Federal Health Architecture
Federal Health Information Model

Immunizations and Laboratory Version 1.0
Datatypes Version 1.0

Contents

Acknowledgments

FHA brings together all federal agencies that need to share electronic health information to support citizen health care and streamline healthcare-related benefits. Through cooperation, agencies are translating the vision of interoperable health IT into a reality.

LEAD PARTNERS:

Department of Health & Human Services *(Managing Partner)*, Department of Defense, Department of Veterans Affairs

PARTICIPATING AGENCIES:

Administration for Children and Families

Administration on Aging

Agency for Healthcare Research and Quality

Agency for Toxic Substances and Disease Registry

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Office of Personnel Management

Railroad Retirement Board

Small Business Administration

Social Security Administration

United States Agency for International Development

Revision History

Rev	Date	Changes
1.0	April 2013	Inital Version

Chapter 1

INTRODUCTION

Topics:

Overview

The Federal Health Architecture (FHA) is an e-government initiative managed by the Office of the National Coordinator for Health IT (ONC) within the Department of Health and Human Services (HHS). FHA was formed to coordinate health IT activities among the more than 20 federal agencies that provide health and healthcare services to citizens.

FHA and its federal partners are helping build a federal health information technology environment that is interoperable with private sector systems and supports the President's plan to enable better point-of-service care, increased efficiency and improved overall health in the U.S. population.

FHA is responsible for:

- Supporting federal efforts to deploy standardized health IT systems and measure health IT standard adoption
- Ensuring that federal agencies can seamlessly exchange health data among themselves, with state, local and tribal governments, and with private-sector partners
- Providing guidance to federal agencies on how to best manage and maintain health IT investments

FHA contributes to the national health IT agenda through:

- Input: FHA provides a coordinated federal voice and collaboration on national health IT solutions
- Implementation: FHA gives guidance to federal agencies on standards-compliant health IT investments that support interoperability
- Accountability: FHA ensures accountability for health IT programs in the federal government in an effort to advance interoperability

At their core, all FHA activities focus on improving citizen access to care, improving quality of care and reducing costs.

FHA is working with federal agencies to build the Federal Health Information Model (FHIM), a modeling initiative focused on producing a logical, health information model that supports semantic interoperability among federal agencies and their health information exchange partners. The model is built by harmonizing information from federal partners and standards development organizations (SDOs) and presenting it in logical and conceptual views based on specialized health domains.

This logical model uses the HL7 Reference Information Model (RIM) as a reference model and is designed to support multiple Office of Interoperability and Standards initiatives, including CONNECT and the S&I Framework. FHA and its stakeholders also use the FHIM to view and analyze information exchanges that have been identified by federal partners and SDOs, and the FHIM model is also used to support the development of National Information Exchange Model (NIEM) compliant information exchanges by the S&I Framework.

Scope

The scope of this document is limited to the Data Types and Person Demographics domains. The Data Types are common, reusable structures that are often needed in healthcare applications. The Person domain contains information about Persons and other living entities.

Audience

This guides intent is to document the data requirements of health exchanges and as such it is intended for Subject Matter Experts, Terminologists, Software Architects and Developers. While a knowledge of UML is not a requirement it is highly recommended that readers can navigate UML class diagrams as they present a valuable perspective to the content of the publication.

Organization of This Guide

The guide contains a chapter per each included domain. Each of the domain chapters will start with the **Diagram Section** containing a UML Class Diagram and corresponding description. This can be followed by an optional **Definitions Section** where all class structures are defined and finally an optional **Value Sets Section** where any terminology leveraged by the domain will be documented.

The Definition Section will have a table per class and a row per property with two columns, *Content* and *Description*. The Content column contains the name, type, cardinality of the property and a possible reference to a value set while the Description column will contain a detailed description of the document. The order of the attributes are first by UML feature type (Attribute then Association) then by the name. Attribute types tend to be simple data types while associations types tend to be other classes definitions. The upper bound cardinality of "*" should be interpreted as no restriction on the number of instances.

The Value Sets Section will have a table per value set. The format contains the name of the value set, code system, version, definition and a URL for the value set. Additionally if there are values available, each value will have a row with its code, code system, and print name.

Chapter 2

FHIM Domain

Topics:

The Federal Health Information Model (FHIM) is a Unified Modeling Language (UML) model that describes the health-related Information needed by the Federal Health Architecture (FHA) federal partner organizations. The FHIM is a Logical Information Model, suitable to guide the Enterprise Architecture of the federal partner organizations – in other words, each agency's Enterprise Data Architecture would conceivably subset and specialize the FHIM models. The FHIM model is aligned with existing and emerging healthcare IT standards, such as those issued by HL7 and IHE, and those endorsed or profiled by HITSP and the ONC Standards and Interoperability Framework for incorporation into Meaningful Use regulations.

One of the primary goals of the FHIM is to enable meaningful information exchange within the partner agencies and externally with the broader health community. Therefore, the FHIM provides a semantic information basis for information exchange, traceability, and alignment into industry information models and standards. FHIM classes and attributes are aligned to the HL7 3.0 Reference Information Model (RIM). This allows standards developers to transform the FHIM into a form that can be used to generate industry-standard HL7 payloads and messaging. The FHIM currently supports transforms to HL7 V3 and NIEM, but other standards are envisioned, including HL7 version 2, ASC X12, Oracle, Java, etc.

The FHIM is an integrated model, and each diagram shows only a portion of the model; otherwise it would become too unwieldy to navigate. When a class in a diagram comes from a different package, it will contain "(from <package>)" beneath the class name, where <package> is the name of the package containing that class. Whenever you see a class on a diagram that contains "(from <package>)", please view that package for more information on what other relationships that class may have.

Diagrams

FHIM Overview Diagram

Class Diagram

The FHIM is organized into information “domains”, which are simply logical groupings of related concepts. These domains are represented in the model by using UML Packages. It is important to note that every element in the model can “see” every other element in the model – the packages serve as convenient containers for groups of elements, not hermetic barriers. Therefore, domain diagrams can and do routinely include classes from other parts of the model. In order to explicitly indicate when a class from another package is being referenced, the class will be annotated with the owning package name.

The FHIM was initially populated using existing models contributed by the partner agencies, including the VHA Health Information Model (VHIM), the Biomedical Research Integrated Domain Group (BRIDG) Model, the Common Product Model (CPM), the Integrated Case Safety Report (ICSR), and various other models developed by the agencies directly at HL7. Since the VHIM was the most comprehensive model, it was used as the starting point, with the FHIM modeling style applied. Then each domain is refined by teams comprised of representatives from the federal partner organizations. Therefore, the FHIM contains domains that are in various states of completion, ranging from not started (aside from the initial application of the FHIM modeling style to the VHIM content) to in-progress to completed.

This diagram is the main diagram of the FHIM, and it simply shows the UML packages which make up the FHIM. The packages are color-coded to indicate the current state of completion. Packages which are unchanged from the federal partner-supplied models are red, packages which are in-progress are yellow, and completed packages are green.

FHIM data elements use simple or “primitive” datatypes wherever possible, but the FHIM does define several common structures for complex yet common cases (e.g, “Address). See the Datatypes package for details on these.


FHA Federal Health Information Model (FHIM)
AdverseEventRepo...
Allergies
AudiologyAndSpe...
Assessment
BehavioralHealth
BloodBank
CarePlan
ClinicalDecisionSu...
ClinicalDocument
Consultation
Dental
Dietetics
Encounter
EnrollEligCOB
HealthConcern
HomeBasedPrima...
Imaging
Immunization
Lab
OncologyRegistry
Orders
PatientEducation
Person
Pharmacy
Prosthetics
Provider
PublicHealthReport...
Radiology
SecurityAndPrivacy
SocialWork
SpinalCord
Surgery
VitalSigns
WomensHealth
Common
Datatypes
FHIM modeling complete
FHIM modeling in progress
Unchanged from the VHIM
Color Key

Chapter 3

Immunization Domain

Topics:

The FHIM Immunization domain is concerned with the documentation surrounding ordering, administration, and reporting to public authorities of vaccines. There are three potential "entry points", the primary one being the Immunization History List. The Immunization History List can be composed of entries from multiple organizations and may include entries describing actual immunizations as well as immunizations that did not occur for some reason.

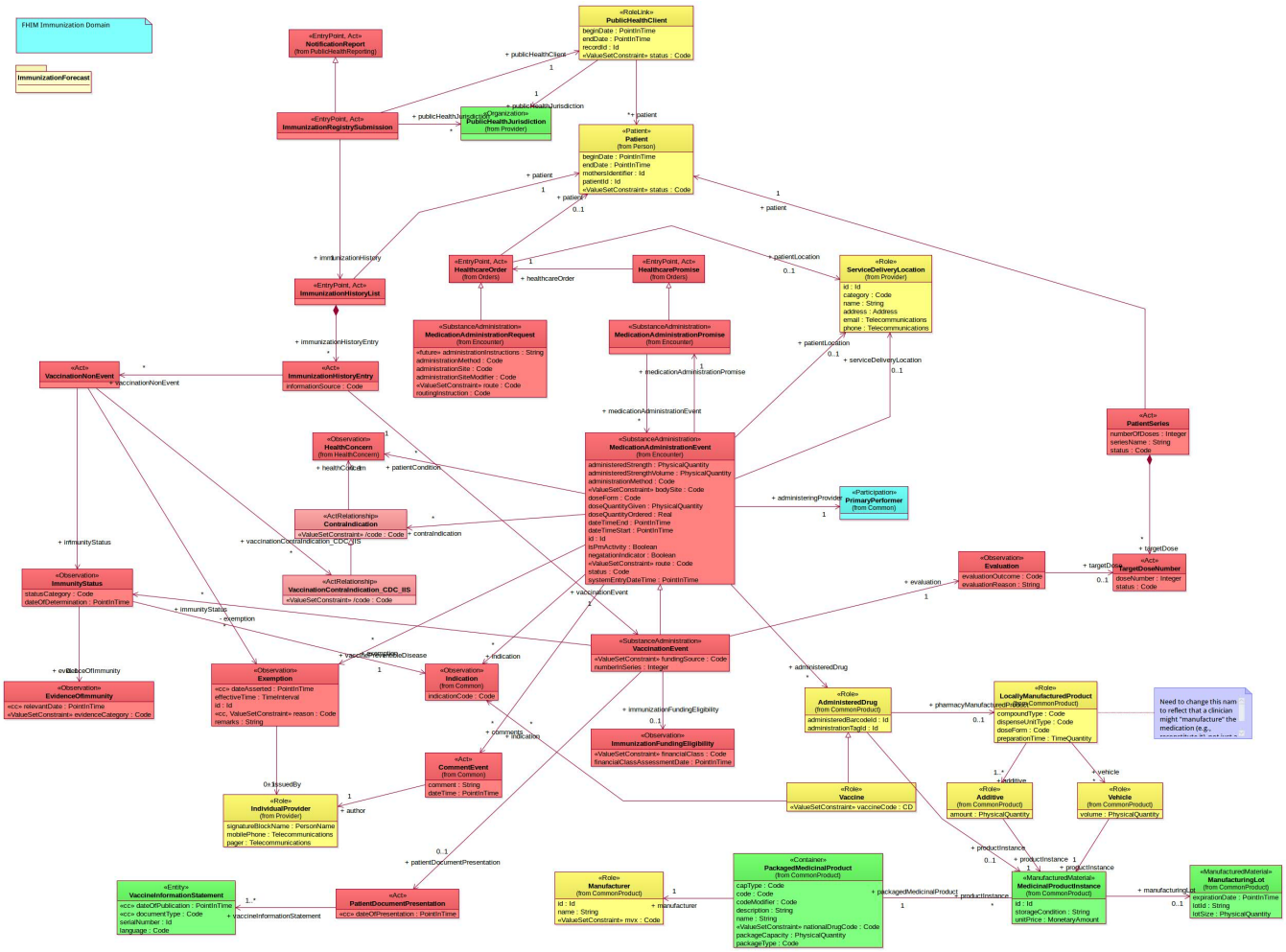
There currently exists a subpackage in this domain that deals with forecasting of immunizations, which is out of scope for this iteration of the FHIM, but was modeled in the HL7 Domain Analysis Model, which was one of the sources for this domain. The Immunization Forecast will likely be modeled in a future iteration.

Need to change this name to reflect that a clinician might "manufacture" the medication (e.g., reconstitute it), not just a pharmacist.

