ART-DECOR®
Introduction and Demos
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ART-DECOR Expert Group
Template WG co-chair, HL7 International Advisory Board, HL7 Foundation
CEO HL7 Germany
HL7 Germany / Netherlands / International
Agenda
Introduction and Demos

- ART-DECOR – what is it?
- Datasets
- Scenarios and Transactions
- Vocabulary and Terminology
- Associations
- CDA Templates
- Issue Management
- Building Block Repositories

Use Case: Vaccination Certificate Document
What is it?

ART-DECOR
• ... and a Specification Developer‘s life
• ... and a Software Developer‘s life
“Life” Cycle

Communication need

Production

Scenarios

Test

Specification

Implementation

IHIC 2016 - dr K Heitmann - ART-DECOR® Intro and Demos
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
ART-DECOR in 4 bullets (1)

- ...is an open-source tool and a methodology for various multidisciplinary stakeholders of healthcare information exchange
ART-DECOR in 4 bullets (2)

• ...supports comprehensive **collaboration of team members** within and between governance groups
• ...allows separation of concerns and different views on one **single documentation for different domain experts**
• ...supports **creation and maintenance** data sets, scenarios, HL7 templates (STU), value sets, and more
ART-DECOR: 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
One of the main objectives

- Separation of concerns towards a comprehensive specification
- Different views on one single documentation
  - With changing focus on different artifacts
  - For different domain experts
Overview DECOR

- 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
DECOR

**project**
- name
- descriptions
- authors
- contributors
- versions
- copyrights

**issues**
- description
- status
- trackings
- assignments

**data sets**
- concepts
- value domains

**scenarios**
- use cases
- actors
- transactions

**terminology**
- value sets
- code systems
- terminology associations

**identification**
- OIDs

**rules**
- instructions
- constraints
- validation
- conditions

**associations**
- identification

**DECOR**

Multi-Language Support

- Interface vs. Project Language
- Four supported languages
  - English
  - Dutch
  - German
  - Polish
- More in preparation
  - French, Spanish, Italian
International projects (mainly in Europe)
- Austria (ELGA National eHealth programme)
- Netherlands (national screening programme on bowel cancer)
- Netherlands (Nictiz, multiple projects)
- Norway (HL7, regional Health networks)
- epSOS/EXPAND (European eHealth programme)
- Germany (HL7, national eHealth programme)
- HL7 Poland
- European Templates and Value Set Repository (nascent)
- IHE Profile and Value Set Repository (in development)
Generating UIs from ART-DECOR

User Interface (forms) for entering data: Colon Screening

Transformation using scenario, value set and template definitions (+ a small amount of handling exceptional things)
• art-decor.org
  • Documentation
  • International site and international projects host
  • blog.art-decor.org etc.
• Sourceforge
• decor.nictiz.nl
  • Dutch projects host
  • Documentation, specification
• HL7 EU Newsletter #4: download at hl7.eu
• HL7 International Newsletter September 2014

ART-DECOR: a tool bridging the chasm between clinicians and health IT

Sometimes it is a long way from an idea to a specification electronically determined a specification by means of standard software applications and exchanging complete and consistent documents. This process and consensus of the experts, ART-DECOR, is now used in many European countries. It provides comprehensive documentation, specific codes, and more. For more information, please visit art-decor.org.
Further Developments ...

... following the “roadmap”
- Extension of Building Block Repositories
  - e.g. Extend the EU Template Repository
  - IHE Profile and Value Set Repository
- Extending our Testing Framework
- Support of FHIR resources, profiles and value sets
- Organizational Enhancements
  → ART-DECOR “Foundation”
Dataset in former times
Excel Spreadsheet Mapping Table

<table>
<thead>
<tr>
<th>Healthcare Professional Content</th>
<th>Mapping to technical artefacts per scenario</th>
<th>Scenarios with cardinalities</th>
</tr>
</thead>
</table>

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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
• Choice of concepts out of data set for a specific use case → scenario
WHO Document: International Certificates of Vaccination
## 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></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 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>
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.

---

**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.

---

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

**Description**

Gender of the person

**Value**

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Codesystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>M</td>
<td>AdministrativeGender</td>
</tr>
<tr>
<td>female</td>
<td>F</td>
<td>AdministrativeGender</td>
</tr>
</tbody>
</table>

**Value Set**

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)
Definition of a dataset
Health Care views “par Excel-lence”
Vocabulary and Terminology
ART-DECOR: tasks + definitions

