Using Archetypes with HL7 Messages and Clinical Documents

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Template Data Schema (TDS)

- XML Schema representation of a clinical template using domain concepts
- TDS is used by non-Archetyped based systems as an intermediate data format to communicate Archetype-based Clinical Documents
- TDS is derived from a Clinical Template using generic rules based on Archetypes and RM
Template Data Schema

- Element names are domain concepts from archetypes/ templates
- Includes most archetype/template constraints
- Generated using Template Designer.
- Single transformation into RM (openEHR) schema for all templates
Demo TDS auto-generation from Template Designer
TDS Example Schematic

Microbiology Laboratory Report
- type = ‘COMPOSITION’
- archetype_node_id = ‘openEHR-EHR-COMPOSITION.report.v1’

  category = "event" [code = ‘433’, terminology = ‘openEHR’]

  content

    Clinical findings
    - type = ‘SECTION’
    - archetype_node_id = ‘openEHR-EHR-SECTION.findings.v1’

    Microbiology laboratory observation
    - type = ‘OBSERVATION’
    - archetype_node_id = ‘openEHR-EHR-OBSERVATION.microbiology.v1’

      name = ‘Microbiology laboratory observation’
      type = ‘DV_TEXT’

      protocol
      - type = ‘ITEM_LIST’
      - archetype_node_id = ‘at0030’

        name = ‘protocol’

      Microscope type
      - type = ‘ELEMENT’
      - archetype_node_id = ‘at0031’

        name = ‘Microscope type’
        type = ‘DV_TEXT’

        value
        - type = ‘DV_TEXT’

        data
        - archetype_node_id = ‘at0002’

may be different from the template depending on the data mapped from the source input, and may be coded text in some instances.
Uses of TDS

- Form data model (InfoPath/XForms)
- Interface between system components
- Interface between systems
- Data Integration Intermediate Form
Using TDS in Data Integration

- Moves the focus of mapping data from the reference model concepts to the domain (clinical) concepts – Semantic Transforms
- Enables consistency & integrity of the domain concepts to be maintained throughout the data integration process
- Supports semantic interoperability between systems using different Reference Models (openEHR, CDA, CEN)
Template Data Document (TDD)

- The Template Data Document is an XML document (e.g. laboratory report) populated with data from the content source.
- Conforms to a template data schema.

Example: Microbiology laboratory report received as a HL7 V2 ORU message, transformed into a TDD that validates against microbiology_report TDS, transform into openEHR and store.
HL7 v2.x message to TDD

Message source system

HL7 v2.x message

Validates

HL7 v2.x Definition

openEHR Standardised Knowledge Environment

Archetypes

Templates

Generate from Tools

Implementation
Standardised XML Environment

Template Data Document

Validates

Template Data Schema (e.g. Patient Admin)
TDD to openEHR

Template Data Document (e.g. HL7v2.3 ADT-A01 XML)

RM-based Transform

openEHR Composition XML (e.g. Patient Administration)

EhrGate WS

openEHR Composition

Archetypes

Templates

openEHR RM Schema

Validates

EhrBank repository

Commit openEHR Composition

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Archetype-based Integration

**Inputs**

- (AUS) ORU^R01 Message
- (HL7) ORU^R01 Message
- HL7 CDA R2, ..., other input formats.

**Archetypes:**
- Report
- Microbiology
- Recommendations
- Follow-up

**Template:**
- Microbiology Report

- Auto generate a Template Data Schema
- Transform data source to Template Data Document, Validate
- Apply generic transform openEHR composition, Validate

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1. Generate TDS from the Template Designer based on the archetypes and template(s) required to capture the integrated HL7 message content.

2. Convert HL7 v2.x ASCII message to XML.

3. Based on the HL7 v2.x definition and required TDS-formatted output, write the XSLT script to map the HL7 v2.x XML nodes to TDS format.*

4. Invoke HL7 v2.x to TDD transform.*
Application data to TDD

- Application Space
  - App. Data
  - App. Data Schema
    - Validates

- openEHR Standardised Knowledge Environment
  - Archetypes
  - Templates
    - Generate from Tools

- Implementation Standardised XML Environment
  - Template Data Document
    - Validates
  - Template Data Schema
    - Validates

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Covert HL7 V2 Referral Message to Referral TDD Extract Demo
TDD to Exchange Format

Archetype based standard XSL Transform fragments

openEHR

CEN 13606

CDA (CCD)

