FHIM Model Content Overview

LINKING
HEALTHCARE
COMMUNITIES

Federal Health Information Model (FHIM) and Associated Terminology Models

- Goal
  - Produce a logical, health information model that supports semantic interoperability and that is built by harmonizing information from the individual Federal partners and standards organizations

- Principles
  - The model will be expressed in standard Unified Modeling Language (UML) notation
  - The model will be designed to meet all Federal partner semantic interoperability needs for the exchange of information with other organizations
  - The model will support existing national health standards
  - The model will be in the public domain, freely available and easy to access
  - The model will be specified as a logical model consisting of a set of domain models

Benefits of Information Modeling Project Information and Terminology Models

- FHIM is a Platform Independent Model (PIM), expressed in standard UML
- The modeling process harmonizes content (information and terminology) across organizations
- The models are integrated (2-way links between Information and Terminology models)
- The models support efficient standards development
  - Standard ballot materials can be *generated* from the FHIM
- The models are being integrated with the Model Driven Health Tools (MDHT) to support a model-driven approach to development of information exchange interoperability specifications
- FHIM maintains traceability to underlying standards - especially HL7, NCPDP, and X12 – as well as to S&I Initiatives
  - FHIM derivative models add "interoperability use cases", which provide additional constraints. These derivative models maintain traceability to the use cases and to the HL7 EHR-S Functional Model
- The models can be leveraged by organizations for internal use in systems and database development

Federal Health Information Model (FHIM) and Associated Terminology Models

- The FHIM Terminology model is a UML model that defines code systems, concept domains and value sets

  - The Terminology model describes the underlying terminology constructs, including urls and version numbers so that software can be automatically generated to insure that implementations are conformant at run-time

- The FHIM (logical, structural) model "binds to" (i.e., links to) the FHIM Terminology model using the same UML Profile that MDHT uses

- The combination of the two FHIM models results in rigorous specifications against which conformance can be tested automatically

Model-driven Constraints in FHIM

Model-Driven Health Tools (MDHT) Examples

Code system vs. Value Set constraints

Problems | @ Javadoc | Declaration | Console | Properties ✕ | Search

`<<codeSystemConstraint, propertyValidation>> <Property> functionCode : CE [0..1]`

- General
- CDA Tools
- **Terminology**
- Documentation
- Advanced

Vocabulary Constraints
☐ Concept Domain ☑ Code System ☐ Value Set

Code System

[Select Code System...] [X] CodeSystems::ParticipationFunction

Name: ParticipationFunction   ID: 2.16.840.1.113883.5.88   Version:

Binding: Static ▾   Code: Code Display Name:

Problems | @ Javadoc | Declaration | Console | Properties ✕ | Search

`<<valueSetConstraint, propertyValidation>> <Property> code : CE [0..1]`

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Vocabulary Constraints
☐ Concept Domain ☐ Code System ☑ Value Set

Value Set

[Select Value Set...] [X] consol-vocab::Healthcare Provider Taxonomy (NUCC - HIPAA)

Name: Healthcare Provider Taxonomy (NUCC - HIPAA)   ID: 2.16.840.1.114222.4.11.1066

Binding: Dynamic ▾   Version:

Fixed value constraints

Benefits of Model-Driven Approach

» Analyze once implement many times

  – Maintain all your project constraints and improve them over time rather than starting "from scratch" if a new standard is needed

    • Consistent with FHIM/Federal Guidelines

  – Your IG model may be reused in the future for other interoperability standards IGs

    • Allows for transition from one information exchange format to another

      – E.g. HL7 Version 2 to FHIR

FHIM model instance examples

The following slides show examples of information modeled in the FHIM, including the vocabulary and metadata

FHIM Problem List instance example

<<metadata (iso 11179)>>
```
dataElementCode : String = "11368-8"
dataElementCodeSystem : String = "LOINC"
dataElementDisplayText : String = "Illness or injury onset date and time"
```

<<metadata (iso 11179)>>
```
dataElementCode : String = "56818-8"
dataElementCodeSystem : String = "LOINC"
dataElementDisplayText : String = "Problem description [identifier]"
```

«Observation»
HealthConcern
```
dateOfOnset : PointInTime = 20140415
«ValueSetConstraint» healthConcern : Code
```

