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

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• 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.
Interoperability

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

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 technology de jour

• **Maintain a repository** (database) of the semantic content to assure a single source, and enable development of support tooling
**Action** – the focus of health care messaging

- 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.
“Rules” for HL7 Designs

• An HL 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.
**Concept Domain** is 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** is defined as a collection of codes with associated designations and meanings [as simple as a table, as complex as SNOMED-CT]

**Value Set** represents a uniquely identifiable set of valid concept representations, where any concept representation can be tested to determine whether or not it is a member of the value set [usually the concept representations are drawn from a single Code System].

**Domain-to-ValueSet Binding** is an assertion that a particular Value Set provides a complete representation of the content of the Concept Domain using values drawn from a particular code system(s)
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 two semantic foundations – a reference information model and a complete, carefully-selected set of terminology domains
- Require all Version 3 standards to draw from these two common resources
- Use software-engineering style tools to support the process.
Tools – for developers and implementers

- Enabled by the presence of “processable” representations of V3 standards – Data bases and XML representations

- Tools for defining, refining and documenting these designs
  - Enforce the “rules” for refinement and localization
  - Draw their starting content from RIM, Vocabulary and previous models
  - Produce processable artifacts that allow this cycle to repeat

- Designed to allow rapid deployment and application of the specifications to particular locale
The problem

Storyboard: A clinician, using a local medical office support system, orders a lab test for one of her patients. The test will be performed on a specimen collected at her office. She will send the specimen by courier, and expects to receive a confirmation that the test will be performed, and a result of the test.
Building messages – relational phrase

ObservationOrder
- classCode*: <= OBS
- moodCode*: <= RQO
- id*: II [1..1]
- code: CE CWE [0..1] <= ObservationType (e.g. LOINC code)
- text: ED [0..1]
- statusCode*: CS CWE [1..1] <= ActStatus "active"
- effectiveTime: GTS [0..1]
- ("physiologically relevant time" aimed for)
- activityTime: IVL<TS> [0..1]
- priorityCode: CE CWE [0..1] <= ActPriority "R"
- confidentialityCode*: SET<CE> CWE [1..*] <= Confidentiality "N"
- methodCode: SET<CE> CWE [0..*] <= ObservationMethod
- targetSiteCode: SET<CD> CWE [0..*] <= ActSite

author
- typeCode*: <= AUT
- contextControlCode*: [1..1]
- <= ContextControlPropagating "OP"
- signatureCode*: CS CWE [1..1]
- signatureText:

performer
- typeCode*: <= PRF
- contextControlCode*: [1..1]
- <= ContextControlPropagating "OP"

subject
- typeCode*: <= SBJ
- contextControlCode*: [1..1]
- <= ContextControlPropagating "OP"

recordTarget
- typeCode*: <= RCT
- contextControlCode*: [1..1]
- <= ContextControlPropagating "OP"

definition
- typeCode*: <= INST
- contextControlCode*: [1..1] <= AN
- contextConductionInd*: [1..1]

ObservationDefinition
- classCode*: <= OBS
- moodCode*: <= DEF
- id: II [1..1]
Demo Example – POLB_RM992100

Order
- Author
  - Physician
- Performer
  - Laboratory
- Subject
  - Specimen
- Record target
  - Patient
- Definition
  - Ordered test

Code:
<xs:complexType name="POLB_MT992100.ObservationOrder">
  <xs:sequence>
    <xs:element ref="InfraStructureRootElements"/>
    <xs:element name="id" type="II"/>
    <xs:element name="code" type="CE" minOccurs="0"/>
    <xs:element name="text" type="ED" minOccurs="0"/>
    <xs:element name="statusCode" type="CS"/>
    <xs:element name="effectiveTime" type="SXCM_TS" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="activityTime" type="IVL_TS" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="priorityCode" type="CE" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="confidentialityCode" type="CE" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="methodCode" type="CE" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="targetSiteCode" type="CD" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="subject" type="POLB_MT992100.Subject" nillable="true"/>
    <xs:element name="recordTarget" type="POLB_MT992100.RecordTarget" nillable="true"/>
    <xs:element name="performer" type="POLB_MT992100.Performer" nillable="true"/>
    <xs:element name="author" type="POLB_MT992100.Author" nillable="true"/>
    <xs:element name="definition" type="POLB_MT992100.Definition" nillable="true"/>
  </xs:sequence>
  <xs:attributeGroup ref="InfraStructureRootAttributes"/>
  <xs:attribute name="nullFlavor" type="NullFlavor" use="optional"/>
  <xs:attribute name="classCode" type="ActClassObservation" use="required"/>
  <xs:attribute name="moodCode" type="ActMood" use="required" fixed="RQO"/>
</xs:complexType>
The essence of Version 3

• A family of specifications
• Built upon a single model of
  – How we construct our messages
  – The domain of discourse
  – The attributes used
• Constructed in a fashion to rapidly develop a comprehensive, fully constrained specification in XML
Bringing it together