CDA R2

Standard Transform for CCD

openEHR Display

Template Data Document
Archetype-based Integration

**Inputs**
- System A
- System B
- System C

**Outputs**
- OpenEHR/ CEN 13606 Extract
- PDF
- openEHR Composition
- HL7 V3 CDA

Archetype Transform Fragments

Content-based Transform Aggregation

Infection Investigation Notification TDD

Content-based Transform

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# Clinical Extracts Compared

<table>
<thead>
<tr>
<th>openEHR R1.0.1</th>
<th>HL7 CDA</th>
<th>CEN 13606-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHR Extract</td>
<td></td>
<td>EHR Extract</td>
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<tr>
<td>Extract Chapter</td>
<td></td>
<td></td>
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<tr>
<td>Demographics</td>
<td>Record Target/Participant</td>
<td>Demographic Extract</td>
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<tr>
<td>EHR Status/Access</td>
<td></td>
<td>Access Policy</td>
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<tr>
<td>Folder</td>
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<tr>
<td>Version</td>
<td>Clinical Document</td>
<td>Version</td>
</tr>
<tr>
<td>Composition</td>
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<td>Composition</td>
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<tr>
<td>Section</td>
<td>Section</td>
<td></td>
</tr>
<tr>
<td>Entry</td>
<td>Clinical Statement</td>
<td>Entry</td>
</tr>
</tbody>
</table>

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CDA Transformation Process

- Build generic CDA Level 2 transform.
- Build Archetype-specific CDA Level 2 transform fragment for each Archetype.
- Build Archetype-specific CDA Level 3 transform fragment for each Archetype.
- Import archetype-specific transform fragments into generic CDA Level 2 transform based on document content.
- Invoke CDA transform.
Microbiology report

Created On: February 26, 2008

Patient: Graham Smith
Woodville, SA,
Birthdate: January 4, 1963
Sex: Male
Guardian: Next of Kin:

MRN: 0952657

Table of Contents

- Clinical findings

Clinical findings

1. Culture Wound: Culture Wound
2. Specimen:
   - Sample description: Wound
   - Site: Foot L
3. Organism:
   - MRSA:
     - Therapeutic susceptibilities:
       - Eryth:
         - Sensitivity: 0
       - Ox:
         - Sensitivity: 0
       - Vanc:
Discharge Summary

Created On: February 16, 2008

Patient: Graham Smith
Birthdate: January 4, 1963
Sex: Male

MRN: 0952657
Guardian: Woodville, SA.
Next of Kin:

Table of Contents
- Discharge medications
- Known adverse reactions and alerts

Discharge medications

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Form</th>
<th>Strength per dose unit</th>
<th>Dose</th>
<th>Frequency</th>
<th>Frequency Qualifier</th>
<th>Route</th>
<th>Quantity to be dispensed</th>
<th>Duration</th>
<th>Indications</th>
<th>Status</th>
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<tbody>
<tr>
<td>Cefuroxime</td>
<td>Tablet</td>
<td>250mg</td>
<td>500 mg</td>
<td>Twice daily</td>
<td></td>
<td>Oral</td>
<td>8 Tablets</td>
<td>2 Days</td>
<td>Respiratory infection</td>
<td>New</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrous Sulfate</td>
<td>Tablet</td>
<td>105 microgram</td>
<td>105 microgram</td>
<td>Once daily</td>
<td>Oral</td>
<td>30 Tablets</td>
<td>1 Month</td>
<td>Fe deficiency anaemia</td>
<td>New</td>
<td></td>
</tr>
</tbody>
</table>
Referral TDD Extract Demo to CDA
Referral Summary Document Demo
XDS Document Meta-Data

XDS meta-data
- title
- typeCode
- languageCode
- authorPerson
- authorInstitution

TDD source
- name/value
- archetype/template ID; or
- name/defining_code
- language/code_string
- composer
- context/health_care_facility
XDS Document Meta-Data

- practiceSettingCode
- serviceStartTime
- serviceStopTime
- intendedRecipient
- patientId
- sourcePatientInfo

- context/setting
- context/start_time
- context/end_time
- context/participations
- subject/id
- subject/identities/name
Referral Summary Document to XDS MetaData Demo
Discharge Summary TDD Extract to CDA Discharge Summary Document Demo
CDA Discharge Summary Document to Discharge Summary TDD Extract Demo