Diagrams

_Immunization

Class Diagram



Definitions

ContraIndication

Derivations

- *VaccinationContraIndication_CDC_IIS* is a kind of ContraIndication

Description

"A factor that renders the administration of a drug or the carrying out of a medical procedure inadvisable." - Stedman's Medical Dictionary.

Note that because almost all Contra-Indications are Health Concerns, for example, "Allergy to Eggs", "Allergy to Aluminum", "Current fever with moderate-to-severe illness", the Contra-Indication is modeled as relationship to

Health Concern, and the Contra-Indication code may be derived from the Health Concern code. This having been said, there are some members of the Contra-Indication Value Set that are too general to point to a single Health Concern, even though they might still be derivable from the Health Concern list. Examples include "Chronic disease (disorder)", and "Immunodeficiency due to any cause, including HIV (hematologic and solid tumors, congenital immunodeficiency, long-term immunosuppressive therapy, including steroids)".

Content	Description
code : *Code* (1..1) See *Vaccination Contraindication (PHVS_IIS)* definition for values.	"A factor that renders the administration of a drug or the carrying out of a medical procedure inadvisable." - Stedman's Medical Dictionary. Note that because almost all Contra-Indications are Health Concerns, for example, "Allergy to Eggs", "Allergy to Aluminum", "Current fever with moderate-to-severe illness", the Contra-Indication is modeled as relationship to Health Concern, and the Contra-Indication code may be derived from the Health Concern code. This having been said, there are some members of the Contra-Indication Value Set that are too general to point to a single Health Concern, even though they might still be derivable from the Health Concern list. Examples include "Chronic disease (disorder)", and "Immunodeficiency due to any cause, including HIV (hematologic and solid tumors, congenital immunodeficiency, long-term immunosuppressive therapy, including steroids)".
healthConcern : *HealthConcern* (0..1)	Indicates the Health Concern that contra-indicates the administration of a drug.

Evaluation

Description

This class represents an evaluation of a given vaccination in which an attempt is made to match the vaccination with a target dose number. If the vaccination event passes the rules for a target dose in a series, the evaluation outcome will "valid" and will point to the appropriate target dose number. Other wise, there will not be a link to the target dose number.

Content	Description
evaluationOutcome : *Code* (1..1)	Indicates the outcome of the evaluation of this vaccine dose administered. Possible values include: Valid, Invalid, NeverEvaluated. Note that NeverEvaluated would be appropriate for vaccines that do not occur in series, or for which there are no rules for the series.
evaluationReason : String (1..1)	Indicates any circumstances which impacted the validation of this vaccine dose administered.
targetDose : *TargetDoseNumber* (0..1)	Each target dose is one step in a patient series.

EvidenceOfImmunity

Description

Evidence of immunity indicates that a person has plausible evidence that they have already developed immunity to a particular disease. The definition of plausible evidence is a local decision, but best practice would suggest that serological evidence of immunity is the strongest indicator of immunity.

Content	Description
evidenceCategory : *Code* (1..1) See *Evidence Of Immunity (PHVS_IIS)* definition for values.	Evidence of immunity indicates that a person has plausible evidence that they have already developed immunity to a particular disease. The definition of plausible evidence is a local decision, but best practice would suggest that serological evidence of immunity is the strongest indicator of immunity.
relevantDate : *PointInTime* (1..1)	The date upon which the immunity is believed to have occurred. For example, the patient may have contracted measles when she was 5 years old, and therefore does not need a measles vaccination.

Exemption

Description

This class is a record of an assertion by the patient, the patient guardian, or someone else in authority that the medication should not be administered. Examples include a parent refusing an immunization for their child based on religious beliefs.

Content	Description
dateAsserted : *PointInTime* (1..1)	The date that the assertion was made.
effectiveTime : *TimeInterval* (1..1)	The date range during which the exemption is valid. Note that the start date may differ from the date asserted, although they typically will be the same.
id : *Id* (0..*)	Uniquely identifies the Exemption.
reason : *Code* (1..1) See *Substance Refusal Reason excluding 'other' (FHIM)* definition for values.	Indicates the basis for the Exemption. "Contains the reason the patient refused the medical substance/treatment. Any entry in the field indicates that the patient did not take the substance." - HL7 Version 2.8, RXA-18
remarks : String (0..*)	Any comments concerning the Exemption.
issuedBy : *IndividualProvider* (0..1)	Indicates the practitioner who issued the exemption.

ImmunityStatus

Description

This class contains information regarding the immunological state of the patient with respect to a given disease.

Content	Description
dateOfDetermination : *PointInTime* (1..1)	The date upon which a healthcare provider determined the immunological state of the Patient with respect to a given disease.
statusCategory : *Code* (1..1)	Categorizes the immunological state of the Patient with respect to a given disease. Possible values include: Susceptible, Equivical, Immune, Currently infected.
evidenceOfImmunity : *EvidenceOfImmunity* (0..1)	Evidence that the patient has already developed immunity to a particular disease.
vaccinePreventibleDisease : *Indication* (1..1)	"Identifies the condition or problem for which the drug/ treatment was prescribed." - HL7 Version 2.8, RXO-20.

ImmunizationFundingEligibility

Description

Indicates the eligibility of the Patient to receive a vaccine under a publicly funded vaccine program. See MIROW “IIS collaboration with VFC Program and Grantee Immunization Programs” guidelines.

Content	Description
financialClass : *Code* (0..*) See *Financial Class (PHVS_IIS)* definition for values.	Categorizes the eligibility of the patient to receive a vaccine under a publicly funded vaccine program.
financialClassAssessmentDate : *PointInTime* (0..1)	The date upon which the Patient's financialClass was determined.

ImmunizationHistoryEntry

ImmunizationHistoryList

Description

An Immunization History is the record of a person's immunizations and the attendant information.

Content	Description
immunizationHistoryEntry : *ImmunizationHistoryEntry* (0..*)	Information about the administration of a vaccine to a patient.
patient : *Patient* (1..1)	Identfies the person who is the subject of the Immunization History record.

ImmunizationRegistrySubmission

Hierarchy

ImmunizationRegistrySubmission is a kind of *NotificationReport*

Description

The transmittal of Immunization information to a Immunization Information System (IIS), which are maintained by Public Health Jurisdictions. Note that healthcare providers typically submit all known information regarding the Patient's immunization history to the IIS, not just those vaccinations that they performed themselves. This is in order to ensure that as much information as possible is available to the IIS. The IIS has the burden to de-duplicate records received from multiple providers.

Content	Description
immunizationHistory : *ImmunizationHistoryList* (1..1)	A record of a person's immunizations.
publicHealthClient : *PublicHealthClient* (1..1)	A Public Health Client is a Patient from the viewpoint of a Jurisdiction.
publicHealthJurisdiction : *PublicHealthJurisdiction* (0..*)	An organization that is responsible for Public Health either at the local, state, or national level.

PatientDocumentPresentation

Description

This class contains information regarding the provision of a Vaccine Information Sheet to the patient. A vaccine information document is an educational document intended to outline the risks and benefits of the vaccine. It outlines the impact of infection by the disease causing organism.

Content	Description
dateOfPresentation : *PointInTime* (1..1)	The date that the Vaccine Information Sheet was provided to the patient (or the patient's representative).
vaccineInformationStatement : *VaccineInformationStatement* (1..*)	An educational document intended to outline the risks and benefits of the vaccine.

PatientSeries

Description

Patient Series is an instantiation in time of the Vaccine Series that represents one path towards the goal of protection against a disease. It consists of a number of Target Doses.

Content	Description
numberOfDoses : Integer (1..1)	The total number of doses of a given vaccine that is anticipated to be administered to the patient.
seriesName : String (1..1)	A designation for the Vaccine Series, for ease in locating a given series.

Content	Description
status : *Code* (1..1)	Indicates the state of the Patient Series. Values should reflect the HL7 V3 Act State Machine. Possible values include: New, Active, Completed, etc.
patient : *Patient* (1..1)	Identfies the person who is the subject of the Patient Series record.
targetDose : *TargetDoseNumber* (0..*)	Each target dose is one step in a patient series.
vaccineSeries : *VaccineSeries* (1..1)	A series is one path to meet the goals for assuming protection against a target disease.

PublicHealthClient

Description

A Public Health Client is a Patient from the viewpoint of a Jurisdiction. For example, John Doe lives in Arizona, and has been seen by two practices, whereby he is patient number 123 at practice A and patient number 456 at practice B. The state of Arizona will assign a single id to John, say, XYZ. This id (the recordId property of this class) is correlated to the ids from the two practices. In other words, each patient will have a separate id and record at each medical practice, but will have one id at the jurisdictional level.

Content	Description
beginDate : *PointInTime* (1..1)	The earliest known date upon which the Patient had a service performed or a condition that was reportable to the Public Health Jurisdiction.
endDate : *PointInTime* (1..1)	The latest known date upon which the Patient had a service performed or a condition that was reportable to the Public Health Jurisdiction.
recordId : *Id* (1..1)	Uniquely identifies the patient from a jurisdictional point of view. This id is used to aggregate data reported from multiple sources within the jurisdiction; each source may have it's own id for the patient.
status : *Code* (1..1) See *Immunization Registry Status (FHIM)* definition for values.	Indicates the active/inactive status of the patient in the IIS. This is a jurisdictional status. See MIROW “Management of Moved or Gone Elsewhere (MOGE) and Other Patient Status Designations in IIS guidelines.
patient : *Patient* (0..*)	Identifies the Patient (from the Provider's point of view) that correlates to the Public Health Client record. For example, John Doe lives in Arizona, and has been seen by two practices, whereby he is patient number 123 at practice A and patient number 456 at practice B. The state of Arizona will assign a single id to John, say, XYZ. The Public Health Client class will contain a recordId = XYZ. This property points to Practice A, patientId=123, and Practice B, patientId=456.

Content	Description
publicHealthJurisdiction : *PublicHealthJurisdiction* (1..1)	An organization that is responsible for Public Health either at the local, state, or national level.

TargetDoseNumber

Description

Each target dose is one step in a patient series. The target dose links the vaccine dose administered to the series dose that it meets the goals of. A vaccine dose may not meet the goals of a given series dose and therefore be not valid.

Content	Description
doseNumber : Integer (1..1)	Indicates the position in which the dose represented by this class is in the sequence of doses that make up a series of doses prescribed by a vaccination protocol.
status : *Code* (1..1)	Indicates the state of the assignment of the patient dose to the vaccine series. Note that this assignment will likely be accomplished by a Rules Engine evaluating various rules against the actual vaccine administration data to determine whether the vaccination satisfies the requirements of the vaccination series. Possible values include: Satisfied.
nextDoseForecast : *NextDoseForecast* (0..1)	The recommended next dose of a particular vaccine for a given patient.

VaccinationContraIndication_CDC_IIS

Hierarchy

VaccinationContraIndication_CDC_IIS is a kind of *ContraIndication*

Description

"A factor that renders the administration of a drug or the carrying out of a medical procedure inadvisable." - Stedman's Medical Dictionary.

This class is a specialization of the generic ContraIndication in order to indicate a specific valueset used by the CDC.

Content	Description
code : *Code* (1..1) See *Vaccination Contraindication (PHVS_IIS)* definition for values.	"A factor that renders the administration of a drug or the carrying out of a medical procedure inadvisable." - Stedman's Medical Dictionary. Note that because almost all Contra-Indications are Health Concerns, for example, "Allergy to Eggs", "Allergy to Aluminum", "Current fever with moderate-to-severe illness", the Contra-Indication is modeled as relationship to Health Concern, and the Contra-Indication code may be derived from the Health Concern code. This having been said, there are some members of the Contra-Indication Value Set that are

Content	Description
	too general to point to a single Health Concern, even though they might still be derivable from the Health Concern list. Examples include "Chronic disease (disorder)", and "Immunodeficiency due to any cause, including HIV (hematologic and solid tumors, congenital immunodeficiency, long-term immunosuppressive therapy, including steroids)".

VaccinationEvent

Hierarchy

VaccinationEvent is a kind of *MedicationAdministrationEvent*

Description

Information about the administration of a vaccine to a patient. This class is a sub-class of MedicationAdministrationEvent, and therefore inherits the properties of that class, and then adds vaccination-specific information such as the dose number within a series, and immunity status.

