ART-DECOR
for Specification Developers

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

Dr Kai U. Heitmann, MD, FHL7
Heitmann Consulting and Services
ART-DECOR expert group
Template WG co-chair,
HL7 International
Past chair HL7 Germany
HL7 Germany / Netherlands
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
“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

Requirements
Users
Regulation/Law
Payors
Research...

Use Cases
Process, Data, Technology

Implementation Guide

Interoperable Applications
ART-DECOR for Specifications Tool and Methodology

- Comprehensive collaboration tool to support governance groups:
  - Concept, model, conversion, cooperation, documentation, publication
  - User interface, rules, test framework, RESTful services, terminology browser, demo and sandbox applications
Overview DECOR

Concept
  • Concept Group / Item
  • Data type
  • Concept list
  • Properties

Scenario
  • Actor
  • Transaction
  • Cardinality
  • Conformance
  • Test suite

Rules
  • Templates
  • Elements
  • Attributes
  • Constraints
  • Validation

Identifiers
  • OID registry
  • Summary of IDs

Codes
  • Value Sets
  • Terminology Associations
  • Coded Concepts

Issues
  • 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
WHO
Document: International Certificates of Vaccination

An example: Vaccinations
**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.

<table>
<thead>
<tr>
<th>Vaccine or prophylaxis</th>
<th>Date</th>
<th>Signature and professional status of supervising clinician</th>
<th>Manufacturer and batch no. of vaccine or prophylaxis</th>
<th>Certificate valid from:</th>
<th>Official stamp of the administering centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccin ou agent prophylactique</td>
<td></td>
<td>Signature et titre du clinicien responsable</td>
<td>Fabricant du vaccin ou de l’agent prophylactique et numéro du lot</td>
<td></td>
<td>Cachet officiel du centre habilé</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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’affectation)
..............................................................................................................
conformément au Règlement sanitaire international.

ART-DECOR Developer Day part 3 – 02.2015
Data “set”

**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.

<table>
<thead>
<tr>
<th>Vaccine or prophylaxis</th>
<th>Date</th>
<th>Signature and professional status of supervising clinician</th>
<th>Manufacturer and batch no. of vaccine or prophylaxis</th>
<th>Certificate valid from: until:</th>
<th>Official stamp of the administering centre</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Signature et titre du clinicien responsable</td>
<td>Fabricant du vaccin ou de l’agent prophylactique et numéro du lot</td>
<td>Certificat valable à partir du : jusqu’au :</td>
<td>Cachet officiel du centre habilité</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dataset in ART-DECOR

Vaccination Certificates Document - Datasets

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Vaccination Certificates Document Dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Vaccination Certificates Document Dataset</td>
</tr>
<tr>
<td>Status</td>
<td>Draft</td>
</tr>
</tbody>
</table>

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
- Description: Gender of the person

Value:
- Type: Code
- Concepts:
  - Concept
    - Description
    - Code
    - Codesystem
- 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
### Overview

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

<table>
<thead>
<tr>
<th>Concept</th>
<th>Scenario</th>
<th>Rules</th>
<th>Identifiers</th>
<th>Codes</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>λ</td>
<td>o</td>
<td>✓</td>
<td>1</td>
<td>m</td>
<td>!?</td>
</tr>
</tbody>
</table>

**ART-DECOR Developer Day part 3 – 02.2015**
Scenarios
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

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

- (sub)-set of dataset concepts
  - Cardinalities, conformance, conditions
  - Source dataset
  - Representing Template
Graphical Representation
Choose concepts from dataset, define cardinalities, conformance, conditions
Vaccinations Certificate Document

Scenarios
Terminologies
• Terminology
  • Document proper terminologies
  • Connect concepts with terminologies
  • Create value sets
  • Link value sets to choice lists
  • Identifier management

ART-DECOR Development Day part 3 – 02.2015
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

