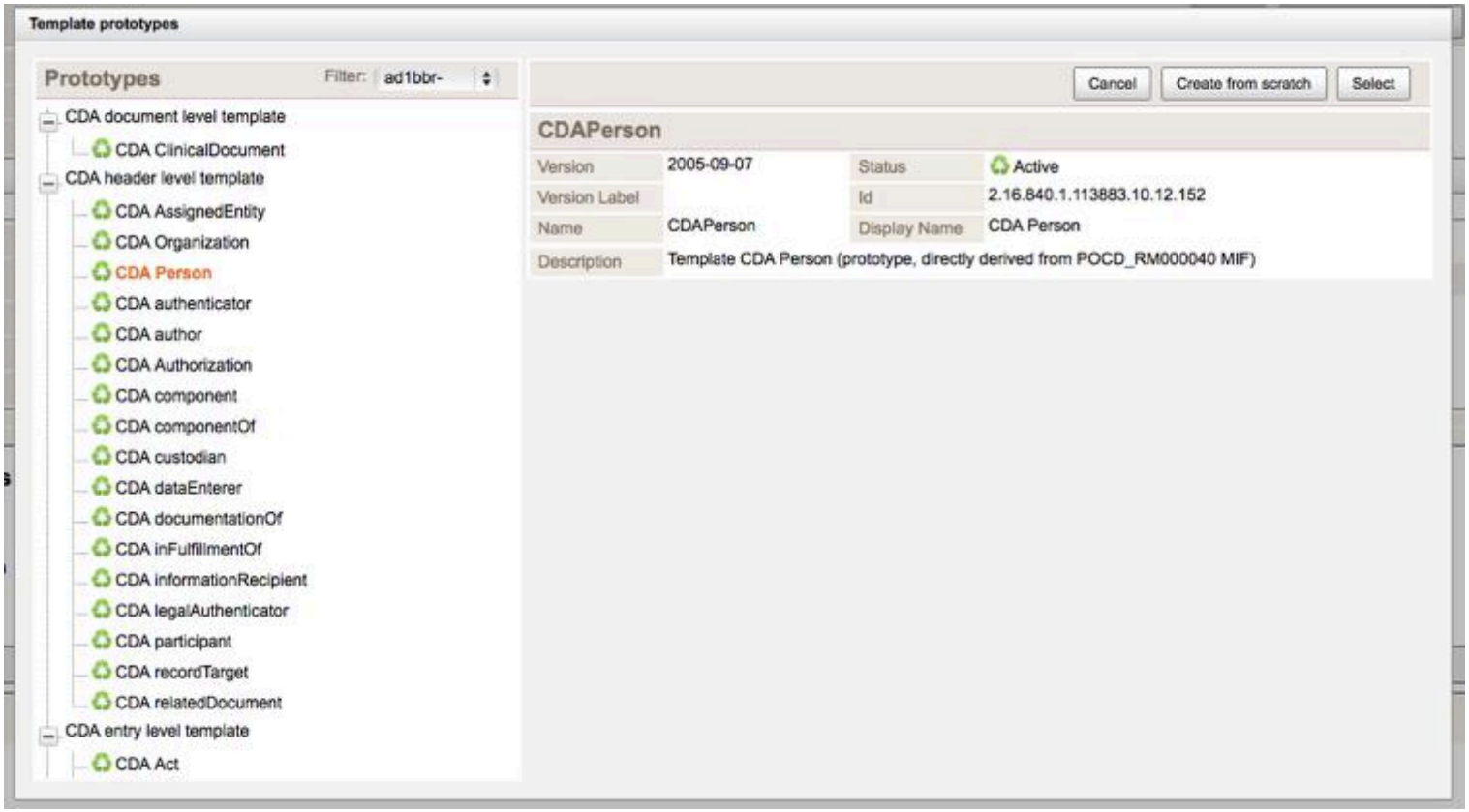
ART-DECOR
Prototypes and Templates

Encounter
classCode*: <= *ENC*
moodCode*: <= *x_DocumentEncounterMood*
id: SET<II> [0..*]
code: CD CWE [0..1] <= *ActEncounterCode*
text: ED [0..1]
statusCode: CS CNE [0..1] <= *ActStatus*
effectiveTime: IVL<TS> [0..1]
priorityCode: CE CWE [0..1] <= *ActPriority*