«ValueSetVersion»
Problem Value Set

«Value Set Version»
```
binding = Static
codeSystem = fhim-vocab::CommonProductVocab::SNOMED-CT
definition = "This describes the problem. Diagnosis/Problem List is broadly defined as..."
effectiveDate = ""
expirationDate = ""
fullName = "Problem Value Set"
identifier = "2.16.840.1.113883.3.88.12.3221.7.4"
releaseDate = ""
revisionDate = "07/23/2009"
source = ""
status = Active
statusDate = ""
type = Extensional
url = "https://phinvads.cdc.gov/vads/ViewValueSet.action?id=70FDBFB5-A277-DE11-9B52-0015173D1785"
version = "1"
```
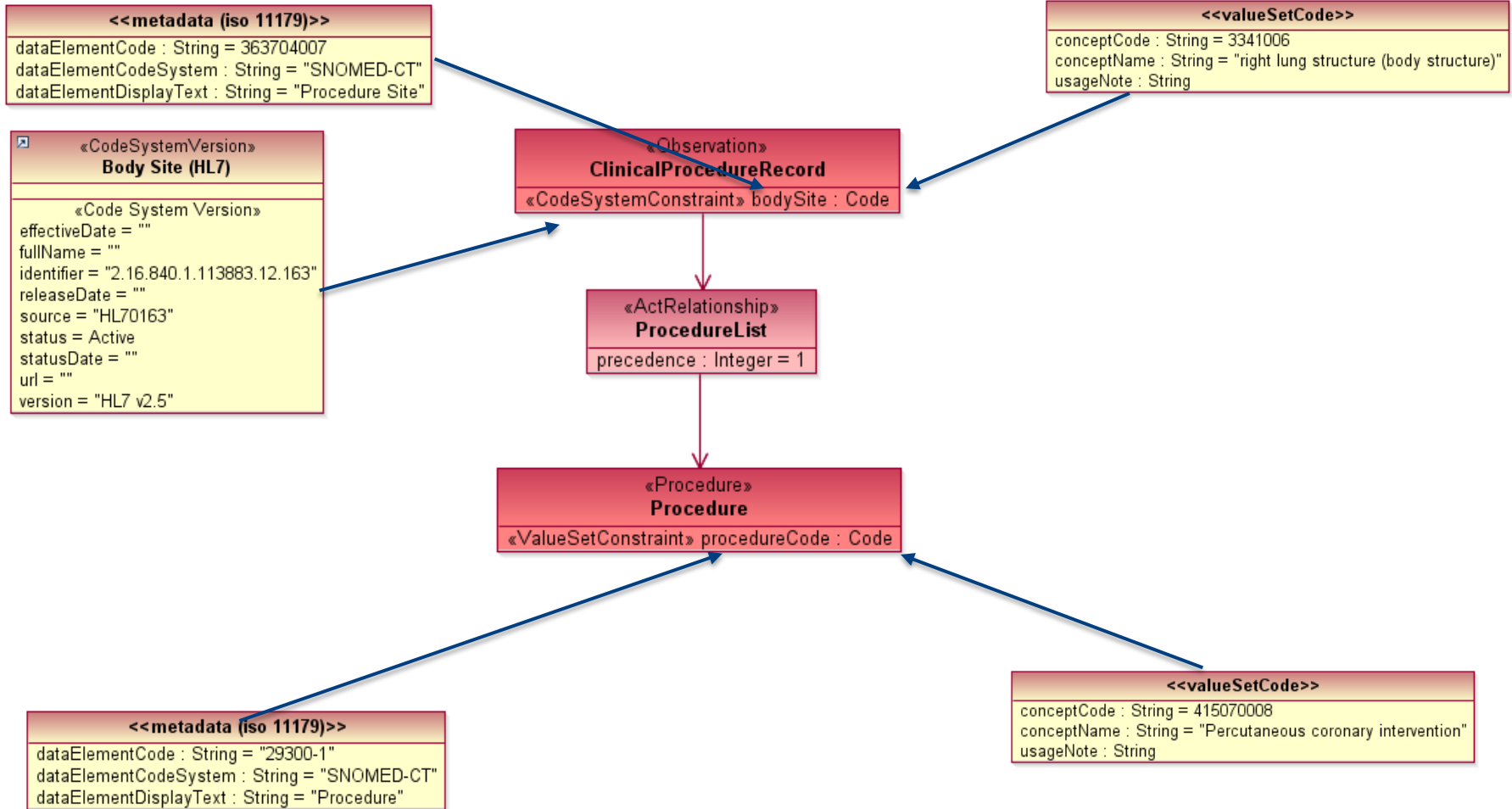
<<valueSetCode>>
```
conceptCode : String = 44054006
conceptName : String = "Diabetes mellitus type 2 (disorder)"
usageNote : String
```

