Representing and sharing knowledge using SNOMED
Proceedings of the 3rd international conference on Knowledge Representation in Medicine (KR-MED 2008)
R. Cornet, K.A. Spackman (Eds)

Semantic Interoprability of Legacy eHealth Systems using SNOMED

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Abstract. *We introduce a framework for applying healthcare standards and clinical terminology systems to achieve semantic interoperability between distributed Electronic Medical Record (EMR) systems. We follow healthcare standards from HL7 [1] and Canada Health Infoway [2] Infostructure (EHRi) guidelines and documents in an integration project. This allows us to tackle the involved complexity and high technical requirements in order to provide guidelines for similar system integration projects. HL7 specifies the details of different healthcare scenarios by identifying the involved entities and required transactions and messages. Scenario information details and actual payload are then encoded into HL7 v3 message structure.*

Semantic interoperability

To achieve semantic interoperability, we map data fields of two healthcare systems onto the HL7 v3 clinical terms using three major Infoway documents: *Vocabulary Status Worksheet*, *Message Definition Worksheet* and *Scope & Package Tracking Framework*. The overall translation framework consists of three phases: *Interactions Extraction*, *Message Analysis*, and *Domain Analysis* to generate HL7 standard messages from typical healthcare scenarios. The legacy healthcare system provides healthcare scenarios and the framework generates the corresponding HL7 v3 messages that implement those scenarios.

Phase 1: interaction extraction. In this phase, HL7 standard interactions are developed through analysis of transactions. Given a scenario of legacy healthcare system, we divide it into smaller transactions required to complete a scenario. The legacy transactions are mapped onto the standard HL7 transactions which have similar semantics. Each transaction consists of a sequence of interactions to support outgoing and incoming communications.

Phase 2: message selection. In this phase, the elements of HL7 message structure (i.e., Transmission Wrapper, Trigger Event Control Act Wrapper and Message Payload) are created. Each interaction resulted form previous phase is assigned to a transmission wrapper schema. The transmission content is defined in this schema. The semantic of transaction content can be understood from the associated HL7 R-MIM.

Phase 3: domain analysis. In this phase, the final HL7 v3 message instance is generated from the message schema resulted form last phase. The HL7 domain that should be used for each field of schema is mentioned inside the schema. The clinical terminology system that should be used for each HL7 domain is defined in 'Vocabulary Status Worksheet'.

Parallel to the steps of the above phases, a mapping file should be generated that assigns data fields of legacy system to HL7 domains and the appropriate clinical terminology system concept defined by SNOMED. Using this mapping file and domains of HL7 schema extracted in the last step, another mapping file should be generated to map legacy system data fields to HL7 domain, HL7 message and the appropriate filed inside the message schema. Using this second mapping file, the pair <*legacy attribute, value*> can be translated by <*HL7 attribute mapped to legacy attribute, value*> inside the HL7 XML message.

Case study environment

As a case study, different algorithms (as proprietary services) of an existing research oriented Clinical Decision Support System (CDSS) have been provided for a Cardiac Rehab Center in another city (as client). The proposed framework has been applied on this integration project and the results are available. Our current research involves using Oracle's Health Transaction Base (HTB) [3] as the application development environment to develop and transfer HL7 v3 messages using Service Oriented Architecture (SOA).

References

[1] Health Level Seven official website. www.hl7.org.
[2] Canada Health Infoway. EHRS Blueprint, an interoperable EHR framework, April 2006.
[3] ORACLE. Oracle HTB datasheet, August 2005.