REFERENCE MODEL

The *open*EHR Integration Information Model

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1. Ocean Informatics Australia

The *open*EHR foundation

is an independent, non-profit community, facilitating the creation and sharing of health records by consumers and clinicians via open-source, standards-based implementations.

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1 Introduction

1.1 Purpose

This document describes the architecture of the *open*EHR Integration Information Model, designed for use in legacy and other integration situations.

The intended audience includes:

- Standards bodies producing health informatics standards;
- Software development groups using *open*EHR;
- Academic groups using *open*EHR;
- The open source healthcare community;
- Medical informaticians and clinicians intersted in health information;
- Health data managers.

1.2 Related Documents

Prerequisite documents for reading this document include:

- The *open*EHR Reference Model documents

1.3 Status

This document is under development, and is published as a proposal for input to standards processes and implementation works.

The latest version of this document can be found in PDF format at `http://svn.openehr.org/specification/TRUNK/publishing/architecture/rm/integration_im.pdf`. New versions are announced on `openehr-announce@openehr.org`.

1.4 Peer review

Areas where more analysis or explanation is required are indicated with "to be continued" paragraphs like the following:

`To Be Continued: more work required`

Reviewers are encouraged to comment on and/or advise on these paragraphs as well as the main content. Please send requests for information to `info@openEHR.org`. Feedback should preferably be provided on the mailing list `openehr-technical@openehr.org`, or by private email.

1.5 Conformance

Conformance of a data or software artifact to an *open*EHR Reference Model specification is determined by a formal test of that artifact against the relevant *open*EHR Implementation Technology Specification(s) (ITSs), such as an IDL interface or an XML-schema. Since ITSs are formal, automated derivations from the Reference Model, ITS conformance indicates RM conformance.

2 Integration Package

2.1 Requirements

Getting data in and out of the EHR is one of the most basic requirements *open*EHR aims to satisfy. In "greenfield" (new build) situations, and for data being created by GUI applications via the *open*EHR EHR APIs, there is no issue, since native *open*EHR structures and semantics are being used. In almost all other situations, existing data sources and sinks have to be accounted for. In general, external or 'legacy' data (here the term is used for convenience, and does not imply anything about the age or quality of the systems in question) have different syntactic and semantic formats than *open*EHR data, and seamless conversion requires addressing both levels.

Typical examples of legacy data sources and sinks include relational databases and HL7v2 messages. HL7v2 messages are probably one of the most common sources of pathology messages in many countries; EDIFACT messages are another. More recently, HL7v2 messages have been designed for referrals and even discharge summaries. Not all legacy systems are standardised; many if not most hospitals as well as GP and other desktop products have their own private models of data and terminology usage. Technically speaking, there is not much difference between standardised and non-standardised legacy models; only the reusability of the solution differs.

One important category of externally sourced data addressed by the Integration package described here is data expressed in the form of a CEN EN13606 Extract. Part 1 of EN13606 defines a information model which is nearly identical to that of *open*EHR at the `COMPOSITION` and `SECTION` levels. The CEN EN13606 `Entry` class is a generic structure with a minimum of contextual meta-data, and can easily be mapped to the *open*EHR Entry type described in this specification.

2.2 Design Basis

2.2.1 Overview

The design basis for connecting legacy systems to *open*EHR is founded upon a clear separation of the syntactic and semantic transformations required on data. The syntactic transformation converts source data from its original form (or whatever intermediate form it may have been converted to) to a format obeying a special class in the *open*EHR reference model, but whose logical structure and semantics are controlled by 'legacy' archetypes so as to mimic the design of the source data. This step brings the data into the *open*EHR computational context. The second step causes transformation on this intermediate *open*EHR data into data which are a) instances of the main *open*EHR reference model, and b) obey 'designed' clinical archetypes.

The additional elements of the *open*EHR architecture which make this transformation possible are:

- a class `GENERIC_ENTRY`, which is a sibling of `SECTION` and `ENTRY`, and contains completely generic, archetypable structures;
- 'legacy' archetypes, i.e. archetypes defined against the `GENERIC_ENTRY` class;
- semantic transformation rules from *open*EHR data based on `GENERIC_ENTRY` and legacy archetypes to data based on the subtypes of `ENTRY`, and designed archetypes.

FIGURE 1 illustrates the `rm.integration` package, which contains a single class `GENERIC_ENTRY`. Unlike other classes in the *open*EHR reference model, `GENERIC_ENTRY` contains no hard-wired attributes at all, only two generic attributes, *content* and *context*. This general design (i.e. separation of content and context) is consistent with the rest of *open*EHR, but unlike classes such as COMPOSITION, OBSERVATION etc, no assumptions at all are made about the actual shape of such data.