| Search Term(s) | 2 evthro |

| Search Term(s) | 2 evthro |

| Results | 1 11 20 | 1 11 20 | 1 11 20 |

| 1256-1 | Desecracted (intermediate) subtype [Presence] on Red Blood Cells from donor | I (int) subtype | ACnc | Pr | RBC, oriented | Ord | Agg RBC |
| 1306-6 | Direct antiglobulin test, IgG specific reagent [interpretation] on Red Blood Cells | Direct antiglobulin test, IgG specific reagent | Imp | Pr | RBC | None |
| 1304-1 | Direct antiglobulin test, complement specific reagent [Presence] on Red Blood Cells | Direct antiglobulin test, complement specific reagent | Pr | Pr | RBC | Ord |
| 1301-4 | Direct antiglobulin test, poly specific reagent [Presence] on Red Blood Cells | Direct antiglobulin test, poly specific reagent | Pr | Pr | RBC | Ord |
| 1321-9 | EAg [Presence] on Red Blood Cells | EAg | Pr | Pr | RBC, 6PU | Ord |
| 1320-7 | EAg [Presence] on Red Blood Cells from donor | EAg | Pr | Pr | RBC, oriented | Ord |
| 13379-6 | Erythrocytes, dual population [Presence] in Blood by Light microscopy | Erythrocytes, dual population | ACnc | Btd | Ord | Microscopy light |
| 1015-7 | EwAg [Presence] on Red Blood Cells | EwAg | Pr | Pr | RBC | Ord |
| 1013-2 | EwAg [Presence] on Red Blood Cells from Blood product unit | EwAg | Pr | Pr | RBC, 6PU | Ord |

| Details | 2 Component | EAg |
| Details | 4 Timing | Pr |
| Details | 6 Scale | Ord |
| Details | 9 Source | FS |
| Details | 11 Change Type | MN (change to field other than name) |
| Details | 15 Class Type | Laboratory class |
| Details | 29 Short Name | EAg RBC QI |
| Details | 35 Long Common Name | EAg [Presence] on Red Blood Cells |
| Details | 45 Common Test Rank | 0 |
| Details | 47 Common SI Test Rank | 0 |

| Details | 3 Property | Pr |
| Details | 5 System | RBC |
| Details | 8 Class | BLDBK |
| Details | 10 Date Last Changed | 20130525 |
| Details | 13 Status | ACTIVE |
| Details | 28 Related Names | Antigen; Antigens; BLOOD BANK; Erythrocytes; Ordinal: Point in time; CL: Qual; Qualitative: Random; Red blood cells; Red blood corpuscles; Screen |
| Details | 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. |
| Details | 46 Common Order Rank | 0 |
Vaccinations Certificate Document

Terminologies
Associations
Associations –
get more out of your specifications
Associations

- Dataset concept ↔ coded concept (terminology)
- Concept choice list ↔ coded concept
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
Overview
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)

**Header**
structured and coded

**Body**
structured content with coded „sections“

Section: Vaccinations
- code
- titel
- text (list)

Vaccine#1

Vaccine#2
...with CDA you aren‘t there yet...

Generic models

...need something

...to fill the gap

...to semantic interoperability
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

Documentation of “rules” in HL7’s Templates Exchange Format (DSTU)
Features of ART-DECOR for HL7 / CDA Templates (1)

- 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
• 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

- Template Viewer Navigation
- 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
- Items: elements, attributes, hierarchy
- Data types, cardinalities, conformance, constants, containments
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
• **Version Management**
  • Id (=unique identification of the semantic concept)
  • effectiveDate
  • statusCode
  • versionLabel (label↩effectiveDate)
• 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<l> [0..*]
code: CD CWE [0..1] `< ActEncounterCode
text: ED [0..1]
statusCode: CS CWE [0..1] `< ActStatus
effectiveTime: IVL<TS> [0..1]
priorityCode: CE CWE [0..1] `< ActPriority
ART-DECOR
Prototypes and Templates
Vaccinations Certificate Document

Templates
Overview

Concept
Scenario
Rules
Identifiers
Codes
Issues

vendor

Concept: λ
Scenario: ⊙
Rules: ✓
Identifiers: 1
Codes: m
Issues: !?

HCP

terminologist

templater
templater
templater
- Validation of XML instances

ISO Schematron Rules

Schematron-Processor

“Report”

CDA Document Instance

Directly derived from templates
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.

ART-DECOR BBR

List, Get

Reference

My ART-DECOR references BBRs
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

**ART-DECOR**
- WEB INTERFACE + DECOR SERVICES
- Data set and scenarios
- Value sets and identifications
- Templates and schematrons

**Artefact Output Options**
- HTML
- XML
- PDF
- Wiki
Health Care views “par Excel-lence”
Templates and Validation

- Validation of XML instances

Directly derived from templates

CDA Document Instance → Schematron-Processor → "Report"

ISO Schematron Rules
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
Publication: HTML
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 applications)
• ART-DECOR strategy
  • FHIR Terminology Capabilities
  • FHIR Profile (and Resource) Viewer
  • FHIR Profile Editor under investigation

ART-DECOR Developer Day part 4 – 02.2015
• **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
• 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)
- Heitmann Consulting and Services, Hürth (DE)
- Gerrit Boers, Maastricht (NL)
- HL7 Germany, Köln (DE)

Become a benefactor!
Thank you!

Questions?