ART-DECOR
Prototypes and Templates

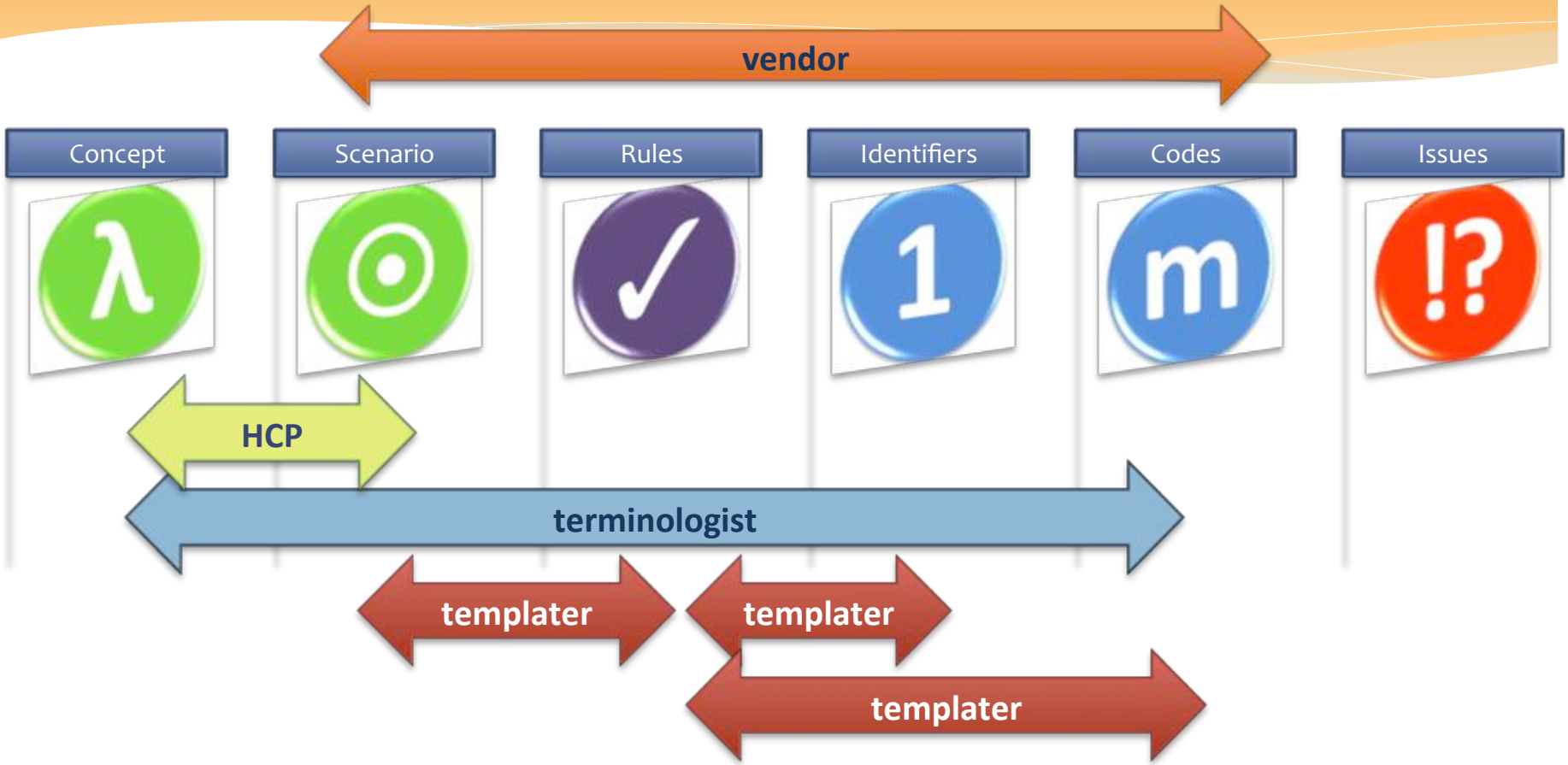


live connection

Vaccinations Certificate Document

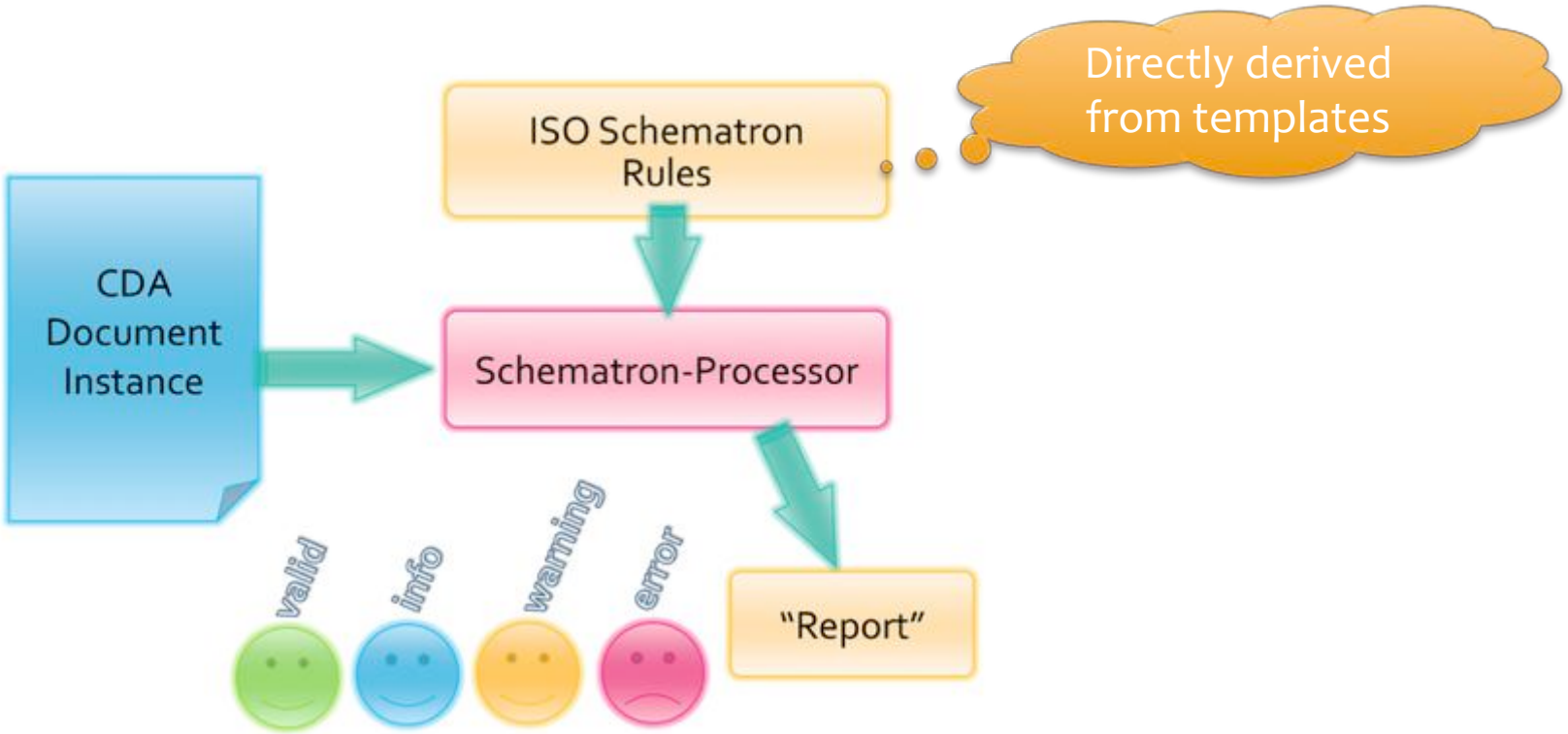
Templates

Overview

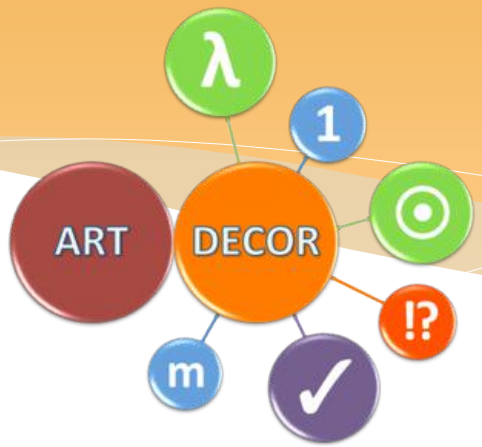

vendor
Concept
Scenario
Rules
Identifiers
Codes
Issues
HCP
terminologist
templater
templater
templater

Templates and Validation

- Validation of XML instances



Building Block Repositories



BBRs = Building Block Repositories

- **Shared repositories** with collection of artifacts
  - Prototypes for Templates
  - Ready-to-use Templates to refer to, to specialize or to adapt → **Template Repository & Registry**
  - Also all necessary Value Sets etc.