Content	Description
fundingSource : *Code* (0..1) See *Immunization Funding Source excluding nulls* definition for values.	Indicates the source of funds used to pay for the Immunization. In the CDC Version 2 Implementation Guide, this is implemented as a seperate observation, in OBX-5.
numberInSeries : Integer (1..1)	"If the order is for a continuous administration (such as an IV), and the rate is changed at a certain time after the start, an RAS message can be issued to record the change. For such an RAS message, this field records the time the rate was changed to the new value recorded in the RXA-12-Administered Per (time unit) of the same message." - HL7 Version 2.8, RXA-2
evaluation : *Evaluation* (1..1)	An evaluation of a given vaccination in which an attempt is made to match the vaccination with a target dose number.
immunityStatus : *ImmunityStatus* (0..*)	The immunological state of the patient with respect to a given disease.
immunizationFundingEligibility : *ImmunizationFundingEligibility* (0..1)	Indicates the eligibility of the Patient to receive a vaccine under a publicly funded vaccine program.
patientDocumentPresentation : *PatientDocumentPresentation* (0..1)	The provision of a Vaccine Information Sheet to the patient.

VaccinationNonEvent

Vaccine

Hierarchy

Vaccine is a kind of *AdministeredDrug*

Description

"Contains the identifier of the medical substance/treatment administered.... If the substance administered is a vaccine, CVX codes may be used to code this field...." - HL7 Version 2.8, RXA-5

Content	Description
vaccineCode : *CD* (1..1) See *Vaccines Administered (CVX_CDC_NIP)* definition for values.	"Contains the identifier of the medical substance/ treatment administered.... If the substance administered is a vaccine, CVX codes may be used to code this field...." - HL7 Version 2.8, RXA-5
indication : *Indication* (0..*)	"Identifies the condition or problem for which the drug/ treatment was prescribed." - HL7 Version 2.8, RXO-20.

VaccineInformationStatement

Description

A vaccine information document is an educational document intended to outline the risks and benefits of the vaccine. It outlines the impact of infection by the disease causing organism. Also known as a Vaccine Information Sheet (VIS).

Content	Description
dateOfPublication : *PointInTime* (1..1)	The date that the Vaccine Information Sheet was published. In effect, this date serves to identify the version of the VIS.
documentType : *Code* (1..1)	The type of Vaccine Information Sheet. The combination of the document type and the date of publication identifies a particular version of the document. Note that the "document title" is in the "text" sub-component of the code datatype.
language : *Code* (0..1)	The language in which the Vaccine Information Sheet is written. This would most likely be a code from ISO table 639.
serialNumber : *Id* (0..1)	Uniquely identifies the Vaccine Information Sheet. This property allows for individual Vaccine Information Sheets to be enumerated, which is uncommon, but is expected to become more prevelent in the future. This property is therefore optional.

Terminology

Evidence Of Immunity (PHVS_IIS)

Value Set	Evidence Of Immunity (PHVS_IIS) - 2.16.840.1.114222.4.11.3293
Version	1
Source	SNOMED-CT
Source URL	http://phinvads.cdc.gov/vads/ViewValueSet.action?id=FEE9E077-ADB9-DF11-9BDD-0015173D1785
Definition	Evidence of immunity indicates that a person has plausible evidence that they have already developed immunity to a particular disease. The definition of plausible evidence is a local decision, but best practice would suggest that serological evidence of immunity is the strongest indicator of immunity.
Description	This value set version is used as-is.

Financial Class (PHVS_IIS)

Value Set	Financial Class (PHVS_IIS) - 2.16.840.1.114222.4.11.3366
Version	2
Source	NIP
Source URL	http://phinvads.cdc.gov/vads/ViewValueSet.action?id=1553768E-88BA-DF11-9BDD-0015173D1785
Definition	User-defined Table 0064 - Financial class [NIP suggested values] (use in PV1-20) Financial class references a client's eligibility status at a point in time. The values in this table relate to eligibility for the Vaccine for Children (VFC) program. Local implementations may define and document local codes.
Description	Note that funding source for a specific immunization is different from Financial Class. These are documented in CDC local codes table, CDCPHINVS (Value set OID 2.16.840.1.114222.4.11.3287).

Immunization Funding Source excluding nulls

Value Set	Immunization Funding Source excluding nulls - 2.16.840.1.113883.3.2074.1.1.1
Version	1
Source	PHVS_ImmunizationFundingSource_IIS 2.16.840.1.114222.4.11.3287
Source URL	http://phinvads.cdc.gov/vads/ViewValueSet.action?id=2DD050CD-9AB9-DF11-9BDD-0015173D1785
Definition	Immunization Funding Source (Used in OBX- 5) - Indicates funding source for an immunization.Includes all the codes from the orignal value sets except for"other" and "unknown".
Description	It is the same the PHVS value set except it does not include null flavors "other" (OTH) and "unknown" (UNK) to specify other funding or uknown funding sources.

Code	Code System	Print Name
VXC1		Federal funds

Code	Code System	Print Name
PHC68		Military funds
PHC70		Private funds
VXC2		State funds
VXC3		Tribal funds

Immunization Registry Status (FHIM)

Value Set	Immunization Registry Status (FHIM) - 2.16.840.1.113883.3.2074.1.1.2
Source	PH_ImmunizationRegistryStatus_IIS 2.16.840.1.114222.4.11.3378
Source URL	https://phinvads.cdc.gov/vads/ViewValueSet.action?id=677AF92A-73F8-E111-B875-001A4BE7FA90
Definition	Includes all the codes from the orignal value sets except for the null qualifier "U" for "Unknown".
Description	FHIM-specific value set.

Code	Code System	Print Name
A		Active
I		Inactive
L		Inactive - Lost to follow-up (cancel contract)
M		Inactive - Moved or gone elsewhere (cancel contract)
P		Inactive - Permanently inactive (Do not reactivate or add new entries to the record

Substance Refusal Reason excluding 'other' (FHIM)

Value Set	Substance Refusal Reason excluding 'other' (FHIM) - 2.16.840.1.113883.3.2074.1.1.4
Version	1
Source	PHVS_SubstanceRefusalReason_IIS 2.16.840.1.114222.4.11.3380
Source URL	tbd
Definition	Includes all the codes from the orignal value sets (PHVS_SubstanceRefusalReason_IIS 2.16.840.1.114222.4.11.3380) except "Other". If the reason is not included, the sender should use the textual description rather than a coded concept.
Description	This value set is new for FHIM based on existing PHVS terminology.

Code	Code System	Print Name
00		Parental decision
01		Religious exemption
03		Patient decision

Vaccination Contraindication (PHVS_IIS)

Value Set	Vaccination Contraindication (PHVS_IIS) - 2.16.840.1.114222.4.11.3288

Version	1
Source	PHIN VS and SNOMED-CT
Source URL	http://phinvads.cdc.gov/vads/ViewValueSet.action?id=DAEDFBD4-9BB9-DF11-9BDD-0015173D1785#
Description	This value set is a mix of two coding systems.

Vaccines Administered (CVX_CDC_NIP)

Value Set	Vaccines Administered (CVX_CDC_NIP) - 2.16.840.1.114222.4.11.934
Version	6
Source	CVX
Source URL	http://phinvads.cdc.gov/vads/ViewValueSet.action?id=CEB1D613-657B-E011-A0EA-00188B39829B
Definition	Vaccine Name Keyword: Clinical Vaccines, Vaccine Names
Description	This value set is used as-is.

Chapter
4

Lab Domain

Topics:

The FHIM Laboratory domain focuses on laboratory orders and the electronic reporting of laboratory results, especially to an Electronic Health Record. The information classes in this domain do not include data which are used solely to operate the laboratory, or any other data which is not reported to an external entity. It is noted that in the course of developing this domain, this package at one time contained certain elements gleaned from existing systems related to Quality Control, including Sterility Control Results and Lab Quality Assurance. These were removed, but may need to be re-visited if we encounter use-cases that require the transmittal of such information. Nevertheless, such use cases would likely be modeled in a separate sub-domain or package, as the focus would be quite different. Note that the Clinical Laboratory Improvement Amendments (CLIA) of 1988 Subpart K (Quality Systems for Nonwaived Testing) defines the quality assurance requirements of CLIA-certified laboratories.

The Laboratory domain currently does not address the needs of blood banking, transfusion services, autopsy, genomics, or food safety. While some elements required by these disciplines may exist in this model for other reasons, we have not addressed their needs. In addition, it is noted that forensics, e.g., chain of custody concerns are not fully modeled.

This domain is heavily influenced by the work of the ONC S&I Framework's Lab Results Interface (LRI) Initiative, which produced an HL7 Version 2.5.1 Implementation Guide for laboratory results which in turn is required for Meaningful Use. Other influences include the existing systems in use by DOD, IHS, and VA; HL7 Version 3; BRIDG; and the Life Sciences Domain Analysis Model developed by the National Cancer Institute.

See the Diagram Documentation for a walkthrough of the major concepts.

Need to model more details regarding chain of custody in general and the storage and handling of specimens in specifica in future modeling iterations. May also need a shipping-container assessment, not just specimen assessment

Diagrams

_Lab

Class Diagram

This is the main diagram for the Laboratory domain. As noted in the package documentation, this domain is concerned primarily with laboratory orders and result reporting.

There are four potential "focal classes" or "entry points" to this model, which are the Specimen Collection Request, the Laboratory Request, the Specimen Collection Promise, and the Laboratory Promise. This allows use cases to begin with either the Request (aka the order), or the Promise (which is the order from the perspective of the filling service). It is important to note that the two Request classes are subtypes of a more general Healthcare Order class, and the two Promise classes are subtypes of the more general Healthcare Promise class. These classes therefore inherit all the properties of the respective super types, which are described in the Orders package. See the Orders domain for more details.

Laboratory processes begin when a clinician orders a test. Logically, there exist simultaneously two orders: one to the laboratory to perform the test, but also one to obtain specimen(s) from the patient. In practice, the order to the collect the specimen is not written or even articulated, but rather occurs automatically according to some pre-determined set of policies and procedures. For example, an outpatient doctor orders a lipid panel. The office personnel direct the patient to the phlebotomist down the hall who draws the appropriate amount of blood (into the appropriate tubes), all based on standing procedures. In this case, there is no separate specimen collection order. But in other cases, the patient may be sent to the laboratory, and an order is communicated to the laboratory to direct them to collect the specimen. Furthermore, the “promise” to conduct the specimen collection is rarely articulated, it simply occurs based on standard procedures. Nevertheless, these concepts logically exist, and the FHIM contains both the specimen collection request and promise, even though the properties often might be blank or might repeat data found in the laboratory test request and promise.

The specimen collection request / promise process will usually result in one or more Specimen Collection Events during which one or more Specimens are collected. The Specimen Collection Event class describes the event, the specimen(s) collected, who performed the collection, and where the collection occurred. The Specimen class describes each specimen, the container(s) in which the specimen is contained, and any processing that was performed on the specimen. The class also links to information regarding transport or storage of the specimen to include temperature information. The specimen transport classes will be expanded in the future to accommodate chain of custody information. The Specimen class is also associated with a Defined Patient Event class that links the specimen to a particular event or condition, for example blood drawn before or after a glucose challenge. Once the specimen is collected, Assessments may be made over time to determine the appropriateness of the specimen for various laboratory procedures.

The Lab Test Promise class is the record of the order from the laboratory’s perspective. The Promise might be related to other promise(s) or might be referred to another laboratory, the results from which are collated and reported by the originating laboratory to the ordering clinician. The laboratory will typically assign one or more Accession numbers to the promise; these accession numbers are typically closely associated with the specimen received. The laboratory will perform various procedures and tests. A link to the common Procedure class is provided to accommodate billing procedures (typically CPT codes), which are often at a different level of granularity from the lab test codes (typically LOINC or SNOMED codes) used to identify the test. It is noted that a single class (LabTest) is used for the test ordered, the test promised, and the test performed. The values for the instances of LabTest may come from different coding systems and may be of different levels of granularity. For example, a clinician might order one Chem 7 using a local order code, the lab might promise a Chem 7 using LOINC, and the results will be reported as seven individual tests (blood urea nitrogen, serum sodium, etc.) using LOINC.

The results of the test and any information concerning procedures performed are accommodated by the Reportable Results class. Subtypes of this class accommodate differing data structures that are associated with broad categories of results. For example, the Measurement With Reference Range is intended for tests that result in a numeric or ordinal value, such as the concentration of potassium in a blood sample (e.g. 4.5 mmol/L), the ratio of blood urea

nitrogen to creatinine (e.g., 17), or the turbidity of a urine sample (e.g., cloudy). Another common characteristic is that many of these tests have an associated reference range, which describes the range of values (low and high) considered to be normal in healthy individuals. For a given test, there may be multiple normal ranges depending on such factors (Reference Range Criterion) as the patient's age, gender, or race.