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

```
<table>
<thead>
<tr>
<th>Level-Type</th>
<th>Code</th>
<th>Display Name</th>
<th>Codesystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-L</td>
<td>112144000</td>
<td>Blood group A (finding)</td>
<td>Snomed CT</td>
</tr>
<tr>
<td>0-L</td>
<td>112149005</td>
<td>Blood group B (finding)</td>
<td>Snomed CT</td>
</tr>
<tr>
<td>0-L</td>
<td>165743006</td>
<td>Blood group AB (finding)</td>
<td>Snomed CT</td>
</tr>
<tr>
<td>0-L</td>
<td>58460004</td>
<td>Blood group O (finding)</td>
<td>Snomed CT</td>
</tr>
</tbody>
</table>
```
Dataset concept and choices of concepts

Eye Color
• blue
• brown
• green
• other
Terminology

ART-DECOR: browsers + support when creating Value Sets
Associations
Associations – get more out of your specifications

Template Associations

- Template
  - element

Dataset

- Concept
  - Choice list
    - A
    - B

Terminology Associations

- Code + Code System...
- Code + Code System...
- Code + Code System...
- Value Set
  - Code + Code System...
  - Code + Code System...

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Overview

Concept
Scenario
Rules
Identifiers
Codes
Issues

HCP
terminologist

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Templates
• 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

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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
- 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 and 2.1, 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
Demo 5: Vital Signs CDA Document Templates

**CDA recordTarget**

- **Version**: 2014-07-08
- **Status**: Active
- **Id**: demo5-template-2001
- **Display Name**: CDA recordTarget

**Description, model, context and examples**

- **Description**: The patient / client
- **Classification**: cda/headlevel
- **Open/Closed**: open

**Used by / Uses**

- **Used by Template Id**: 2.16.840.1.113883.3.1937.99.60.5.10.1
- **Inclusion**: VitalSignsCDAAdocument, Vital Signs Summary CDA document

- **Uses Template Id**: 2.16.840.1.113883.3.1937.99.60.5.10.900207
- **Inclusion**: NationalPatientIdentifier, BurgerserviceNummer

**Relations**

- **Type**: Specialization
- **Model / Template**: 2.16.840.1.113883.10.12.101

**Example**

A simple patient, named John Doe, does:

```xml
<recordTarget>
  <patientRole>
    <!--id root="1.16.840.1.113883.2.4.6.3" extension="180202020"/>
    <patient>
      <given>John</given>
      <family>Doe</family>
    </name>
    <administrativeGenderCode code="M" codeSystem="2.16.840.1.113883.5.1"/>
    <birthtime value="19620101"/>
  </patientRole>
</recordTarget>
```
- **Items**: elements, attributes, hierarchy
- **Data types, cardinalities, conformance, constants, containments**

```xml
<hl7:section>
  <hl7:templateId>
    <root>
      <@templateId>2.16.840.1.113883.3.1937.99.61.5.10.900207</root>
    </@templateId>
  </hl7:templateId>
  <hl7:code>
    <code>11369-6</code>
    <codeSystem>2.16.840.1.113883.6.1</codeSystem>
    <displayName>History of Immunization</displayName>
  </hl7:code>
  <hl7:title>
    <ST>1..1</ST>
  </hl7:title>
  <hl7:text>
    <SD.TEXT>1..1</SD.TEXT>
  </hl7:text>
  <hl7:entry>
    <@typeCode>0..*</@typeCode>
    <contains:ImmunizationActivity>
      <CCDA Immunization Activity>(dynamic)</contains:ImmunizationActivity>
  </hl7:entry>
  <hl7:contextConductionInd>
    <bi>0..1</bi>
  </hl7:contextConductionInd>
</hl7:section>
```
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

Vacc Doc
- Client
- Author
- Custodian

Vaccinations
- Vaccines
- Reasons
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 STU

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ART-DECOR
Prototypes and Templates

Encounter

classCode*: <= ENC
moodCode*: <= _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
• 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.
ART-DECOR in Europe

- Shared repositories with collection of artifacts
  - Template Repository (building blocks for clinical document definitions) and Value Sets (code lists)
  - Sharing artifacts between countries has already started by Germany, Austria, Netherlands, Poland, Switzerland
- ART-DECOR specs ➔ Input for Testing Tool
Issue Management
Issue Management

- Issue Management
- Change Requests
- Incidents
- Request for Information/Education
- For future consideration
- Signal issue associated with an artefact (e.g. a template) or just “as-is”
Issue Management

New Issue

<table>
<thead>
<tr>
<th>Type</th>
<th>Change Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>Normal</td>
</tr>
<tr>
<td>Description</td>
<td></td>
</tr>
</tbody>
</table>

Finding:
- 

Suggestion:
- 

Further explanation:

Assign To
- not-set-
Issue Management

Image of a software interface showing issue management features, including search and status tracking.

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Issue Management

- Emails upon new issues

[art-decor] Wijzigingen op issues voor project RIVM bevolkingsonderzoek darmkanker d.d. 2015-02-02 12:07:01

Samengesteld voor gebruiker kai (kaiheitmann@t-online.de). Stuur geen antwoord op deze email. Gebruik in plaats daarvan de links naar de issues.