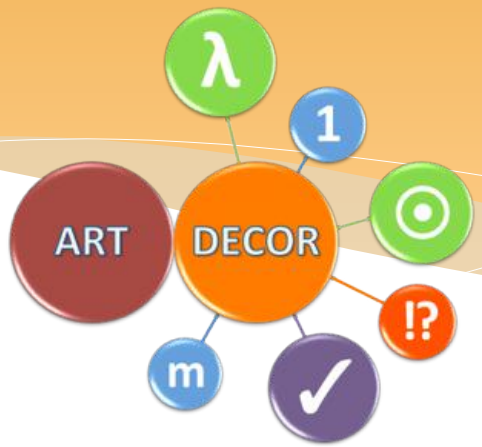
My ART-DECOR references BBRs

live connection

Vaccinations Certificate Document

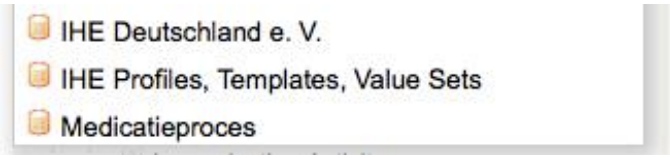
Building Block Repositories

Existing Specifications



Existing Specs

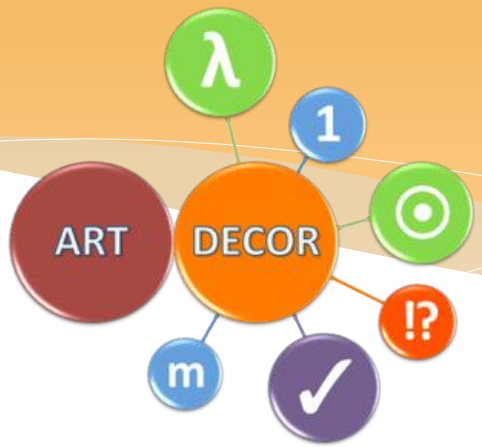
- Building Block Repositories, ready for use
  - CDA R2 Standard Prototype Templates and Value Sets
  - HL7 v3 Value Sets
  - Continuity of Care Document 1.1
  - Consolidated CDA C-CDA 1.1 (and 2.0 in March 2015)
  - epSOS (Patient Summary, Prescription)
  - Templates DSTU R1 Definitions
  - V2.xml
  - Local Repos



Existing Specs

- Building Block Repositories started
  - EU Repository
  - IHE Templates,
    Profiles, Value Sets
  - C-CDA 2.0