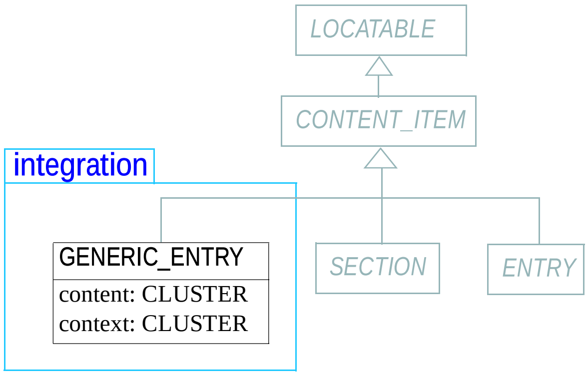

FIGURE 1 rm.integration Package

2.2.2 Semantics of GENERIC_ENTRY

A number of useful consequences follow from this modelling approach. Firstly, instances of GENERIC_ENTRY will contain attributes inherited from the LOCATABLE class, including *archetype_node_id*, and are thus archetypable in the same way as all other classes in the *open*EHR reference model. The LOCATABLE attribute *feeder_audit* is also inherited, and may be used to mark every node of data with relevant meta-data from the source system record or message. Secondly, as a subtype of CONTENT_ITEM, GENERIC_ENTRY is a valid value for COMPOSITION.*content*. This is a completely desirable situation, since the same rules apply to GENERIC_ENTRY as to other content: instances can only be committed to the record as part of a COMPOSITION instance. GENERIC_ENTRY data are thus audit-trailed and versioned in the normal way. Thirdly, GENERIC_ENTRY instances can occur within a hierarchy of SECTIONs, which is useful for data sources which have headings or section equivalents (this is quite common in hospital information systems containing physician notes). Lastly, in common with all other *open*EHR data, design-time paths can be constructed for archetypes of GENERIC_ENTRY, while runtime paths can be extracted from data based on such archetypes. These path sets can be used for writing the data transformation rules.

It should be remembered that while GENERIC_ENTRY provides a standardised syntactic form for externally sourced data within *open*EHR, it provides no semantic coherence. This is particularly true for GENERIC_ENTRY instances sourced from numerous data sources: there is no guarantee that the GENERIC_ENTRY representations of “cholesterol result” from system A will be congruent with those sourced from system B. It is not even required that the data sources be vastly different for this problem to occur. Examples of messages can be found coming from different pathology laboratories, which obey the same minor version of HL7v2 (e.g. 2.3.1) and supposedly implement the same message type (e.g. “complete blood picture”) but which differ in actual structure and content.

The consequence of this situation is that GENERIC_ENTRY data cannot in general safely be used for clinical computation (e.g. decision support), and will not in general even support reliable clinical querying. In other words, a repository of GENERIC_ENTRYs (within appropriate COMPOSITION structures) does not constitute a reliable or interoperable health record - it can only be considered a standardised health information data store whose primary purpose is as the input to or output of semantic conversion processes, or for other auditing or non-clinical data management purposes.

2.2.3 Integration with CEN EN13606

The GENERIC_ENTRY class provides a convenient basis for making *open*EHR systems EN13606-compliant, which in turn gives *open*EHR a gateway capability in heterogeneous environments where EN13606 is being used to communicate data. A CEN EN13606 EHR Extract can be converted to a series of COMPOSITIONs containing GENERIC_ENTRY objects which obey appropriate legacy archetypes; this data can then be semantically converted into orthodox *open*EHR objects for integration into a coherent EHR. Similarly, *open*EHR data can be converted into the GENERIC_ENTRY-based intermediate form for further conversion into EN13606 EHR Extracts.

2.3 Class Descriptions

2.3.1 GENERIC_ENTRY Class

CLASS	GENERIC_ENTRY	
Purpose	This class is used to create intermediate representations of data from sources not otherwise conforming to *open*EHR classes, such as HL7 messages, relational databases and so on.	
CEN	Entry	
Inherit	CONTENT_ITEM	
Attributes	**Signature**	**Meaning**
	content: CLUSTER	The items considered to be the 'data' from the source message or record.
	context: CLUSTER	Other items not part of the 'data' from the source message or record; typically identity and time-stamp information.
Invariants		

To Be Determined: it would be reasonable to include from_en13606 and to_en13606 methods.

A References

A.1 Standards

1 ENV 13606-1 - *Electronic healthcare record communication - Part 1: Extended architecture*. CEN/ TC 251 Health Informatics Technical Committee.

2 HL7 version 2 ref....

END OF DOCUMENT