HL7’s Version 3 Standards:
The Essence of Model-driven Standards

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Mission

- HL7 provides standards for interoperability that improve care delivery, optimize workflow, reduce ambiguity and enhance knowledge transfer among all of our stakeholders, including healthcare providers, government agencies, the vendor community, fellow SDOs and patients. In all of our processes we exhibit timeliness, scientific rigor and technical expertise without compromising transparency, accountability, practicality, or our willingness to put the needs of our stakeholders first.
HL7 Mission (2)

- Interoperability

“Ability of two or more systems or components to exchange information and to use the information that has been exchanged”


Functional interoperability

Semantic interoperability
Core requirements for standard exchanges

- **Nouns** – items we communicate about
  - Typically **actions** and physical **things** (persons, places, etc.)

- **Phrases** - the **essential bindings** between nouns
  - An action **happens to** a person
  - One action **causes** another
  - A person **performs** an action

- **Vocabulary & model** – common definitions
  - Assure common perspective
  - Prescribe the nouns and phrases we can use
How is Version 3 “better”?

- **Conceptual foundation** – a single, common reference information model to be used across HL7

- **Semantic foundation** – in explicitly defined concept domains drawn from the best terminologies

- **Abstract design methodology** that is technology-neutral – able to be used with whatever is the preferred technology: information resources, documents, messages, services, applications

- **Maintain a repository** of the semantic content to assure a single source, and to enable development of support tooling
Class Diagram – Normative RIM Release 1

Physical things of interest …
- Persons, Organizations, Places,
- 9
- 28

… take on Roles in health care …
Patient, Physician, Employer

… participate in Acts …
Encounters, Observations, procedures, medications …

Entities in Roles participate as …
Performer, Author, target
**Action** – the focus of health care communication & documentation

- The reason we want to automate health care data is to be able to document the **actions** taken to treat a patient:
  - A request or order for a test is an **action**
  - The report of the test result is an **action**
  - Creating a diagnosis based on test results is an **action**
  - Prescribing treatment based on the diagnosis is an **action**

- In simple terms, a medical record is a record of each of the individual **actions** that make up the diagnosis, treatment and care of a patient.
Five core concepts of the RIM

- Every happening is an **Act**
  - Procedures, observations, medications, supply, registration, etc.
- Acts are related through an **ActRelationship**
  - composition, preconditions, revisions, support, etc.
- **Participation** defines the context for an Act
  - author, performer, subject, location, etc.
- The participants are **Roles**
  - patient, provider, practitioner, specimen, employee etc.
- Roles are played by **Entities**
  - persons, organizations, material, places, devices, etc.
RIM Core Classes

Entity

- Organization
- Living Subject
- Person
- Material
- Place

Role

- Link

0..* 0..*

1 1

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Act

- Relationship

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1

Procedure

Observation

Patient Enc’nt’r

Substance Adm

Supply

Referral

Financial act

Working list

Account

Role Participation

0..*

1

Phrase

Noun
HL7 Information Model Design Rules

- An HL7 information model can not include any “class”, that is not a sub-type of a defined class in the RIM
- The “Associations” and “Attributes” used must be subtypes of the associations and attributes defined for that class in the RIM
- Cardinality, data types and other class properties, can be restricted from their RIM values, but not extended.
Binding Terminology to a Model

**Concept Domain:** a named category of like concepts (semantic type) that will be bound to one or more coded elements [documented by specifying a name, a narrative definition]

**Code System:** collection of uniquely identifiable concepts with associated representations, designations, associations, and meanings. [as simple as a table, as complex as SNOMED-CT]

**Value Set** represents a uniquely identifiable set of valid concept identifiers, where any concept identifier in a coded element can be tested to determine whether it is a member of the Value Set at a specific point in time.

**Vocabulary Binding:** the mechanism of identifying specific codes to be used to express the semantics of coded model elements in HL7 information models or coded data type properties. May be “context” binding between a value set and a concept domain, or a “model” binding of a data element to a value set or a single concept.)
Domain–Value Set Binding Example

Concept Domain defines concepts to represent an attribute in a particular design.

Code system provides a set of coded concepts.

Value set selects a sub-set of the coded concepts.

Binding asserts that a particular value set “satisfies” the domain.
The “essence” of Version 3

- Apply the ‘best practices’ of software development to developing standards – a model-based methodology
- Predicate all designs on three semantic foundations – a reference information model, a specification of data types, and a complete, carefully-selected set of terminology domains
- Require all Version 3 standards to draw from these three common resources
- Use software-engineering style tools to support the process.
The “definition” of Version 3

- A family of specifications
- Usable on a variety of technology platforms
- Built upon a shared set of core models
- Constructed in a fashion to permit the rapid development of comprehensive, fully constrained specifications
Bringing it together

- One Reference Model, one set of tools, one process produce
  - A simple common resource for patient
  - Standard clinical documents for an array of uses
  - Large, rich sets of information—electronic claims, clinical trial data
  - Clinical genomics information structures
- All taken from RIM to schemas, **and published** with a single set of effective tools
Version 3 Normative Editions