Implementation Guideline Publication and the REST



Artefact Output Options

Stakeholders

- HCP
- Terminologists
- Architects
- Test tooling
- Systems

HTML

XML

PDF

Wiki

ART-DECOR

WEB INTERFACE + DECOR SERVICES

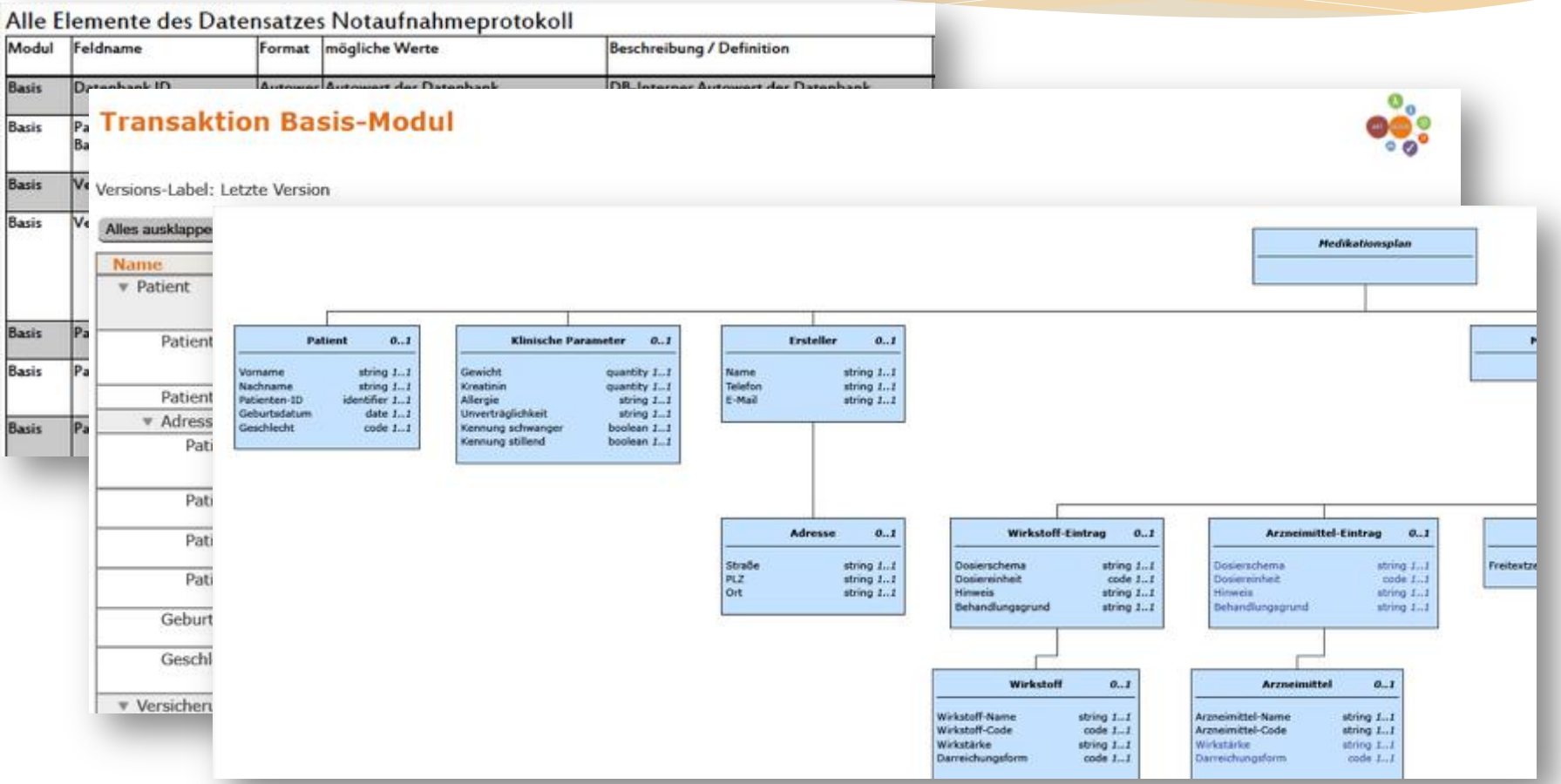
Data set and scenarios

Value sets and identifications

Templates and schematrons

HCP

Health Care views
“par Excel-lence”