Note that the request was to show "problem date"; the FHIM has several dates concerning problems (aka Health Concerns), including date of onset, and date diagnosed. This model snippet assumes that "problem date" means date of onset.
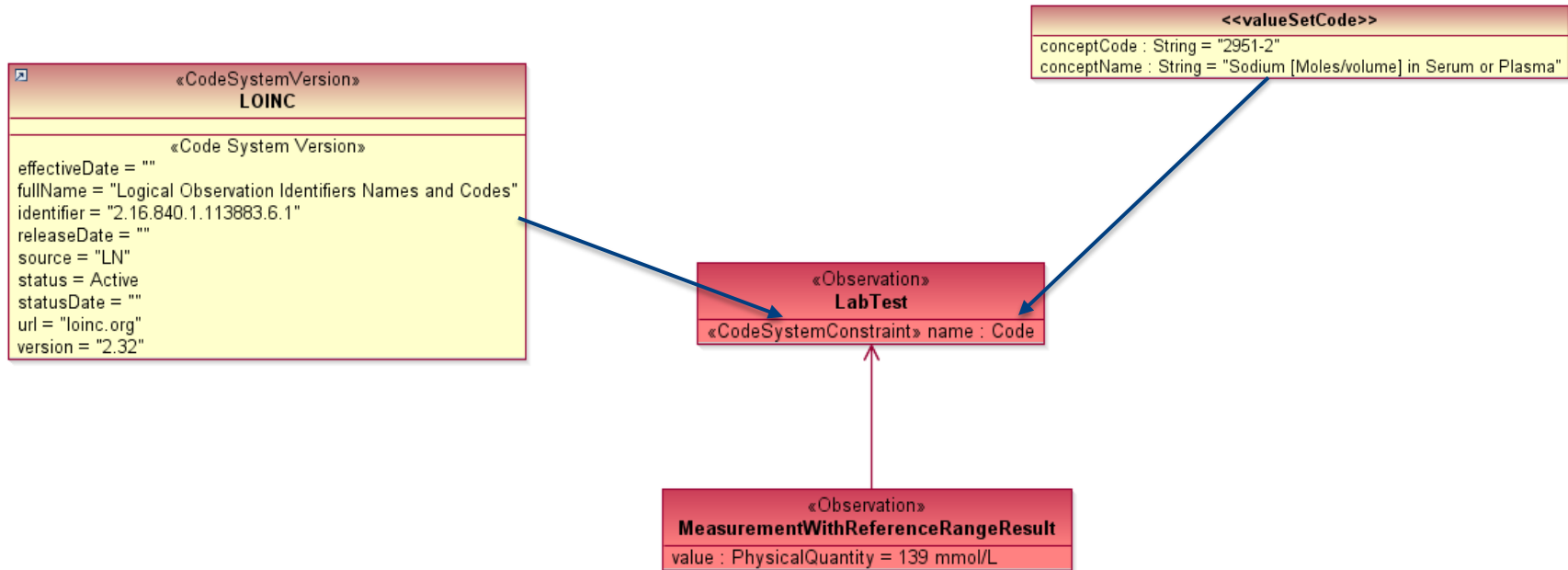
FHIM Procedure instance example

<<metadata (iso 11179)>>
dataElementCode : String = 363704007
dataElementCodeSystem : String = "SNOMED-CT"
dataElementDisplayText : String = "Procedure Site"

<<valueSetCode>>
conceptCode : String = 3341006
conceptName : String = "right lung structure (body structure)"
usageNote : String

«CodeSystemVersion»
Body Site (HL7)

«Code System Version»
effectiveDate = ""
fullName = ""
identifier = "2.16.840.1.113883.12.163"
releaseDate = ""
source = "HL70163"
status = Active
statusDate = ""
url = ""
version = "HL7 v2.5"

«Observation»
ClinicalProcedureRecord
«CodeSystemConstraint» bodySite : Code

«ActRelationship»
ProcedureList
precedence : Integer = 1

«Procedure»
Procedure
«ValueSetConstraint» procedureCode : Code

<<metadata (iso 11179)>>
dataElementCode : String = "29300-1"
dataElementCodeSystem : String = "SNOMED-CT"
dataElementDisplayText : String = "Procedure"

<<valueSetCode>>
conceptCode : String = 415070008
conceptName : String = "Percutaneous coronary intervention"
usageNote : String