- HL7 ballots individual Version 3 standards
  - Under our consensus process
  - Ballot until you satisfy your own toughest critics – your self
- These are registered as ANSI specifications
- Standards are grouped informally as:
  - Domains – topics of healthcare interest
  - Common – Content shared by/across domains
  - Infrastructure – enables communication
  - Foundation – the basis for the V3 family of standards
- They are published annually in a comprehensive “Normative Edition”
Content of V3 Normative Editions

- Final publication form of all Normative Specifications (ANSI registered)
- Supporting Reference Material – methodology guide, readers guides, etc.
- Processable representations of all content – XML interchange format, schemas, etc.
- Documented dependency hierarchy
<table>
<thead>
<tr>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
</tr>
<tr>
<td>- Package Note to Readers</td>
</tr>
<tr>
<td>- Version 3 Guide</td>
</tr>
<tr>
<td>- Normative Edition 2011 Welcome</td>
</tr>
<tr>
<td><strong>Foundation</strong></td>
</tr>
<tr>
<td>- Reference Information Model</td>
</tr>
<tr>
<td>- Data Types: Abstract</td>
</tr>
<tr>
<td>- GELLO R2: Common Expression Language</td>
</tr>
<tr>
<td>- Refinement, Constraint and Localization</td>
</tr>
<tr>
<td>- Security (RBAC)</td>
</tr>
<tr>
<td>- Templates Project</td>
</tr>
<tr>
<td>- Using SNOMED CT</td>
</tr>
<tr>
<td>- Vocabulary</td>
</tr>
<tr>
<td><strong>Specification Infrastructure</strong></td>
</tr>
<tr>
<td>- Messaging</td>
</tr>
<tr>
<td>- Message Control Act Infrastructure</td>
</tr>
<tr>
<td>- Transmission Infrastructure</td>
</tr>
<tr>
<td>- Master File - Registry Infrastructure</td>
</tr>
<tr>
<td>- Query Infrastructure</td>
</tr>
<tr>
<td>- Transport Specifications</td>
</tr>
<tr>
<td><strong>Implementation Technology Specifications</strong></td>
</tr>
<tr>
<td>- XML</td>
</tr>
<tr>
<td>- UML</td>
</tr>
<tr>
<td><strong>Services</strong></td>
</tr>
<tr>
<td>- Common Terminology Services, Release 1</td>
</tr>
<tr>
<td>- Common Terminology Services, Release 2</td>
</tr>
<tr>
<td>- Resource Location and Updating Service (RLUS)</td>
</tr>
<tr>
<td>- Entity Identification Service</td>
</tr>
<tr>
<td>- Decision Support Service</td>
</tr>
</tbody>
</table>

**Help for readers**
- Fundamental models, including ANSI-ISO RIM, ISO/HL7/CEN data types, vocabulary, constraint rules, etc
- Message wrappers and so on
- Implementation technologies
- Service specifications
Version 3 - where is it being used?

As CDA documents, as SOA designs, as interchanged Messages

- In large-scale projects deriving from governmental mandates
- For communications between multiple, independent, “non-integrated” entities
- Wherever there are requirements to communicate parts of an EHR and to maintain the integrity of the EHR data relationships
V3 Lessons

- “Universal interoperability” demands great detail captured in complex specifications
- Simpler paradigms – CDA documents, Structured Product Labeling, localized interoperability – that focus on selected areas have had greater uptake
- HL7 has a wealth of good designs in a variety of domains of interest; in common model elements; and in universal data types, but needs to simplify the end product for implementers.
V3 Directions (selected)

- CDA R3 – Extends base design model so that the document can include content from any RIM-based model
- Green – CDA – Support simplified implementation CDA documents
- RIMBAA (RIM-Based Application Architecture) – a development environment established solely on RIM-based elements
- EHR-FM (EHR Functional Models) – add information analysis model requirements
- FHIR* - (Fast Health Interoperability Resources) – Will develop and standardize a suite of information “resources” that can be readily implemented
V3 Directions (FHIR)

FHIR* - (pronounced “fire”):

- Draws requirements from the best of V3, V2 & CDA
- 80-20 rule – the 20% of content that meets 80% of needs
- Rigorously mapped to HL7/ISO RIM and Data Types
- Represents each resource once, not in many variants
- Includes RIM-mapped extension formalism to meet specific needs
- Uses business names to promote understanding & adoption
- Targeted to RESTful transport, but supports documents, messaging, SOA and more

[* Google “FHIR”]
The power of HL7 and Version 3

- Consensus standards, developed by volunteers who come from countries around the world to undertake “practical” informatics
- Welcoming new participants, and their ideas
- Founded on solid principles of system design, focusing on models & terminology
- Models that emphasize clinical concepts, and the supporting context needed for decision support, clinical decision making and just plain “solid patient care”

Thank you!