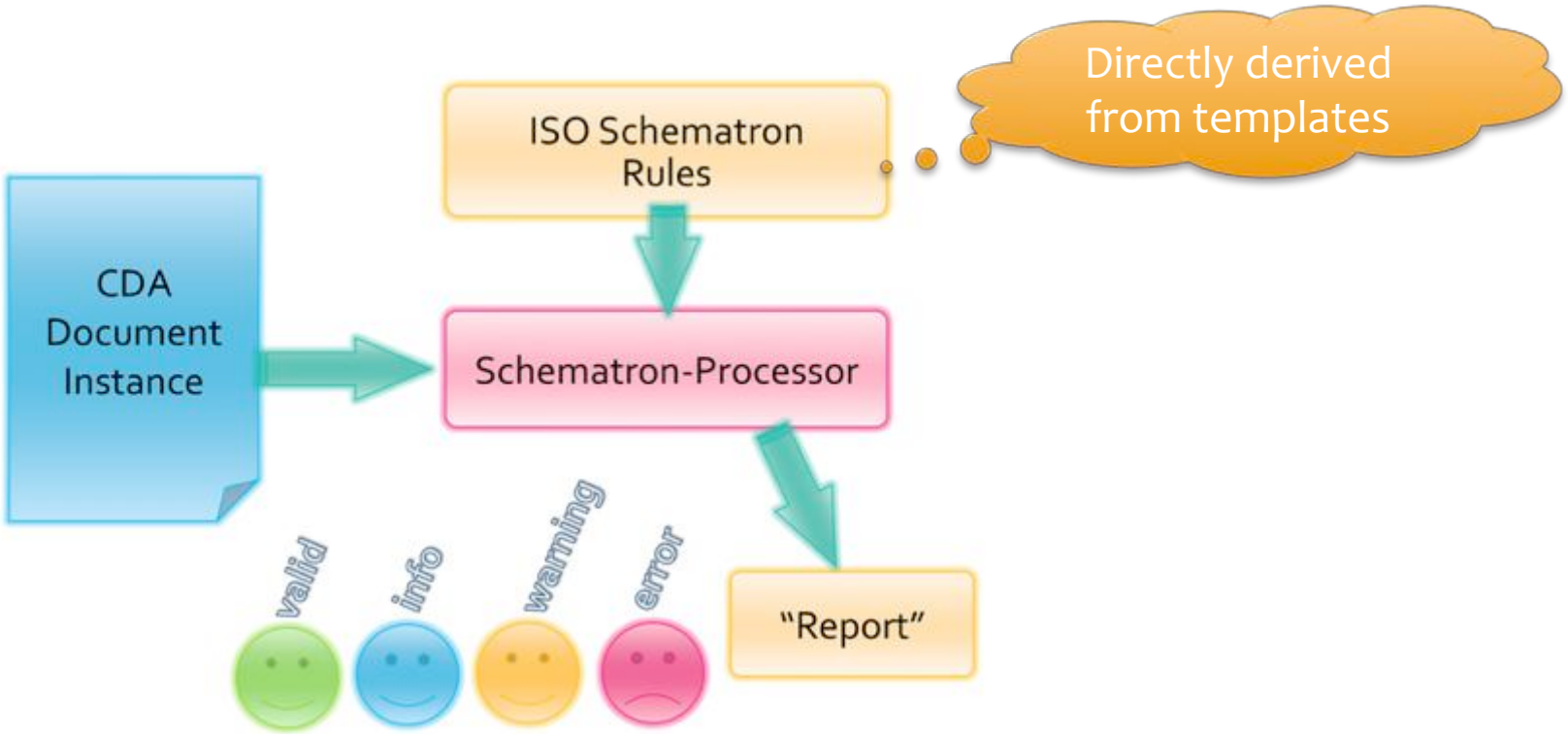


Test tooling

Systems

Templates and Validation

- Validation of XML instances



Termino logists

Architects

HL7 / CDA Templates and Value Sets Support

- Template Viewer based on the Templates DSTU R1 exchange format (balloted)
- Documentation of templates and value sets
  - in ART (viewer),
  - as HTML / PDF / wiki
- Terminology Browser for various terminologies
- Value Set Editor

- Items: elements, attributes, hierarchy
- Data types, cardinalities, conformance, constants, containments

Systems

Template details

Immunization Sect

Version	
Version Label	
Name	

Description, model, co

Description	Immunization Section
Context	Parent nodes of template element with id 2.16.840.1.113883.3.1937.99.61.7.10.900202
Classification	cdasectionlevel