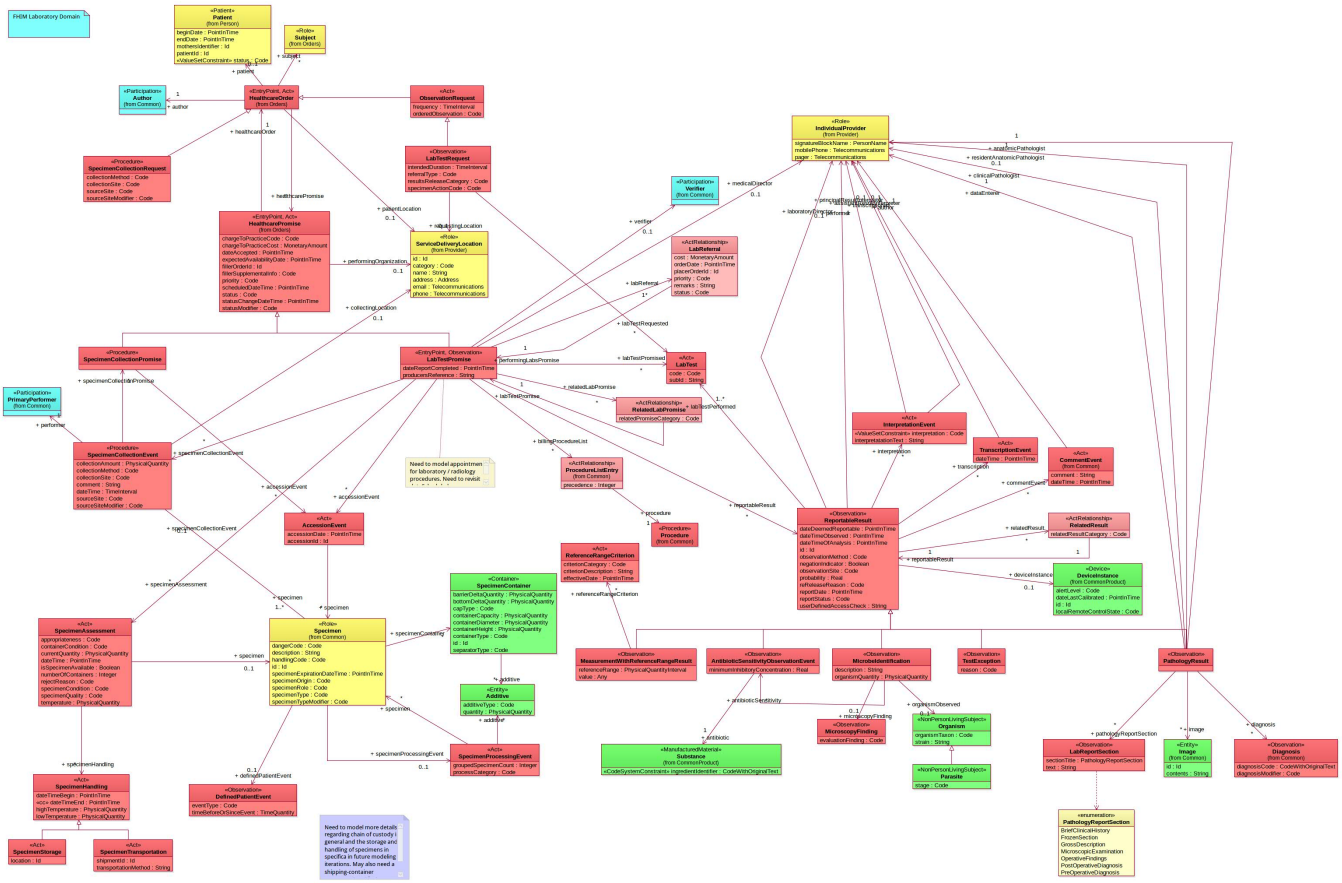
Another category of tests and results is the identification of microbes in a sample, such as bacteria, parasites, or viruses. Upon receipt, a portion of the sample is placed in a culture medium and allowed to grow. Often a stain test is performed to identify the category(ies) of microbes present. Later any organisms found are identified, along with an indication of the number of organisms (i.e., bacteria are often measured in colony-forming units). If the microbes are bacteria, an antibiotic sensitivity test may be performed as well. If the microbes are parasites, an additional observation is noted with respect to whether adults, larvae, eggs, or some combination, are present. A key characteristic of these tests is that the overall process requires considerable time, so intermediary reports are created and sent to the ordering clinician as information becomes available. Therefore, multiple results will be sent for a single ordered test, typically with some kind of status indicating that the report is a preliminary or intermediate finding. Each subsequent revision generally will include all the text of the previous report(s), until the last report, the status of which will be marked as Final. It is noted that even Final reports can be amended, although not routinely so – final reports will generally be amended to correct or augment previously reported information. The Related Result class is used to link the versions of the report, usually by using replaces/replaced by relationships.

Note also that multiple personnel may be involved in the performance of tests, especially microbiology cultures, which require more than a day to complete. The potential for multiple Reportable Results to exist for one Lab Test Promise also allows for the identification of the multiple persons involved.

All Reportable Results can have an interpretation associated with it. The Interpretation Event class contains the interpretation as either a code or a free-form text or both, and indicates who provided the interpretation. Reportable Results can be transcribed, especially for pathology reports. The Transcription Event provided the date/time of the transcription and identifies the transcriptionist. The Comment Event allows for any individual in the process to add remarks; the author of the comment event identifies the person making the comment. Reportable Results may identify the device(s) used to produce the results – the association to Device Instance provides access to Common Product model hierarchy which contains the manufacturer model number, etc. as needed.

A separate Reportable Result sub-type exists to report Test Exceptions. This sub-type would be used to communicate reasons why a test was unable to be performed. It may indicate that the quantity of specimen was insufficient, that the specimen was contaminated, that the specimen is inappropriate for the kind of test ordered, etc.

Finally, there is a subtype of Reportable Result for Pathology Results. Pathology results generally take the form of documents, which in turn are composed of sections containing free-form text. The College of American Pathologists lists a number of sections that a well-formed pathology report should or may contain. The Pathology Result class therefore is comprised of Lab Report Sections, the Section Title of which should come from some pre-defined vocabulary. The report may also contain images and diagnoses. It is noted that this entire structure could easily be replaced by a Clinical Document; in the future we may point to Clinical Document rather than maintain a separate Pathology Result structure. On the other hand, we may wish to be more specific in this model, defining the specific kinds of sections directly in the model.



Definitions

AccessionEvent

Description

Accession: "An increase by means of something added to record as acquired" - Websters. The act of accepting a laboratory test and entering the test into the laboratory's workload. While the definition would imply a close alignment with the Lab Test Promise, in practice, the Accession (and the "Accession Number") are more closely associated with the Specimen, as the Specimen represents a unit of work. Accession numbers and specimen numbers are often related, and when a specimen is subsetted for some other purpose, a new accession number may be created. This class represents the act of creating a new accession, and is associated with both the Promise and the Specimen.

Content	Description
accessionDate : *PointInTime* (1..1)	The date/time upon which the laboratory accepted the unit of work into its workload. This date/time might be the same as the Laboratory Promise date, or the date/time that the laboratory received the Specimen(s), depending on local laboratory practice.
accessionId : *Id* (1..1)	Uniquely identifies the accession. The accession is closely associated with both the Promise to perform a laboratory test, and the Specimen(s) upon which the tests are performed. The accession id therefore may be based upon the LabTestPromise.fillerOrderId or the

Content	Description
	Specimen.id, or conversely, those ids might be based upon this accessionId, depending on local laboratory practice. For example, if the accession id is ABCD, and two samples were received, one sample id might be ABCD-01 and the other ABCD-02. The accession id therefore may be used to identify the laboratory promise, samples, and results. "This field contains accession identifier(s) associated with the specimen...." - HL7 Version 2.8, SPM-30.
specimen : *Specimen* (0..*)	Identifies the specimen(s) associated with the accession.

Additive

Description

This class identifies any substances that were added or introduced to the specimen in order to preserve, maintain or enhance the particular nature or component of the specimen. While the HL7 definition implies that this additive is only used before or during specimen collection, this Additive class may be used after specimen collection as part of specimen processing as well.

Content	Description
additiveType : *Code* (0..*)	"Identifies any additives introduced to the specimen before or at the time of collection. These additives may be introduced in order to preserve, maintain or enhance the particular nature or component of the specimen." - HL7 Version 2.8, SPM-6. Note that HL7 identifies a Code Table (Table 371) for this property, which currently contains 57 suggested values.
quantity : *PhysicalQuantity* (1..1)	Indicates the amount of the substance that is identified in the additiveType property exists in this instance.

AntibioticSensitivityObservationEvent

Hierarchy

AntibioticSensitivityObservationEvent is a kind of *ReportableResult*

Description

This class represents a drug challenge. A drug challenge tests the susceptibility of a culture of the identified organism to an antibiotic. Note that the determination whether a microbe is susceptible or resistant to the antibiotic would be reported in the interpretation class, which is inherited from the Reportable Result super type.

Content	Description
minimumInhibitoryConcentration : *Real* (0..1)	The minimum inhibitory dilution of the serum or body fluid, which inhibits reproduction of the patient's infecting organism. Fluid is drawn from the patient who is undergoing antibiotic therapy. Samples of the fluid is diluted between 1:2 and 1:16 and a sample of

Content	Description
	the infecting organism is cultured in each of the diluted samples. "Contains the value observed by the observation producer.... It is not a required field because some systems will report only the Interpretation Codes.... This field may repeat for multipart, single answer results." - HL7 Version 2.8, OBX-5.
antibiotic : *Substance* (1..1)	Antibiotic: "A substance, such as penicillin or streptomycin, produced by or derived from certain fungi, bacteria, and other organisms, that can destroy or inhibit the growth of other microorganisms." - The American Heritage Stedman's Medical Dictionary. This association identifies the antibiotic substance used to test the degree of susceptibility of the microorganism to that substance.

DefinedPatientEvent

Description

The specific patient-related event to which a specimen collection or collections (and subsequently, any tests performed on that specimen) are related or affected by time, sequence, directive, intent, etc. Examples might include drug administration (peak and trough), beginning of fasting (lipids, FBS), glucose challenge (tolerances) or meal (postprandial), admission (pre- or post-admission studies), scheduled surgery/transfusion (compatibility testing), onset of symptoms (acute and convalescent), Last Menstrual Period (pregnancy test, Pap smear), lumbar puncture (CSF tubes 1, 2, and 3), treatment completion (test of cure, post-transfusion H&H), use/ingestion (BAT, toxicology), start of 24-hour urine pooling (creatinine clearance), etc.

Content	Description
eventType : *Code* (1..1) See *Event type* definition for values.	Categorizes the patient event that triggered the speciment collection, or the patient state at the time of the specimen collection. Examples might include drug administration (peak and trough), beginning of fasting (lipids, FBS), glucose challenge (tolerances) or meal (postprandial), admission (pre- or post-admission studies), scheduled surgery/transfusion (compatibility testing), onset of symptoms (acute and convalescent), LMP (pregnancy test, Pap smear), lumbar puncture (CSF tubes 1, 2, and 3), treatment completion (test of cure, post-transfusion H&H), use/ingestion (BAT, toxicology), start of 24-hour urine pooling (creatinine clearance), etc.
timeBeforeOrSinceEvent : *TimeQuantity* (1..1)	Specifies the amount of time that had elapsed between the event and the collection of the specimen. Note that the event usually occurs before the specimen collection (e.g., in a glucose tolerance test, the amount of time after the glucose load had been administered), but sometimes the event in question occurs after the specimen collection (e.g., pre-admission).

InterpretationEvent

Description

"One or more codes specifying a categorical assessment of the observation value, such as "Normal", "Abnormal", "Positive", "Negative", "Resistant", "Susceptible", etc...." - HL7 Version 2.8, OBX-8.