FHIM Lab test instance example

FHIM Medicinal Product instance example

«CodeSystemVersion»
RxNormClinicalDrugOrPack

«Code System Version»
effectiveDate = ""
fullName = "RxNorm Clinical Drug Or Pack"
identifier = ""
releaseDate = ""
source = "RxNorm Clinical Drug Or Pack"
status = Active
statusDate = ""
url = ""
version = ""

«Entity»
MedicinalProduct
«CodeSystemConstraint» name : Code

<<valueSetCode>>
conceptCode : String = 855302
conceptName : String = "Warfarin Sodium 2 MG Oral Tablet"
usageNote : String

«Role»
DrugIngredient
quantity : PhysicalQuantityRatio = 2 mg/tablet

«ManufacturedMaterial»
Substance
«CodeSystemConstraint» ingredientIdentifier : Code

«CodeSystemVersion»
RxNormPreciseIngredient

«Code System Version»
effectiveDate = ""
fullName = "RxNorm Precise Ingredient"
identifier = ""
releaseDate = ""
source = "RxNorm Precise Ingredient"
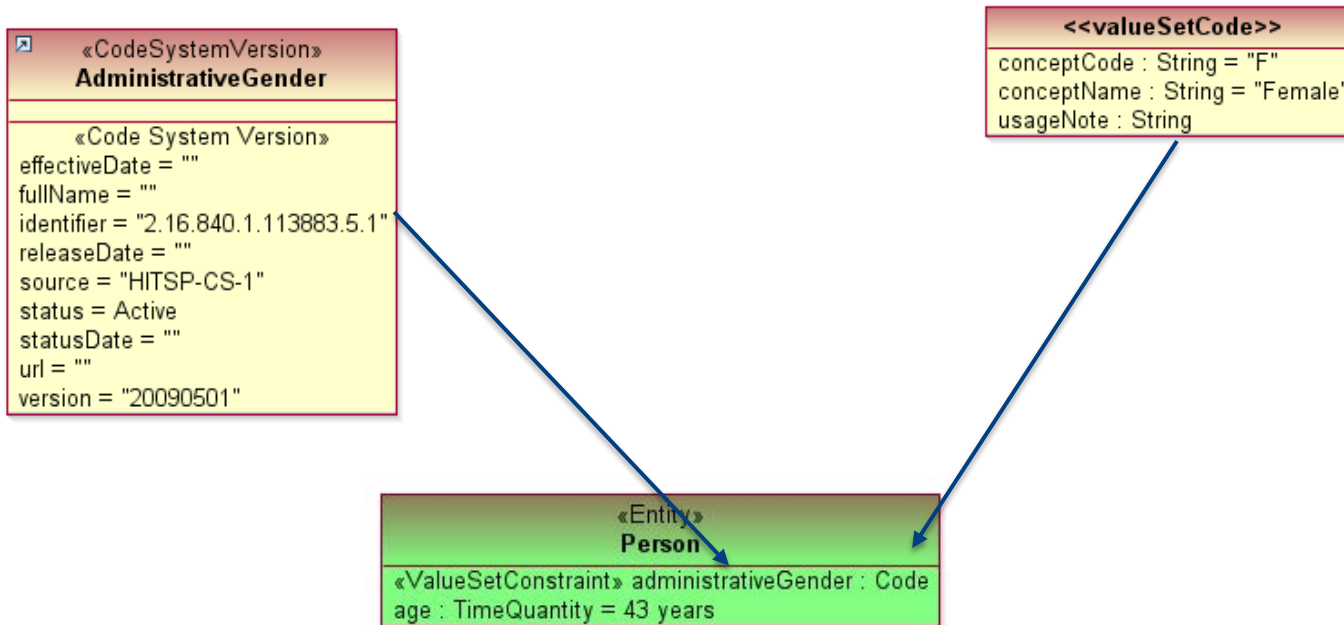status = Active
statusDate = ""
url = ""
version = ""