Open/Closed	open

Used by / Uses

Uses Template Id	as	Name	as of
2.16.840.1.113883.3.1937.99.61.7.10.900203	Containment	MyImmunizationActivity *My Immunization Activity*	2014-11-18 12:26:17

Relations

Type	Model / Template	as of
Specialization	2.16.840.1.113883.10.12.201 *CDA Section* (repository: ad1bbr-)	2005-09-07

Example

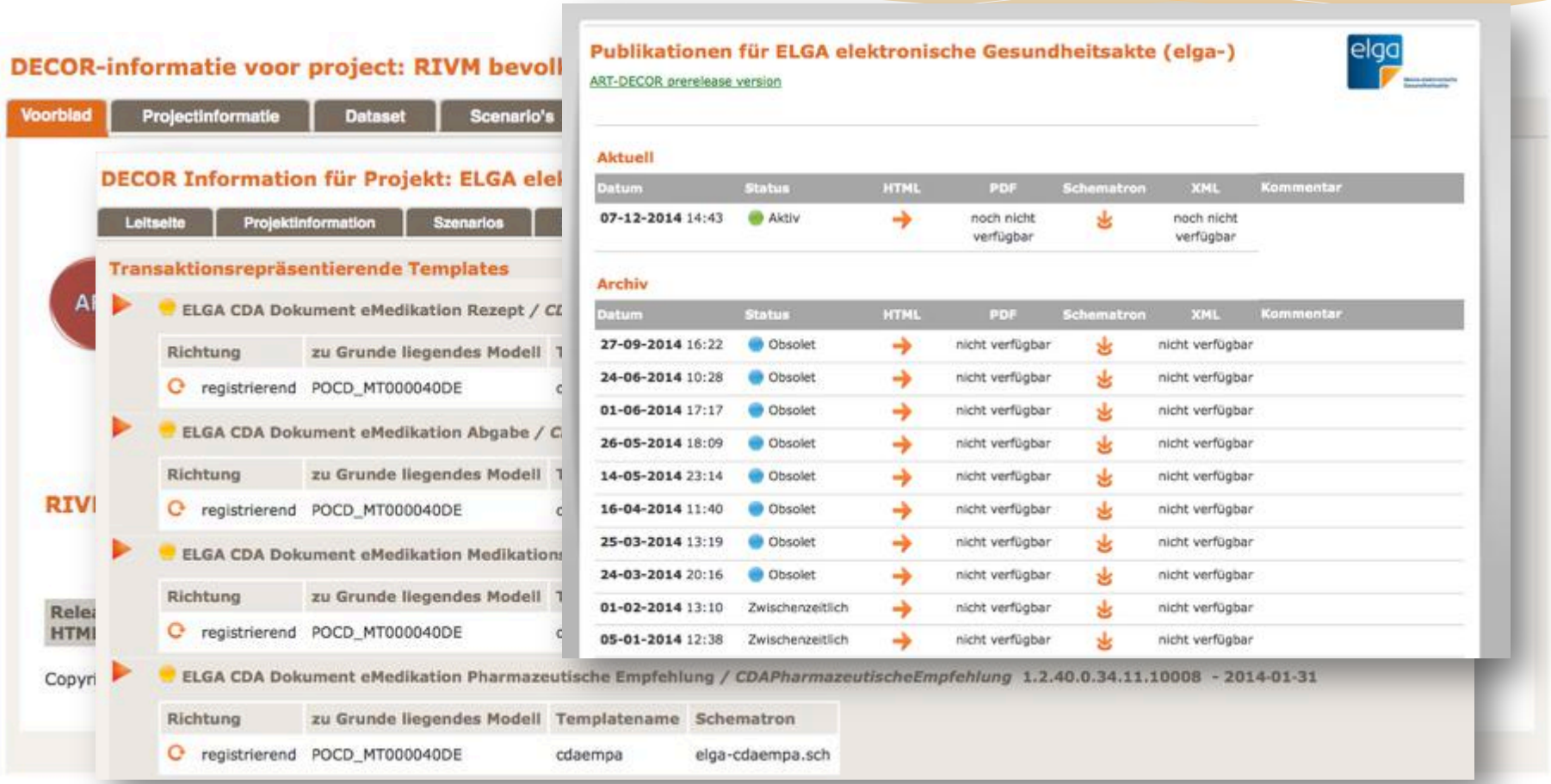
```
<section classCode="DOCSECT" moodCode="EVN">
   <templateId root="2.16.840.1.113883.3.1937.99.61.7.10.900202"/>
   <templateId root="2.16.840.1.113883.10.12.201"/>
   <code code="11369-6" codeSystem="2.16.840.1.113883.6.1"/>
   <title>Impfungen</title>
   <text>Ich bin ein Supertext</text>
   <entry typeCode="DRIV">
      <!-- template 2.16.840.1.113883.3.1937.99.61.7.10.900203 (dynamic) -->
   </entry>
</section>
```