For chemistry tests, provides an automated indication of the result, based upon "normal" values as indicated by the reference range. Examples include High, Low, Critically High, Critically Low, etc. For antibiotic sensitivity tests, provides an indication of the susceptibility of the identified organism to the test antibiotic. Possible values include: Intermediate, Moderately Susceptible, Resistant, Susceptible. In addition, Not Tested may occasionally used when an antibiotic that would commonly be tested was not for some reason.

Content	Description
interpretatationText : String (0..1)	Contains the clinician's assessment based on the observation. This property is used for textual assessments as opposed to a coded interpretation. This property is used more often for pathology observations where pathologist's interpretation may be several sentences long, as opposed to "chemistry" tests, which are often automated and which produce a coded interpretation.
interpretation : *Code* (1..1) See *Abnormal Flag (HL7)* definition for values.	"One or more codes specifying a categorical assessment of the observation value, such as "Normal", "Abnormal", "Positive", "Negative", "Resistant", "Susceptible", etc...." - HL7 Version 2.8, OBX-8 For chemistry tests, provides an automated indication of the result, based upon "normal" values as indicated by the reference range. Examples include High, Low, Critically High, Critically Low, etc. For antibiotic sensitivity tests, provides an indication of the susceptibility of the identified organism to the test antibiotic. Possible values include: Intermediate, Moderately Susceptible, Resistant, Susceptible. In addition, Not Tested may occasionally used when an antibiotic that would commonly be tested was not for some reason.
assistantResultInterpreter : *IndividualProvider* (0..1)	"Identifies the clinical observer who assisted with the interpretation of this study." - HL7 Version 2.8, OBR-33.
principalResultInterpreter : *IndividualProvider* (0..1)	"Identifies the physician or other clinician who interpreted the observation and is responsible for the report content." - HL7 Version 2.8, OBR-32.

LabReferral

Description

An order placed by a laboratory to another laboratory to perform a test that the originating laboratory had taken on. This action typically occurs when the originating laboratory cannot perform the requested test in-house.

Content	Description
cost : *MonetaryAmount* (1..1)	Indicates the amount charged by the performing lab to perform the referred test.
orderDate : *PointInTime* (1..1)	The date/time that the order was created by the ordering provider.
placerOrderId : *Id* (1..1)	"This field is the placer application's order number." - HL7 Version 2.8, ORC-2
priority : *Code* (1..1) See *Lab Priority* definition for values.	"Describes the urgency of the request. If this field is blank, the default is [Routine]" - HL7 Version 2.8, TQ1-9. Possible values include (from HL7 Table 122): Stat; ASAP; Routine; Preop; Callback; Timing critical*; As needed. *Note that the Timing Critical has a syntax that allows more information, e.g., Timing Critical within 15 minutes.
remarks : String (1..1)	Any comments regarding the referral.
status : *Code* (1..1)	"Specifies the status of an order.... The purpose of this field is to report the status of an order either upon request (solicited), or when the status changes (unsolicited). It does not initiate action. It is assumed that the order status always reflects the status as it is known to the sending application at the time that the message is sent. Only the filler can originate the value of this field." - HL7 Version 2.8, ORC-5 A code specifying the status of the Order. Valid status codes should reflect the HL7 state machine, e.g., Active, Held, Canceled, Aborted, New, Nullified, Obsolete.
performingLabsPromise : *LabTestPromise* (1..1)	Points to the performing laboratory's promise to perform the requested test(s). This allows navigation to the results, etc.

LabReportSection

Description

This class represents a section of a Pathology Report. Pathology results generally take the form of documents, which in turn are composed of sections containing free-form text. The College of American Pathologists lists a number of sections that a well-formed pathology report should or may contain. The Pathology Result class therefore is comprised of Lab Report Sections, the Section Title of which should come from some pre-defined vocabulary.

Content	Description
sectionTitle : *PathologyReportSection* (1..1)	Categorizes the section of the report. Possible values include: Brief Clinical History, Frozen Section, Gross Description, MicroscopicExamination, Operative Findings, Post-operative Diagnosis, Pre-operative Diagnosis, etc.

Content	Description
text : String (1..1)	Contains the lab report results in textual format. "Contains the value observed by the observation producer.... It is not a required field because some systems will report only the Interpretation Codes.... This field may repeat for multipart, single answer results." - HL7 Version 2.8, OBX-5.

LabTest

Description

This class represents a laboratory test ordered, promised, or resulted. It consists of a test code, which should be a LOINC code, and a sub-identifier, which may be used when more than one of the same test are ordered, promised, or resulted.

Content	Description
code : *Code* (1..1)	"This field contains the identifier code for the requested observation/test/battery." - HL7 Version 2.8, OBR-4 "Contains a unique identifier for the observation.... In most systems the identifier will point to a master observation table that will provide other attributes of the observation that may be used by the receiving system to process the observations it receives". - HL7 Version 2.8, OBX-3. It is recommended that LOINC be used. Note that VA's VistA system uses the VA National Laboratory Test code via File 64.
subId : String (0..1)	"This field is used to distinguish between multiple OBX segments with the same observation ID organized under one OBR.". - HL7 Version 2.8, OBX-4.

LabTestPromise

Hierarchy

LabTestPromise is a kind of *HealthcarePromise*

Description

This class represents an intent to perform one or more Laboratory Tests in response to a Request (an Order) from an authorized entity (usually a doctor). A Promise is an intent to perform a service that has the strength of a commitment, i.e., other parties may rely on the originator of such promise that said originator will see to it that the promised act will be fulfilled. A promise can be either solicited or unsolicited. The entity that makes such a promise is also called a "filler", while the entity that requests the service is also called a "placer". The Laboratory Test Promise can be looked at as the Laboratory Test Order from the laboratory's point of view.

Content	Description
dateReportCompleted : *PointInTime* (0..1)	"Specifies the date/time when the results were reported or status changed. This conditional field is required whenever [Report Status] is valued. This field is used to indicate the date and time that the results are composed into a report and released, or that [Healthcare Order status] is entered or changed." - HL7 Version 2.8, OBR-22.
producersReference : String (1..1)	"Contains a unique identifier of the responsible producing service. It should be reported explicitly when the test results are produced at outside laboratories, for example. When this field is null, the receiving system assumes that the observations were produced by the sending organization. This information supports CLIA regulations in the US...." - HL7 Version 2.8, OBX-15.
accessionEvent : *AccessionEvent* (0..*)	This property points to the record of the laboratory's accepting a laboratory test and entering the test into the laboratory's workload.
billingProcedureList : *ProcedureListEntry* (0..*)	"Contains a unique identifier assigned to the procedure, if any, associated with the charge." - HL7 Version 2.8, OBR-44. "Contains the procedure code modifier to the procedure code reported in OBR-44-procedure code, when applicable.... Multiple modifiers may be reported...." - HL7 Version 2.8, OBR-45.
labReferral : *LabReferral* (0..*)	An order placed by a laboratory to another laboratory to perform a test that the originating laboratory had taken on. This action typically occurs when the originating laboratory cannot perform the requested test in-house.
labTestPromised : *LabTest* (0..*)	"This field contains the identifier code for the requested observation/test/battery." - HL7 Version 2.8, OBR-4
medicalDirector : *IndividualProvider* (0..1)	"Contains the medical director of the organization/ service responsible for performing the service. For labs, this field specifies the medical director of the laboratory that produced the test result described in this OBX segment. This field is different than OBX-16 in that OBX-16 identifies the individual who performed the lab test (made the observation) whereas this field identifies the individual who is the medical director of the organization responsible for the result. It should be reported explicitly when the test results are produced at outside laboratories, for example. This information supports CLIA regulations in the US." - HL7 Version 2.8, OBX-25.
relatedLabPromise : *RelatedLabPromise* (0..*)	Identifies other Lab Test Promise(s) to which this Lab Test Promise is somehow related.

Content	Description
reportableResult : *ReportableResult* (0..*)	This property points to the set (zero to many) of test results or observations that were generated as a result of the laboratory tests performed. Note that the word Reportable is used to indicate that these Results are limited to those which have reached the point where they are deemed to be reportable or releasable. The result may or may not have been part of an actual report, as it might be on hold waiting for other results to be combined with it. A result that has not yet been approved by the appropriate personnel does not meet the criteria of being reportable, and therefore will not be available through this stucture.
specimenAssessment : *SpecimenAssessment* (0..*)	Contains observations regarding the Specimen. Such observations, or assessments, of the Specimen are performed by the laboratory upon initial receipt, although periodic assessments may be performed later, especially when the Specimen is in long-term storage, or when some change in custody has occurred. The assessment also contains information concerning the handling of the Specimen, such as storage or transportation information.
specimenCollectionEvent : *SpecimenCollectionEvent* (0..*)	The actual gathering of portions or quantities of material for use in testing, examination, or study based upon the request (order).
verifier : *Verifier* (0..1)	"Contains the identifier of the individual directly responsible for the observation (i.e., the person who either performed or verified it). In a nursing service, the observer is usually the professional who performed the observation (e.g., took the blood pressure). In a laboratory, the observer is the technician who performed or verified the analysis...." - HL7 Version 2.8, OBX-16.

LabTestRequest

Hierarchy

LabTestRequest is a kind of *ObservationRequest*

Description

This class contains attributes associated with a record of the investigative procedure requested to be performed in the laboratory. Need to flesh out how to model both Panels and individual tests at the same time. It is not reasonable to expect to be able to standardize panels, but may have to enumerate the tests that make up the panel ordered.

Content	Description
intendedDuration : *TimeInterval* (1..1)	Contains the time period over which one or more LabTestRequests are to be executed. "Contains the duration for which the service is requested." - HL7 Version 2.8, TQ1-6.

Content	Description
	"Indicates the earliest date/time at which the services should be started." - HL7 Version 2.8, TQ1-7. "Contain(s) the latest date/time that the service should be performed. If it has not been performed by the specified time, it should not be performed at all." - HL7 Version 2.8, TQ1-8.
referralType : *Code* (1..1)	If the test was accepted as a referral from another facility, only portions of the test may need to be performed. For example, CHCS lists the following: Procedure Only, Report Only, and Outside Films.
resultsReleaseCategory : *Code* (0..*) See *Results Release Categorization* definition for values.	"Contains instructions on whether to share the results with the patient, and if so how." - HL7 Version 2.8, OBX-26. Possible values include (from HL7 Table 909): Share To Be Determined: Category to be determined; Share Immediately: Share result with patient immediately; Share Within Normal Limits: Share result in reference/ therapeutic range with patient immediately, Share result out of reference/therapeutic ranges with patient after 1 or more business day as agreed to by the systems in play; Share In 1 Day: Share result regardless of reference/ therapeutic range after 1 or more business day as agreed to by the systems in play; Share in 1 Day Conditionally: Share result in reference ranges/therapeutic with patient after 1 or more business day as agreed to by the systems in play, Withhold result out of reference/therapeutic range until physician release; Share Withhold: Withhold result regardless of reference/therapeutic ranges.
specimenActionCode : *Code* (1..1)	"Identifies the action to be taken with respect to the specimens that accompany or precede this order." - HL7 Version 2.8, OBR-11. Possible values include (from HL7 Table 65): Add ordered tests to the existing specimen; Generated order - reflex order; Lab to obtain specimen from patient; Specimen obtained by service other than Lab; Pending specimen - Order sent prior to delivery; Revised order; Schedule the tests specified below.
labTestRequested : *LabTest* (0..*)	"This field contains the identifier code for the requested observation/test/battery." - HL7 Version 2.8, OBR-4
requestingLocation : *ServiceDeliveryLocation* (0..1)	An association from LabTestRequest to Institution identifying a requesting organization that is devoted to the diagnosis and care.

MeasurementWithReferenceRangeResult

Hierarchy

MeasurementWithReferenceRangeResult is a kind of *ReportableResult*

Description

An observation of the quantity of the analyte found within the sample. Note that loinc and procedure codes are identifying more specifically the type of test being performed. Because there may be multiple methodologies available to measure the same substance, these codes are more specific than the analyte and testCode referenced in the ChemistryTest class. Note that this class has 5 subtypes to handle the different kinds of result values. Most chemistry tests are physical quanties (e.g., mg/dL). Some are coded, and even those that normally are physical quantities might be replaced by a coded observation of Quantity Not Sufficient.