• One Reference Model, one set of tools, one process produce
  – The mundane – a Common element for patient
  – The complex – a specification to communicate annotated ECGs for clinical trials
  – Large, rich sets – electronic claims, clinical trial data
  – The esoteric – clinical genomics
  – The basics – message control (headers)
• All taken from RIM to schemas, and published with a single set of effective tools
Version 3 Normative Editions

• After 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

• Grouped informally as:
  – Domains – topic of healthcare interest
  – Common – Content shared by/across domains
  – Infrastructure – enables communication
  – Foundation – the basis for the V3 family of standards

• And bundled into 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 – data bases, XML interchange format, schemas, etc.
• Documented dependency hierarchy
<table>
<thead>
<tr>
<th>Table of Contents</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><strong>Foundation</strong></td>
</tr>
<tr>
<td>- Reference Information Model</td>
</tr>
<tr>
<td>- Data Types: Abstract</td>
</tr>
<tr>
<td>- Vocabulary</td>
</tr>
<tr>
<td>- Refinement and Localization</td>
</tr>
<tr>
<td>- GELLO: Common Expression Language</td>
</tr>
<tr>
<td><strong>Specification Infrastructure</strong></td>
</tr>
<tr>
<td>- Messaging</td>
</tr>
<tr>
<td>- Master File / Registry Infrastructure</td>
</tr>
<tr>
<td>- Message Control Act Infrastructure</td>
</tr>
<tr>
<td>- Query Infrastructure</td>
</tr>
<tr>
<td>- Transmission 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</td>
</tr>
<tr>
<td><strong>Domains</strong></td>
</tr>
<tr>
<td>- Common Domains</td>
</tr>
<tr>
<td>- Administrative Management Domains</td>
</tr>
<tr>
<td>- Account and Billing</td>
</tr>
<tr>
<td>- Claims &amp; Reimbursement</td>
</tr>
<tr>
<td>- Patient Administration</td>
</tr>
<tr>
<td>- Scheduling</td>
</tr>
<tr>
<td>- Health and Clinical Management Domains</td>
</tr>
<tr>
<td>- Clinical Document Architecture</td>
</tr>
<tr>
<td>- Medical Records</td>
</tr>
<tr>
<td>- Public Health Reporting</td>
</tr>
<tr>
<td>- Regulated Studies</td>
</tr>
<tr>
<td><strong>Background Documents</strong></td>
</tr>
<tr>
<td>- Version 3 Guide</td>
</tr>
<tr>
<td>- Glossary</td>
</tr>
<tr>
<td><strong>Support Files</strong></td>
</tr>
<tr>
<td>- Schemas</td>
</tr>
</tbody>
</table>

- **Help for readers**
- **Fundamental models – RIM, vocabulary, data types, rules**
- **Message wrappers and so on**
- **Patient and insurance accounting, Patient management, Scheduling**
- **CDA**
- **Public Health Messaging**
- **Clinical studies**
ANSI/ISO Standard RIM
Data types as HL7/CEN/ISO Spec
Refinement “rules” standardized
Templates & Terminology in DSTU
Vocabulary concept domains, code systems & value sets
Infrastructure, Implementation & Services

Messaging and Registry infrastructure
Message Transport in variety of modes
Message expression in XML & UML
Services (SOA) specifications
## Array of Specific Domains

<table>
<thead>
<tr>
<th>Universal Domains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Account and Billing</td>
</tr>
<tr>
<td>Blood, Tissue and Organ</td>
</tr>
<tr>
<td>Care Provision</td>
</tr>
<tr>
<td>Clinical Genomics</td>
</tr>
<tr>
<td>Claims &amp; Reimbursement</td>
</tr>
<tr>
<td>Clinical Decision Support</td>
</tr>
<tr>
<td>Clinical Document Architecture</td>
</tr>
<tr>
<td>Clinical Statement</td>
</tr>
<tr>
<td>Common Message Element Types</td>
</tr>
<tr>
<td>Imaging Integration Domain</td>
</tr>
<tr>
<td>Immunization</td>
</tr>
<tr>
<td>Laboratory</td>
</tr>
<tr>
<td>Medication</td>
</tr>
<tr>
<td>Materials Management</td>
</tr>
<tr>
<td>Medical Records</td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>Orders</td>
</tr>
<tr>
<td>Patient Administration</td>
</tr>
<tr>
<td>Personnel Management</td>
</tr>
<tr>
<td>Pharmacy</td>
</tr>
<tr>
<td>Registries</td>
</tr>
<tr>
<td>Public Health</td>
</tr>
<tr>
<td>Regulated Products</td>
</tr>
<tr>
<td>Regulated Studies</td>
</tr>
<tr>
<td>Scheduling</td>
</tr>
<tr>
<td>Shared Messages</td>
</tr>
<tr>
<td>Specimen Domain</td>
</tr>
<tr>
<td>Therapeutic Devices</td>
</tr>
</tbody>
</table>
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
- Whereever there are requirements to communicate parts of an EHR and to maintain the integrity of the EHR data relationships
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!