Item	DT	Card	Conf	Description	Label
<> hl7:section		0..*	O		ImmunizationSection
@ classCode		0..1	F	DOCSECT	
@ moodCode		0..1	F	EVN	
<> hl7:templateId	II	1..1	M		ImmunizationSection
@ root		1..1	F	2.16.840.1.113883.3.1937.99.61.7.10.900202	

Test tooling

Systems

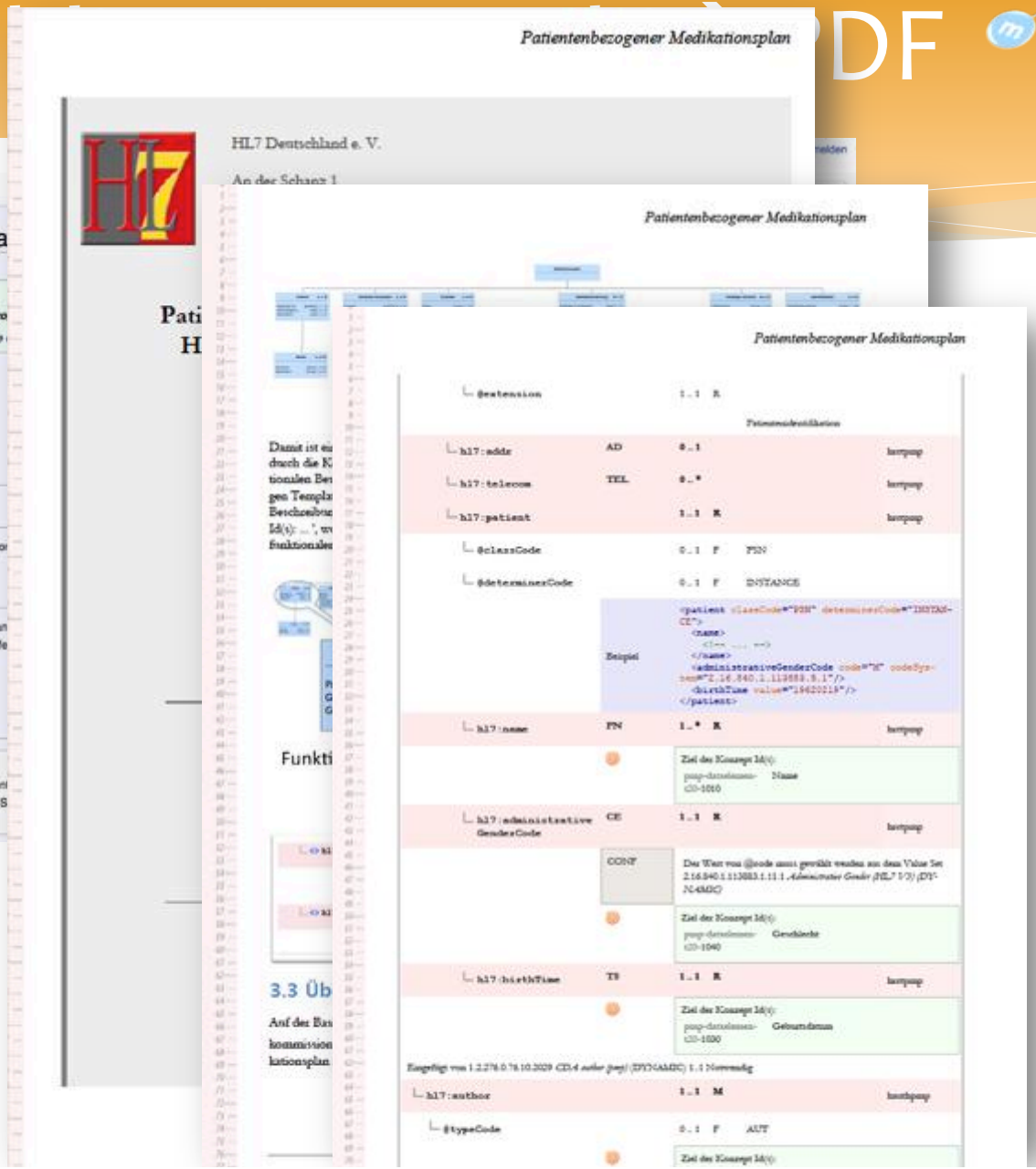
Publication : HTML



Test tooling

Systems

Pu DF



Test tooling

Systems

Getting the REST

- Almost all artefacts are reachable through the ART-DECOR RESTful interface

http://art-decor.org/decor/services/RetrieveTemplate?id=2.16.840.1.113883.3.1937.99.60.3.10.3001&prefix=demo3-&format=xml

will return a original template in raw format with id 2.16.840.1.113883.3.1937.99.60.3.10.3001 (Electrocardiogram Report) in project demo3

http://art-decor.org/decor/services/RetrieveValueSet?id=1.2.40.0.34.10.65&effectiveDate=2013-01-10T00:00:00&format=csv

Will return a valueset with a specific date in the return format CSV

http://art-decor.org/decor/services/RetrieveValueSet?id=1.2.40.0.34.10.65

Will return the most recent valueset in the default return format (XML)

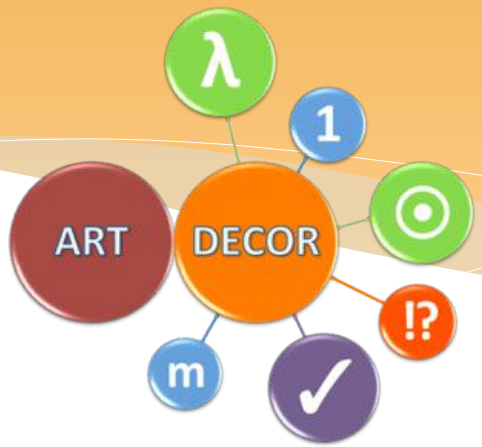
http://art-decor.org/decor/services/RetrieveValueSet?id=1.2.40.0.34.10.65&language=en-US

{for future use} will return the most recent valueset in the default return format (XML) in American English

http://art-decor.org/decor/services/RetrieveCode?code=1&codeSystem=2.16.840.1.113883.5.1

{for future use} will return the concept 'Male' of HL7 AdministrativeGender

FHIR with ART-DECOR



ART-DECOR FHIR strategy

- FHIR (Fast Healthcare Interoperable Resources, pronounced "fire")
- HL7's next generation standard (mobile appilcations)
- ART-DECOR strategy
  - FHIR Terminology Capabilities
  - FHIR Profile (and Resource) Viewer
  - FHIR Profile Editor under investigation

ART-DECOR FHIR Strategy

- End goals:
  - Integrate writing and retrieving FHIR Profiles and ValueSets on par with DECOR Templates and Value Sets are today;
  - Provide the same level of validation and testing as currently available for V3.
- First connectathons in Feb 2015 (Terminology) and May 2015 @ Paris WGM

Alexander Henket
Nictiz, The Netherlands
henket@nictiz.nl

ART-DECOR FHIR Strategy

- Current state of affairs on server
  - REST API implementation almost done;
  - Based on 0.4.0.3886 (Dec 12, 2014)
- Next steps (2015-2016)
  - Automate code generation where possible
  - Update Value Set Editor
  - Work on Profile Editor
  - Update for DSTU2

ART-DECOR Benefactors

ART-DECOR is developed with funding by

- Nictiz, Den Haag (NL)

  and

- Heitmann Consulting and Services, Hürth (DE)
- Gerrit Boers, Maastricht (NL)
- HL7 Germany, Köln (DE)

Become a benefactor!

Dr. Kai U. Heitmann, MD, FHL7
Heitmann Consulting and Services, Germany
Immediate Past Chair HL7 Germany
ART-DECOR expert group
Templates Co-chair HL7 International
info@kheitmann.de

Thank you!
Questions?