Content	Description
referenceRange : *PhysicalQuantityInterval* (0..*)	The range of normal values (low and high) determined for a test. For toxicology, this range is the theraputic range. "When the observation quantifies the amount of a toxic substance, then the upper limit of the range identifies the toxic limit. If the observation quantifies a drug, the lower limits identify the lower therapeutic bounds and the upper limits represent the upper therapeutic bounds above which toxic side effects are common." - HL7 Version 2.8, OBX-7.
value : *Any* (0..*)	"Contains the value observed by the observation producer.... It is not a required field because some systems will report only the Interpretation Codes.... This field may repeat for multipart, single answer results." - HL7 Version 2.8, OBX-5.
referenceRangeCriterion : *ReferenceRangeCriterion* (0..*)	"Contains the nature of the abnormal test. Refer to HL7 Table 0080 - Nature of abnormal testing for valid values. As many of the codes as apply may be included, separated by repeat delimiters. For example, normal values based on age, sex, and race would be codes as "A~S~R"." - HL7 Version 2.8, OBX.10 This is the criteron by which the reference range is valid. Different reference ranges may be defined based on the subject's age, race, sex, etc.

MicrobeIdentification

Hierarchy

MicrobeIdentification is a kind of *ReportableResult*

Description

This class documents each Microbiology identification observation (note that in this case, "Microbiology" includes Bacteriology, Mycobacteriology, Mycology, Parasitology, and Virology).

Content	Description
description : String (1..1)	An optional textual description of the microbial observation, which may include other items of note.

Content	Description
organismQuantity : *PhysicalQuantity* (1..1)	The quantification the organism detected. e.g., >100,000 CFU/ML. "Contains the value observed by the observation producer.... It is not a required field because some systems will report only the Interpretation Codes.... This field may repeat for multipart, single answer results." - HL7 Version 2.8, OBX-5.
antibioticSensitivity : *AntibioticSensitivityObservationEvent* (0..*)	The results of a drug challenge. A drug challenge tests the susceptibility of a culture of the identified organism to an antibiotic.
microscopyFinding : *MicroscopyFinding* (0..1)	Pointer to findings, other than the identification of microorganisms, arrived at by microscopic observation of a specimen.
organismObserved : *Organism* (0..1)	The organism identified as being present within a microbiology observation.

MicroscopyFinding

Description

This class represents findings, other than the identification of microorganisms, arrived at by microscopic observation of a specimen. This includes observations made of cells or tissue. For example, the detection of red blood cells in a urine sample would be reported via this class.

Content	Description
evaluationFinding : *Code* (1..1)	Findings concerning cells which are not separate microorganisms arrived at by microscopic observation. These finding might be of normal cells existing in an abnormal location such as the detection of red blood cells in a urine sample.

Organism

Derivations

- *Parasite* is a kind of Organism

Description

The organism identified as being present within a specimen sample. "Organism" as used here is not the full spectrum of possible living things, but rather is limited to a member of the following: Bacteria, Fungus, Mycobacterium, Parasite, or Virus.

Content	Description
organismTaxon : *Code* (1..1)	A categorization of the organism identified, i.e., the “type” of organism. Note that this property is intended to include not only specific species of organisms (e.g., Staphylococcus aureus, SNOMED-CT code 3092008),

Content	Description
	but also more general classifications that might be found in laboratory results, such as Gram-positive Cocci (SNOMED-CT code 59206002). Note also that since this property is a coded element, it contains both a code and a display name.
strain : String (0..1)	A more precise subdivision of the value in the organism taxon, for example, the H1N1 form of Influenza. Because of the multitude of strains and the speed at which they are discovered, the organism taxon coding system may not provide such values. This property is therefore modeled as a string, rather than a code, as one might otherwise expect. "Contains the specific strain of animal. It can also be expanded to include strain of any living organism and is not restricted to animals." - HL7 Version 2.8, PID-37. "The body of descendants of a common ancestor, as a family or stock. A variety, especially of microorganisms." - Dictionary.com

Parasite

Hierarchy

Parasite is a kind of *Organism*

Description

Parasite: "An organism that grows, feeds, and is sheltered on or in a different organism while contributing nothing to the survival of its host." - The American Heritage Stedman's Medical Dictionary. This class identifies the organism identified in a sample, and contains an indication of the life-cycle-stage(s) of the organisms observed (e.g., eggs, larvae, adults).

Content	Description
stage : *Code* (1..1)	Stage: "A particular step, phase, or position in a developmental process." - The American Heritage Stedman's Medical Dictionary. Categorizes the life-cycle-stage of the organism observed in a sample. Possible values include: Adults, Cysts, Eggs, Filariform Larvae, Gametes, Larvae, Microfilaria, Rhabditiform Larvae, Schizonts, Trophozoites.

PathologyResult

Hierarchy

PathologyResult is a kind of *ReportableResult*

Description

This class documents the results of a Pathology observation event. Note that the VA makes a distinction between AnatomicalPathology, Cytopathology, ElectronMicroscopy, and SurgicalPathology, all of which are handled by this one class. Also, a large portion of Autopy observations take the form of pathology reports.

Pathology results generally take the form of documents, which in turn are composed of sections containing free-form text. The College of American Pathologists lists a number of sections that a well-formed pathology report should or may contain. The Pathology Result class therefore is comprised of Lab Report Sections, the Section Title of which should come from some pre-defined vocabulary. The report may also contain images and diagnoses. It is noted that this entire structure could easily be replaced by a Clinical Document; in the future we may point to Clinical Document rather than maintain a separate Pathology Result structure.

Content	Description
anatomicPathologist : *IndividualProvider* (1..1)	A clinician who is board certified in the field of Anatomic Pathology. This person may or may not also be board certified in the field of Clinical Pathology. This person is responsible for applying clinical judgement to arrive at an interpretation of the subject of the study.
clinicalPathologist : *IndividualProvider* (0..1)	A clinician who is board certified in the field of Clinical Pathology. This person may or may not also be board certified in the field of Anatomic Pathology. This person is responsible for applying clinical judgement to arrive at an interpretation of the subject of the study, but limited to the clinical, non-anatomic pathology testing (e.g., hematology, chemistry)
dataEnterer : *IndividualProvider* (1..1)	The person in the role of data enterer.
diagnosis : *Diagnosis* (0..*)	Diagnoses associated with the Pathology Report. Such diagnoses are typically determined by the pathologist based on the observations made and documented in the report.
image : *Image* (0..*)	An image associated with the Pathology Report.
pathologyReportSection : *LabReportSection* (0..*)	A section of a Pathology Report. Pathology results generally take the form of documents, which in turn are composed of sections containing free-form text. The College of American Pathologists lists a number of sections that a well-formed pathology report should or may contain. The Pathology Result class therefore is comprised of Lab Report Sections, the Section Title of which should come from some pre-defined vocabulary.
residentAnatomicPathologist : *IndividualProvider* (1..1)	A clinician who is currently undergoing a Anatomic Pathology residency program. This person is responsible for applying clinical judgement to arrive at an interpretation of the subject of the study, subject to the delegated authority and confirmation from the anatomic pathologist.

ReferenceRangeCriterion

Description

Indicates the criteron by which the reference range is valid. Different reference ranges may be defined based on the subject's age, race, sex, etc.

Content	Description
criterionCategory : *Code* (1..1) See *Criterion Category* definition for values.	Indicates the criteron by which the reference range is valid. Different reference ranges may be defined based on the subject's age, race, sex, etc. "Contains the nature of the abnormal test.... As many of the codes as apply may be included" - HL7 Version 2.8, OBX-10. Possible values (from HL7 Table 80) include: An age-based population; None - generic normal range; A race-based population; A sex-based population; Species; Breed; Strain.
criterionDescription : String (1..1)	Describes the criteron by which the reference range is valid. Different reference ranges may be defined based on the subject's age, race, sex, etc. This property is a human-readable label for the criterion, it is not necessarily computable. Examples include 40-50 years old, Female, etc.
effectiveDate : *PointInTime* (1..1)	"Contains the date (and, optionally, the time) on which the values in OBX-7-reference range went into effect...." - HL7 Version 2.8, OBX-12. Note that we may wish change this to a date range in the future.

RelatedLabPromise

Description

This class identifies Laboratory Promises that are related to each other in some way. The relatedPromiseCategory indicates how the referenced Promise is related to the "owning" Promise.

Note that a "Reflex Test" will be handled through this RelatedLabPromise mechanism. A Reflex Test is a test that is performed and is made necessary based on results from another test, such as results that need confirmation or tests that are indicated by standards of care, so that it is necessary to perform even though the clinician hasn't ordered it. Examples include when a CBC indicates a high white blood cell count, a differential is automatically performed. These tests are usually defined within the laboratory's established procedures. In this case, the original order will point to an instance of RelatedLabPromise, wherein the relatedPromiseCategory will contain a code that means "reflex test", and a pointer (i.e., the labTestPromise property) that points to the reflex test promise. Similarly, the reflex test promise can point to another instance of RelatedLabPromise, wherein the relatedPromiseCategory will contain a code that means "original promise", and a pointer (i.e., the labTestPromise property) that points to the original lab test promise.

Content	Description
relatedPromiseCategory : *Code* (1..1) See *Laboratory test relationship* definition for values.	Indicates how the "target LabTestPromise" is related to the "source LabTestPromise". Examples include Parent, Child, Replaces, Replaced By, Reflex Test, Original Promise, etc.
labTestPromise : *LabTestPromise* (1..1)	Points to the Lab Test Promise (i.e., the "target Lab Test Promise") to which the "source Lab Test Promise" (i.e., the Lab Test Promise that points to this class) is somehow related.

RelatedResult

Description

"This field is defined to make it available for other types of linkages (e.g., toxicology). This important information, together with the information in OBR-29 or OBR-57, uniquely identifies the parent result's OBX segment related to this order." - HL7 Version 2, OBX-26.

Content	Description
relatedResultCategory : *Code* (1..1) See *Laboratory test relationship* definition for values.	Indicates how the "target Result" is related to the "source Result". Examples include Parent, Child, Replaces, Replaced By, etc.
reportableResult : *ReportableResult* (1..1)	Points to the Reportable Result (i.e., the "target Reportable Result") to which the "source Reportable Result" (i.e., the Reportable Result that points to this class) is somehow related. "This field is defined to make it available for other types of linkages (e.g., toxicology). This important information, together with the information in OBR-29 or OBR-57, uniquely identifies the parent result's OBX segment related to this order." - HL7 Version 2, OBX-26.

ReportableResult

Derivations

- *MicrobeIdentification* is a kind of ReportableResult
- *AntibioticSensitivityObservationEvent* is a kind of ReportableResult
- *PathologyResult* is a kind of ReportableResult
- *TestException* is a kind of ReportableResult
- *MeasurementWithReferenceRangeResult* is a kind of ReportableResult

Description

This class represents a test result or observation that may be reported. Some tests, such as an microbiology identification may have multiple results reported over time, for example a preliminary gram stain result might be initially reported, followed by the identification and relative number of organisms, followed by an antibiotic senstivity test results. Each one of these results would manifest as a separate instance of this class, each with their own date/times, performers, etc.

"The OBX segment is used to transmit a single observation or observation fragment. It represents the smallest indivisible unit of a report." - HL7 Version 2.8, OBX

Content	Description
dateDeemedReportable : *PointInTime* (1..1)	"Specifies the date/time when the results were reported or status changed. This conditional field is required whenever [Report Status] is valued. This field is used to indicate the date and time that the results are composed into a report and released, or that [Healthcare Order

Content	Description
	status] is entered or changed." - HL7 Version 2.8, OBR-22.
dateTimeObserved : *PointInTime* (1..1)	"This field is required in two circumstances. The first is when the observations reported beneath one report header have different dates/times. This could occur in the case of queries, timed test sequences, or clearance studies where one measurement within a battery may have a different time than another measurement.... The observation date-time is the physiologically relevant date-time or the closest approximation to that date-time. In the case of tests performed on specimens, the relevant date-time is the specimen's collection date-time. In the case of observations taken directly on the patient (e.g., X-ray images, history and physical), the observation date-time is the date-time that the observation was performed." - HL7 Version 2.8, OBX.14
dateTimeOfAnalysis : *PointInTime* (1..1)	"The time stamp associated with generation of the analytical result by the instrument specified in [the deviceInstance]" - HL7 Version 2.8, OBX.19
id : *Id* (1..1)	"Contains a unique identifier for this observation." - HL7 Version 2.8, OBX-21.
negationIndicator : Boolean (1..1)	This is a placeholder to convey the concept that something looked for was not found. It is possible that this property might be superfluous and may be removed.
observationMethod : *Code* (0..*) See *Lab Observation Method* definition for values.	"The method or procedure by which an observation was obtained when the sending system wishes to distinguish among one measurement obtained by different methods and the distinction is not implicit in the test ID. Chemistry laboratories do not usually distinguish between two different methods used to measure a given serum constituent (e.g., serum potassium) as part of the test name...." - HL7 Version 2.8, OBX-17. Note that the aerobic condition of the culture is included in this concept. Note also that this property can repeat.
observationSite : *Code* (0..1)	"Contains the body site(s) where the measurement being reported was obtained. This field should not be used for a specimen source or specimen collection site. This information is of particular importance if the clinical meaning of a value is modified either directly by the site (for example, is the temperature central or peripheral?) or if the site of one measurement impacts the value of another measurement (for example, is the finger SpO2 probe on the same arm as the NIBP cuff?). In most cases these observations are performed directly upon the patient and do not involve a specimen." - HL7 Version 2.8, OBX-20.