Issue #382: Coecum intubatie hernomen.
Stuur geen antwoord op deze email. Dit is de directe link naar dit issue...

Er is nieuwe gebeurtenis toegevoegd door André Huisman (AH) op 2015-02-02 11:08. Status: ‘open’.

Bevinding:
- In het geval er geen coecum aanwezig is gaat het om de intubatie van het terminale ileum (in dat geval het eindpunt)

Voorstel:
- Concept hernemen naar “Coecum / terminaal ileum intubatie”

Er is een toewijzing gedaan door André Huisman (AH) op 2015-02-02 11:08, nu toegewezen aan dr Kai U. Heitmann (KH).

- Publish and Subscribe mechanism
Deliverables
Artefact Output Options

Stakeholders
- HCP
- Terminologists
- Architects
- Test tooling
- Systems

WEB INTERFACE + DECOR SERVICES
- HTML
- XML
- PDF
- Wiki

ART-DECOR
- Data set and scenarios
- Value sets and identifications
- Templates and schematrons
Health Care views “par Excel-lence”
- Items: elements, attributes, hierarchy
- Data types, cardinalities, conformance, constants, containments

Example:

```xml
<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="DRTV">
    <!-- template 2.16.840.1.113883.3.1937.99.61.7.10.900203 (dynamic) -->
  </entry>
</section>
```
### Aktuell

<table>
<thead>
<tr>
<th>Datum</th>
<th>Status</th>
<th>HTML</th>
<th>PDF</th>
<th>Schematron</th>
<th>XML</th>
<th>Kommentar</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-12-2014</td>
<td>Aktiv</td>
<td>nicht verfügbar</td>
<td>noch nicht verfügbar</td>
<td>noch nicht verfügbar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Archiv

<table>
<thead>
<tr>
<th>Datum</th>
<th>Status</th>
<th>HTML</th>
<th>PDF</th>
<th>Schematron</th>
<th>XML</th>
<th>Kommentar</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-09-2014</td>
<td>Obsolet</td>
<td>nicht verfügbar</td>
<td></td>
<td></td>
<td>nicht verfügbar</td>
<td></td>
</tr>
<tr>
<td>24-06-2014</td>
<td>Obsolet</td>
<td>nicht verfügbar</td>
<td></td>
<td></td>
<td>nicht verfügbar</td>
<td></td>
</tr>
<tr>
<td>01-06-2014</td>
<td>Obsolet</td>
<td>nicht verfügbar</td>
<td></td>
<td></td>
<td>nicht verfügbar</td>
<td></td>
</tr>
<tr>
<td>26-05-2014</td>
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</tr>
<tr>
<td>14-05-2014</td>
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</tr>
<tr>
<td>16-04-2014</td>
<td>Obsolet</td>
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</tr>
<tr>
<td>25-03-2014</td>
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<td></td>
</tr>
<tr>
<td>24-03-2014</td>
<td>Obsolet</td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td>nicht verfügbar</td>
<td></td>
</tr>
<tr>
<td>05-01-2014</td>
<td>Zwischenzeitlich</td>
<td>nicht verfügbar</td>
<td></td>
<td></td>
<td>nicht verfügbar</td>
<td></td>
</tr>
</tbody>
</table>
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
ART-DECOR as an Organization
Benefactors
ART-DECOR® is

- driven by the ART-DECOR Expert Group
- supported by a Team of Testers...
- and the Community
- is a Trademark
- will become the ART-DECOR Foundation soon

**Founders**

DECOR is developed by Dr Kai Heltemann who works as an healthcare IT consultant in Europe with the main focus on Germany and the Netherlands. He is mainly active in the fields of standardization in healthcare communication, especially the HL7 (Health Level Seven) family of standards like CDA or V3.

Kai is an acknowledged expert in the application of XML in Healthcare; he has advised the Ministries of Health of the Netherlands and Lithuania, as well as large trade associations in Germany and the Netherlands, on aspects of e-Health.

ART is developed by Gerrit Boers who is a health care consultant.

**ART-DECOR Expert Group**

Since the original development of ART-DECOR, the following people have joined the ART-DECOR Expert Group:

- **Alexander Henket** is a consultant at Nictiz with >15 years of experience in the creation and implementation of various standards and based in The Netherlands. He is an active member of the HL7 community both national and international.

- **Marc de Graauw** is an independent consultant who specializes in digital information exchange, health & ICT, information architecture, security, semantics & Web Services.

- **Maarten Ligtoet** is an architect at Nictiz who specializes in network infrastructure, audits of health information systems, open standards, authentication & security.

- **Dr Frank Oemig** works for Deutsche Telekom Healthcare and Security Solutions GmbH and focuses on Conformance and Testing as well as on Java applications around ART-DECOR.
ART-DECOR Benefactors

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

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    - In Dutch
Thank you!
Questions?

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