Tool-assisted Knowledge to Message Translation

Priya Jayaratna and Kamran Sartipi

Department of Computing and Software
McMaster University


Background

• Background
  ◦ HL 7
  ◦ SNOMED
  ◦ Infoway
  ◦ EHR
  ◦ VT

• Research Problem
  ◦ To develop a tool-assisted process to streamline message workflow design during HL7 v3 based healthcare integration projects

Priya Jayaratna & Kamran Sartipi
Related Work

- 7-Scan, 7-Edit
- Neobrowse
- Mirth

- Where we want to go – Mirth equivalent for HL7 v3
Tool-Assisted Message Mapping Process (TAMMP)
TAMMP (Contd..)

TAMMP provides a well-defined process for streamlining the HL7 messaging workflow design process with the help of a tool.

- **Step 1: Integration Requirement Analysis**
  Examine information exchange requirements of the systems being integrated using Storyboards and Tool assisted domain mapping.

- **Step 2: Interaction Search**
  Map extracted Structured Transaction Initiators to HL7 Interactions with the help of TAMMP tool’s advanced semantic search feature. The search is based on an alternate artifact meta-model we have developed that reflects the nature of real world transactions.

- **Step 3: Vocabulary Mapping**
  Map legacy terms to standard clinical terminology (SNOMED, LOINC) assisted by TAMMP tool.

*Priya Jayaratna & Kamran Sartipi*
Structured Transactions

Priya Jayaratna & Kamran Sartipi
Today, Mrs. Everywoman needs to get a repeat of her usual medications – Glyburide 5 mg tid, Metformin 500 mg tid, Coumadin 5 mg once daily (od), Celebrex 100 mg od. She comes in to see her regular FP, Dr. Primary. Dr. Primary pulls up Mrs. Everywoman’s chart in her EMR, which automatically queries the EHR for current medication, allergy history and medical conditions and downloads the information to her EHR. Dr. Primary updates her EMR with Mrs. Everywoman’s new allergy. She also notes that Mrs. Everywoman’s last HbA1c (a measure of long-term glucose control) was high and recommends that Mrs. Everywoman start a new medication, Roziglitazone 4 mg od. She then re-prescribes for Mrs. Everywoman all her usual medications using her EMR. Once Dr. Primary is satisfied that there are no drug-drug interactions, she initiates a transfer of the prescription to the EHR and tells Mrs. Everywoman that she has prescribed the medications for her with 3 repeats and that she can pick them up from the pharmacy of her choice. When Dr. Primary closes Mrs. Everywoman’s chart on her EMR, it automatically updates the EHR with the updated information she has agreed to send; in this case just the allergies.
Step 1.2 – Identify Contexts

Automatic Context Mapping Results

- Medication – Pharmacy
- Allergies – Allergies
- Medical conditions – Clinical document
- Prescriptions – Pharmacy
- Glucose level – Non-laboratory observation

Original HL7 Domains for above contexts

- Medication, Prescription – Pharmacy
- Allergies, medical condition – Care provision
- Glucose Level - Observation
Step 1.3 – Identify Transaction Initiators

- EMR sends request for patient medication history.
- EMR sends request for patient allergies.
- EMR updates EHR with medication.
- EMR updates EHR with allergies.
- EMR sends prescription request to pharmacy.
Step 1.3 – Extract Structured Transactions

- EMR sends request for patient medication history.
  - Action – QueryDetail
  - Context – Pharmacy
  - Content – Medication history

- EMR sends request for patient allergies.
  - Action – QueryDetail
  - Context – Allergies
  - Content – Patient Allergies

- EMR updates EHR with patient medication.
  - Action – CommandUpdate
  - Context – Pharmacy
  - Content – Patient Medication
## Step 2 – Interaction Search

<table>
<thead>
<tr>
<th>Transaction Initiator</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMR sends request for patient medication history</td>
<td>Medication Profile Detail Generic Query (PORX_IN060350UV)</td>
</tr>
<tr>
<td>EMR sends request for patient allergies.</td>
<td>Patient adverse reactions query(REPC_IN000058UV)</td>
</tr>
<tr>
<td>EMR updates EHR with medication.</td>
<td>Medication Order Record Request (PORX_IN010380UV)</td>
</tr>
<tr>
<td>EMR updates EHR with allergies.</td>
<td>Record adverse reaction request (REPC_IN000004UV)</td>
</tr>
<tr>
<td>EMR sends prescription request to pharmacy</td>
<td>Medication Order Fulfillment Request (PORX_IN011070UV)</td>
</tr>
</tbody>
</table>
TAMMP Tool

Architecture
TAMMP Tool (Contd..)

• Components
  ◦ Web UI  
  ◦ Artifact Search Controller  
  ◦ Sesame Server  
  ◦ Terminology System Interface  
  ◦ Web Server

• Features
  ◦ User assisted message mapping - RDF Based search and retrieval of artifacts based on the new metadata model  
  ◦ User assisted terminology mapping  
  ◦ Artifact navigation and exploration support

• Artifact Preprocessing
  ◦ Preparation of HL7 artifacts and RDF instances for to be stored in the web server and RDF Repository

Priya Jayaratna & Kamran Sartipi
RDF Graph for HL7 Artifact Metadata Model
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:hl7="http://hl7.mcmaster.ca/hl7/schema#">
    <hl7:artifactClass rdf:resource="http://hl7.mcmaster.ca/schema/Query-Detail"/>
    <hl7:keywords>Observation, vitals, measurements, height, weight, blood pressure</hl7:keywords>
  </hl7:Interaction>
</rdf:RDF>
For VT..

- Patient clinical obs. doc summaries query response(REPC_IN000089UV)
- Patient referral details query response(REPC_IN000091UV)
- Subject clinical observations query response(POOB_IN000005UV)
- Find Document Metadata and Content Response(RCMR_IN000032UV01)
Tool-assisted Knowledge Translation to HL7 v3 Messages

Transaction Schema for Message Categorization

Step 1: Integration Requirements Analysis
- Extract
- Contexts
- Transaction Initiator
- Transaction Schema
- Structured Transactions
- Mapping

Step 2: Structured Transaction Generation
- Define
- Transaction Mapping Facility
- Switch
- Terminology System Interface

Step 3: Mapping
- Preprocessed Artifact Repository

Tool-assisted Message Mapping Process (TAMMP)


TAMMP Tool: 5 Screenshots
Tool-assisted Knowledge to Message Translation

Priya Jayaratna and Kamran Sartipi

Department of Computing and Software
McMaster University


Priya Jayaratna & Kamran Sartipi