Content	Description
probability : *Real* (0..1)	"Contains the probability of a result being true for results with categorical values. It mainly applies to discrete coded results. It is a decimal number ... between 0 and 1, inclusive." - HL7 Version 2.8, OBX-9.
reReleaseReason : *Code* (0..1)	"Indicates the root cause for the reissue of a previously released lab report. This element is used in conjunction with OBX-11 Observation Result Status to define the root cause for a reissued laboratory report in the case of a corrected, amended, appended, or revised report." - HL7 Version 2.8, OBX-27.
reportDate : *PointInTime* (1..1)	"Specifies the date/time when the results were reported or status changed. This conditional field is required whenever [Report Status] is valued. This field is used to indicate the date and time that the results are composed into a report and released, or that [Healthcare Order status] is entered or changed." - HL7 Version 2.8, OBR-22.
reportStatus : *Code* (1..1) See *Act Instance Status* definition for values.	"Contains the observation result status.... This field reflects the current completion status of the results for one Observation Identifier...." - HL7 Version 2.8, OBX-11.
userDefinedAccessCheck : String (0..1)	"This field permits the producer to record results-dependent codes for classifying the observation at the receiving system. This field should be needed only rarely..." - HL7 Version 2.8, OBX-13.
commentEvent : *CommentEvent* (0..*)	Contains any comments pertinent to the result of the lab test.
deviceInstance : *DeviceInstance* (0..1)	"Identifies the Equipment Instance (e.g., Analyzer, Analyzer module, group of Analyzers, etc.) responsible for the production of the observation...." - HL7 Version 2.8, OBX-18.
interpretation : *InterpretationEvent* (0..*)	"One or more codes specifying a categorical assessment of the observation value, such as "Normal", "Abnormal", "Positive", "Negative", "Resistant", "Susceptible", etc...." - HL7 Version 2.8, OBX-8. For chemistry tests, provides an automated indication of the result, based upon "normal" values as indicated by the reference range. Examples include High, Low, Critically High, Critically Low, etc. For antibiotic sensitivity tests, provides an indication of the susceptibility of the identified organism to the test antibiotic. Possible values include: Intermediate, Moderately Susceptible, Resistant, Susceptible. In addition, Not Tested may occasionally used when an

Content	Description
	antibiotic that would commonly be tested was not for some reason.
labTestPerformed : *LabTest* (1..*)	"Contains a unique identifier for the observation.... In most systems the identifier will point to a master observation table that will provide other attributes of the observation that may be used by the receiving system to process the observations it receives". - HL7 Version 2.8, OBX-3.
laboratoryDirector : *IndividualProvider* (0..1)	This is the director of the laboratory that is reporting the result to the Orderer. This person may or may not be the director of the organization that actually performed the analysis, rather of the reporting organization.
performer : *IndividualProvider* (1..1)	"This field identifies the performing technician." - HL7 Version 2.8, OBR-34 "This field contains the identifier of the individual directly responsible for the observation (i.e., the person who either performed or verified it). In a nursing service, the observer is usually the professional who performed the observation (e.g., took the blood pressure). In a laboratory, the observer is the technician who performed or verified the analysis...." - HL7 Version 2.8, OBX.16
relatedResult : *RelatedResult* (0..*)	Identifies other Reportable Result(s) to which this Reportable Result is somehow related. "This field is defined to make it available for other types of linkages (e.g., toxicology). This important information, together with the information in OBR-29 or OBR-57, uniquely identifies the parent result's OBX segment related to this order." - HL7 Version 2, OBX-26.
transcription : *TranscriptionEvent* (0..*)	Transcribe: "to make a written copy, especially a typewritten copy, of (dictated material, notes taken during a lecture, or other spoken material)." - Dictionary.com. This association points to information about who transcribed the provider's dictated notes, and when that transcription occurred.

SpecimenAssessment

Description

This class contains observations regarding the Specimen. Such observations, or assessments, of the Specimen are performed by the laboratory upon initial receipt, although periodic assessments may be performed later, especially when the Specimen is in long-term storage, or when some change in custody has occurred. The assessment also contains information concerning the handling of the Specimen, such as storage or transportation information.

Content	Description
appropriateness : *Code* (1..1)	"The suitability of the specimen for the particular planned use as determined by the filler." - HL7 Version 2.8, SPM-23. Possible values include (from HL7 Table 492): Preferred; Appropriate; Inappropriate; Inappropriate due to....
containerCondition : *Code* (1..1)	"In chain of custody cases where specimens are moved from lab to lab, the status of the container that the specimen is shipped in must be recorded at each receipt. If the container is compromised in any way (seal broken, container cracked or leaking, etc) then this needs to be recorded for legal reasons." - HL7 Version 2.8, SPM-28. Note that HL7 identifies a Code Table (Table 544) for this property, which currently contains 21 suggested values.
currentQuantity : *PhysicalQuantity* (1..1)	"The amount of specimen that currently exists or is available for use in further testing." - HL7 Version 2.8, SPM-25.
dateTime : *PointInTime* (1..1)	The date/time that the Specimen Assessment was performed
isSpecimenAvailable : Boolean (1..1)	"Describes whether the specimen, as it exists, is currently available to use in an analysis." - HL7 Version 2.8, SPM-20.
numberOfContainers : Integer (1..1)	"The number of containers for a given sample. For sample receipt verification purposes; may be different from the total number of samples that accompany the order." - HL7 Version 2.8, OBR-37 and SPM-26.
rejectReason : *Code* (1..1) See *FHIM Specimen Rejection Reason* definition for values.	"Describes one or more reasons the specimen is rejected for the specified observation/result/analysis." - HL7 Version 2.8, SPM-21. Possible values include (from HL7 Table 490): Expired; Quantity not sufficient; Broken container; Clotting; Missing collection date; Missing patient ID number; Missing patient name; Hemolysis; Identification problem; Labeling; Contamination; Missing phlebotomist ID; Improper storage; Name misspelling.
specimenCondition : *Code* (0..*) See *Specimen Condition* definition for values.	"A mode or state of being that describes the nature of the specimen." - HL7 Version 2.8, SPM-24. Possible values include (from HL7 Table 493): Autolyzed; Clotted; Contaminated; Cool; Frozen; Hemolyzed; Live; Room temperature; Sample not received.
specimenQuality : *Code* (1..1)	"The degree or grade of excellence of the specimen at receipt." - HL7 Version 2.8, SPM-22. Possible values include (from HL7 Table 491): Excellent; Good; Fair; Poor.

Content	Description
temperature : *PhysicalQuantity* (0..1)	"Identifies the specimen temperature in degrees Celsius" - HL7 Version 2.8, SAC-31.
specimen : *Specimen* (0..1)	Identifies the specimen associated with the assessment, and therefore to which the assessment data pertains.
specimenHandling : *SpecimenHandling* (0..*)	Points to information regarding the transportation or storage of a specimen.

SpecimenCollectionEvent

Description

The actual gathering of portions or quantities of material for use in testing, examination, or study based upon the request (order).

Content	Description
collectionAmount : *PhysicalQuantity* (1..1)	"Specifies the volume or mass of the collected specimen." - HL7 Version 2.8, SPM-12. "The volume of a specimen." - HL7 Version 2.8, OBR-9.
collectionMethod : *Code* (1..1) See *Specimen Collection Method* definition for values.	"Describes the procedure or process by which the specimen was collected." - HL7 Version 2.8, SPM-7. Note that HL7 identifies a Code Table (Table 488) for this property, which currently contains 42 suggested values.
collectionSite : *Code* (1..1)	"This field differs from [Specimen Source Site] in those cases where the source site must be approached via a particular site (e.g., anatomic location). For example, in the case where a liver biopsy is obtained via a percutaneous needle, the collection site would be the point of entry of the needle. For venous blood collected from the left radial vein, the collection site could be Antecubital Fossa." - HL7 Version 2.8, SPM-10. Note that HL7 identifies a Code Table (Table 543) for this property, but does not provide any suggested values.
comment : String (1..1)	"This field is for reporting additional comments related to the sample." - HL7 Version 2.8, OBR-39.
dateTime : *TimeInterval* (1..1)	"The date and time when the specimen was acquired from the source. The use of the Date Range data type allows for description of specimens collected over a period of time, for example, 24-hour urine collection. For specimens collected at a point in time, only the first component (start date/time) will be populated." - HL7 Version 2.8, SPM-17. "The clinically relevant date/time of the observation. In the case of observations taken directly from a subject, it is the actual date and time the observation was obtained.

Content	Description
	In the case of a specimen associated study, this field shall represent the date and time the specimen was collected or obtained." - HL7 Version 2.8, OBR-7. "Contains the end date and time of a study or timed specimen collection." - HL7 Version 2.8, OBR-8. "This field is required in two circumstances. The first is when the observations reported beneath one report header have different dates/times. This could occur in the case of queries, timed test sequences, or clearance studies where one measurement within a battery may have a different time than another measurement.... The observation date-time is the physiologically relevant date-time or the closest approximation to that date-time. In the case of tests performed on specimens, the relevant date-time is the specimen's collection date-time. In the case of observations taken directly on the patient (e.g., X-ray images, history and physical), the observation date-time is the date-time that the observation was performed." - HL7 Version 2.8, OBX-14. Note that this property is a Time Interval.
sourceSite : *Code* (1..1)	"Specifies the source from which the specimen was obtained. For example, in the case where a liver biopsy is obtained via a percutaneous needle, the source would be Liver. Any nationally recognized coding system might be used for this field including SNOMED; alternatively HL7 Table 0163 may be used." - HL7 Version 2.8, SPM-8.
sourceSiteModifier : *Code* (0..*) See *Anatomical Site Modifier* definition for values.	"Contains modifying or qualifying description(s) about the specimen source site. The use of this attribute is to modify, qualify or further specify, the entity described by [Specimen Source Site]. This is particularly useful when the code set used in [Specimen Source Site] does not provide the precision required to fully describe the site from which the specimen originated. For example, if the specimen source site was precisely described as Left Radial Vein but the code set employed only provided Radial Vein, this attribute could be employed to add the modifier Left." - HL7 Version 2.8, SPM-9. Note that HL7 identifies a Code Table (Table 542) for this property, but does not provide any suggested values.
collectingLocation : *ServiceDeliveryLocation* (0..1)	The anatomic location from which the specimen was obtained. The collection site would be the point of entry of the needle.
performer : *PrimaryPerformer* (1..1)	"Identifies the person, department, or facility that collected the specimen." - HL7 Version 2.8, OBR-10
specimen : *Specimen* (1..*)	A collection of samples or specimens collected and potentially processed for eventual testing.

Content	Description
specimenCollectionPromise : *SpecimenCollectionPromise* (1..1)	Points to the "promise" made in response to a Request (an Order) from an authorized entity (usually a doctor), which resulted in this Specimen Collection Event. A Promise is an intent to perform a service that has the strength of a commitment, i.e., other parties may rely on the originator of such promise that said originator will see to it that the promised act will be fulfilled. The Specimen Collection Promise can be looked at as the Specimen Collection Order from the point of view of the entity collecting the Specimen.

SpecimenCollectionPromise

Hierarchy

SpecimenCollectionPromise is a kind of *HealthcarePromise*

Description

This class represents an intent to collect one or more Specimens in response to a Request (an Order) from an authorized entity (usually a doctor). A Promise is an intent to perform a service that has the strength of a commitment, i.e., other parties may rely on the originator of such promise that said originator will see to it that the promised act will be fulfilled. A promise can be either solicited or unsolicited. The entity that makes such a promise is also called a "filler", while the entity that requests the service is also called a "placer". The Specimen Collection Promise can be looked at as the Specimen Collection Order from the point of view of the entity collecting the Specimen.