<<valueSetCode>>
conceptCode : String = 114194
conceptName : String = "Warfarin Sodium"
usageNote : String
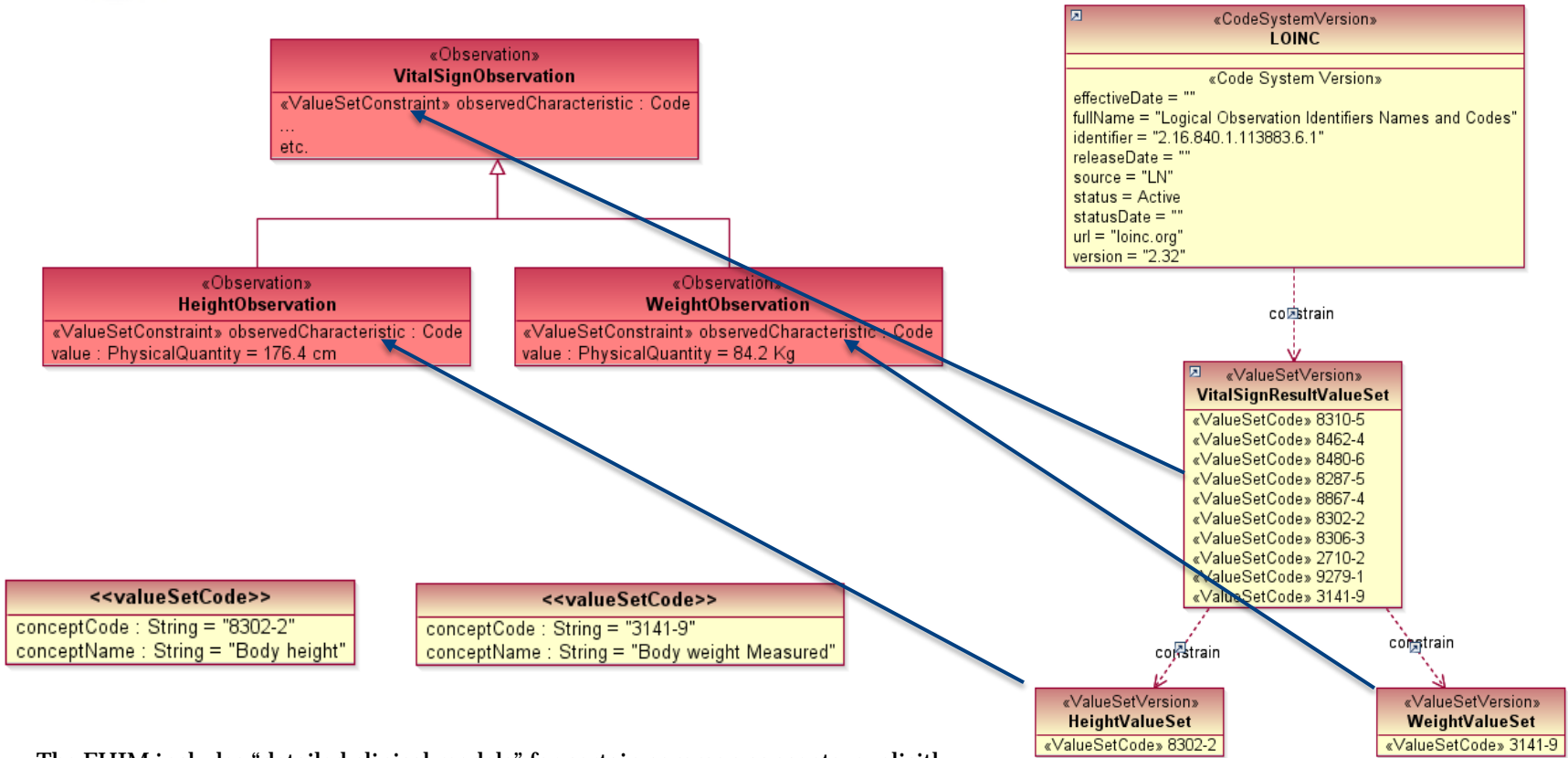
FHIM Demographics instance example

«CodeSystemVersion»
AdministrativeGender

«Code System Version»
effectiveDate = ""
fullName = ""
identifier = "2.16.840.1.113883.5.1"
releaseDate = ""
source = "HITSP-CS-1"
status = Active
statusDate = ""
url = ""
version = "20090501"

<<valueSetCode>>
conceptCode : String = "F"
conceptName : String = "Female"
usageNote : String

«Entity»
Person
«ValueSetConstraint» administrativeGender : Code
age : TimeQuantity = 43 years

FHIM Vital Signs instance example

The FHIM includes "detailed clinical models" for certain common concepts, explicitly showing first-class classes for each concept. It is important to note that after reaching a certain point in the model (VitalSignObservation, in this case), the detailed clinical model classes could be *generated* from an ontology or a knowledge base

Conclusion

» The FHIM contains all of the data elements requested

» The FHIM unambiguously binds to the proper valuesets

» The FHIM can link the UML concepts to a 11179 metadata registry (via UML stereotypes)

– In fact, we could generate a 11179 registry from the FHIM

» The FHIM plus MDHT enables *generation* of multiple kinds of artifacts, including interoperability specifications and code that developers can implement