It should be noted that while a Specimen Collection Promise logically occurs in response to an order, the notion of a Specimen Collection Promise is rarely implemented as separate concept, because specimen collections typically occur automatically based on policy, procedure, or contract. Rarely would two computers be exchanging messages requesting and acknowledging specimen collections; most likely this would occur when a patient is sent to the laboratory for specimen collection. Nevertheless, the class exists in order to support the few cases where an explicit promise is needed.

Content	Description
accessionEvent : *AccessionEvent* (0..*)	This property points to the record of the laboratory's accepting a laboratory test and entering the test into the laboratory's workload.

SpecimenCollectionRequest

Hierarchy

SpecimenCollectionRequest is a kind of *HealthcareOrder*

Description

The gathering of portions or quantities of material for use in testing, examination, or study based upon a request (order). For example, a blood or urine sample.

Content	Description
collectionMethod : *Code* (1..1)	"Describes the procedure or process by which the specimen was collected." - HL7 Version 2.8, SPM-7.

Content	Description
collectionSite : *Code* (1..1)	"This field differs from SPM-8-Specimen Source Site in those cases where the source site must be approached via a particular site (e.g., anatomic location). For example, in the case where a liver biopsy is obtained via a percutaneous needle, the collection site would be the point of entry of the needle. For venous blood collected from the left radial vein, the collection site could be "antecubital fossa"." - HL7 Version 2.8, SPM.10
sourceSite : *Code* (1..1)	"Specifies the source from which the specimen was obtained. For example, in the case where a liver biopsy is obtained via a percutaneous needle, the source would be liver. " - HL7 Version 2.8, SPM-8.
sourceSiteModifier : *Code* (0..*) See *Anatomical Site Modifier* definition for values.	"This field contains modifying or qualifying description(s) about the specimen source site. The use of this attribute is to modify, qualify or further specify, the entity described by [sourceSite]. This is particularly useful when the code set used in [sourceSite] does not provide the precision required to fully describe the site from which the specimen originated. For example, if the specimen source site was precisely described as left radial vein but the code set employed only provided radial vein, this attribute could be employed to add the modifier left. " - HL7 Version 2.8, SPM-9.

SpecimenContainer

Description

Container: "an object used for or capable of holding, esp for transport or storage, such as a carton, box, etc." - Dictionary.com. This class describes the object in which the specimen is contained, such as the capacity, etc. Some containers are manufactured such that they contain a pre-defined substance that may act to preserve, maintain or enhance the particular nature or component of the specimen. For example, a "blue top tube" typically contains an anticoagulant such as citrate. It is therefore important to know what kind of container the sample is in, as the condition of the sample may be affected.

"An Entity that holds other Entities." - HL7 Version 3.

Content	Description
barrierDeltaQuantity : *PhysicalQuantity* (0..1)	"Identifies the distance from the Point of Reference to the separator material (barrier) within the container in units specified below. This distance may be provided by the LAS to the instrument and/or specimen processing/ handling device to facilitate the insertion of a sampling probe into the specimen without touching the separator." - HL7 Version 2.8, SAC-18. "The distance from the point of reference to the separator material (barrier) within a container." - HL7 Version 3 (Container.barrierDeltaQuantity).

Content	Description
bottomDeltaQuantity : *PhysicalQuantity* (0..1)	"Identifies the distance from the Point of Reference to the separator material (barrier) within the container in units specified below. This distance may be provided by the LAS to the instrument and/or specimen processing/ handling device to facilitate the insertion of a sampling probe into the specimen without touching the separator." - HL7 Version 2.8, SAC-18. "The distance from the point of reference to the separator material (barrier) within a container." - HL7 Version 3 (Container.barrierDeltaQuantity).
capType : *Code* (0..1)	"Indicates the type of cap that is to be used with this container for decapping, piercing or other mechanisms." - HL7 Version 2.8, SAC-26. Note that HL7 identifies a Code Table (Table 381) for this property, but does not provide any suggested values. "The type of cap (closure) associated with the container that is the entity being described." - HL7 Version 3 (Container.capTypeCode).
containerCapacity : *PhysicalQuantity* (0..1)	"Indicates the capacity of the container in the units specified [in SAC-24]." - HL7 Version 2.8, SAC-21. "The unit identifier that is being used to describe the volume of the container...." - HL7 Version 2.8, SAC-24. "The functional capacity of the container." - HL7 Version 3 (Container.capacityQuantity).
containerDiameter : *PhysicalQuantity* (1..1)	"Identifies the outside diameter of the container in units specified [in SAC-24]." - HL7 Version 2.8, SAC-17. "The unit identifier that is being used to describe the volume of the container...." - HL7 Version 2.8, SAC-24. "The outside diameter of the container." - HL7 Version 3 (Container.diameterQuantity).
containerHeight : *PhysicalQuantity* (0..1)	"Identifies the height of the container in units specified [in SAC-24]." - HL7 Version 2.8, SAC-16. "The unit identifier that is being used to describe the volume of the container...." - HL7 Version 2.8, SAC-24. "The height of the container." - HL7 Version 3 (Container.heightQuantity).
containerType : *Code* (1..1)	"The container in or on which a specimen is transported." - HL7 Version 2.8, SPM-27. Note that although this property is a flavor of Code in HL7 Version 2, HL7 does not link this property to a Code Table nor do they provide any suggested values.
id : *Id* (1..1)	"The container's unique identifier assigned by the corresponding equipment...." - HL7 Version 2.8, SAC-3.

Content	Description
separatorType : *Code* (0..1)	"Identifies the type of the separator that is being used (e.g., gel separator in the container…)" - HL7 Version 2.8, SAC-25. Note that HL7 identifies a Code Table (Table 380) for this property, but does not provide any suggested values. "A material added to a container to facilitate and create a physical separation of specimen components of differing density. The composition or nature of the separator material may have an effect on the analysis. Knowledge of the material aids interpretation of results." - HL7 Version 3 (Container.separatorTypeCode).
additive : *Additive* (0..*)	"Identifies any additives introduced to the specimen before or at the time of collection. These additives may be introduced in order to preserve, maintain or enhance the particular nature or component of the specimen." - HL7 Version 2.8, SPM-6. Note that HL7 identifies a Code Table (Table 371) for this property, which currently contains 57 suggested values.

SpecimenHandling

Derivations

- *SpecimenStorage* is a kind of SpecimenHandling
- *SpecimenTransportation* is a kind of SpecimenHandling

Description

This class contains information regarding the transportation or storage of a specimen. Information may be recorded for both storage and transportation about the minimum and maximum temperatures to which the specimen was exposed. Subtypes of this class deal with specific requirements for storage and transportation.

Note that we need to model more details regarding chain of custody in general and the storage and handling of specimens in specific in future modeling iterations. We may also need a shipping-container assessment, not just specimen assessment.

Content	Description
dateTimeBegin : *PointInTime* (1..1)	The date time upon which the specimen handling commenced. For Specimen Transportation, this would be the date/time that the specimen was sent.
dateTimeEnd : *PointInTime* (1..1)	The date time upon which the specimen handling ended. For Specimen Transportation, this would be the date/time that the specimen was received. "The time that the specimen is received at the diagnostic service. The actual time that is recorded is based on how specimen receipt is managed and may correspond to the time the sample is logged in." - HL7 Version 2.8, SPM-18.

Content	Description
highTemperature : *PhysicalQuantity* (0..1)	The maximum temperature to which the specimen was exposed during the Specimen Handling episode described by this class.
lowTemperature : *PhysicalQuantity* (0..1)	The minimum temperature to which the specimen was exposed during the Specimen Handling episode described by this class.

SpecimenProcessingEvent

Description

This class represents actions performed on a specimen in order to prepare it for future testing. Such actions may include adding an additive or placing the specimen in a container containing a pre-defined additive in order to preserve, maintain or enhance the particular nature or component of the specimen. Other actions include aliquoting a single specimens into multiple subsets, grouping or pooling multiple specimens into one specimen, etc. As a result of this processing event, a new specimen(s) may be created, thus this class contains a pointer (zero-to-many) back to the Specimen class to identify the newly-created Specimen(s).

Content	Description
groupedSpecimenCount : Integer (0..1)	"The number of individual specimens of a particular type represented by this instance of a specimen. The use of this field is restricted to specimens upon which all specimen related attributes are identical. This field would only be valued if the [Specimen Role] attribute has the value [Group]." - HL7 Version 2.8, SPM-13.
processCategory : *Code* (1..1) See *Specimen Process* definition for values.	Identifies the process that was performed. Possible values include: Aliquot, Pool, Spun, etc.
additive : *Additive* (0..*)	Identifies any materials introduced to the specimen before or at the time of collection. These additives may be introduced in order to preserve, maintain enhance, or change the particular nature or component of the specimen.
specimen : *Specimen* (0..*)	Identifies Specimen instance(s) created as a result of a Specimen Processing Event. Note the Id of the newly-created specimens are often derived from the Id of the original specimen. For example, if a samply of whole blood with Id=1234 was spun into two new samples containing plasma (Id=1234-01) and platelets (Id=1234-02), two new Sample instances are created.

SpecimenStorage

Hierarchy

SpecimenStorage is a kind of *SpecimenHandling*

Description

This class contains information regarding the storage of a specimen. This class currently contains a storage location identifier, but will be augmented in future iterations as we intend to model more details regarding chain of custody as well as long-term storage (for example tissue banks).

Content	Description
location : *Id* (1..1)	Identifies the location in which the specimen is/was stored.

SpecimenTransportation

Hierarchy

SpecimenTransportation is a kind of *SpecimenHandling*

Description

This class contains information regarding the transportation of a specimen. This class currently contains the shipment identifier and the method of transportation, but will be augmented in future iterations as we intend to model more details regarding chain of custody.

Content	Description
shipmentId : *Id* (1..1)	"The identifier assigned by the shipment transportation provider that uniquely identifies this shipment from all other shipments by the same provider. The addressee for the shipment should be able to use this identifier to match a physical shipment with the electronic manifest for the shipment." - HL7 Version 2.8, SPM-32.
transportationMethod : String (1..1)	Indicates "the means by which a sample reaches the diagnostic service provider. This information is to aid the lab in scheduling or interpretation of results. Possible answers: routine transport van, public postal service, etc." - HL7 Version 2.8, OBR-38.

TestException

Hierarchy

TestException is a kind of *ReportableResult*

Description

This class is used to communicate reason(s) why a test was unable to be performed. It may indicate that the quantity of specimen was insufficient, that the specimen was contaminated, that the specimen is inappropriate for the kind of test ordered, etc.

Content	Description
reason : *Code* (1..1)	Indicates the reason why a test was unable to be performed. It may indicate that the quantity of specimen was insufficient, that the specimen was contaminated, that the specimen is inappropriate for the kind of test ordered, etc.

Content	Description
	"Contains the value observed by the observation producer.... It is not a required field because some systems will report only the Interpretation Codes.... This field may repeat for multipart, single answer results." - HL7 Version 2.8, OBX-5.

TranscriptionEvent

Description

Transcribe: "to make a written copy, especially a typewritten copy, of (dictated material, notes taken during a lecture, or other spoken material)." - Dictionary.com. This class captures information about who transcribed the provider's dictated notes, and when that transcription occurred.

Content	Description
dateTime : *PointInTime* (1..1)	The date and time upon which the person identified as the transcriptionist converted the provider's dictated notes into written form.
transcriptionist : *IndividualProvider* (1..1)	"This field identifies the report transcriber." - HL7 Version 2.8, OBR-35

Terminology

Act Instance Status

Value Set	Act Instance Status - 2.16.840.1.113883.3.2074.1.1.16
Code System	ActStatus - 2.16.840.1.113883.5.14
Version	
Definition	

Code	Code System	Print Name
suspended	ActStatus	suspended
obsolete	ActStatus	obsolete
nullified	ActStatus	nullified
new	ActStatus	new
completed	ActStatus	completed
cancelled	ActStatus	cancelled
aborted	ActStatus	aborted
held	ActStatus	held
active	ActStatus	active
suspended	ActStatus	suspended
obsolete	ActStatus	obsolete

Code	Code System	Print Name
nullified	ActStatus	nullified
new	ActStatus	new
completed	ActStatus	completed
cancelled	ActStatus	cancelled
aborted	ActStatus	aborted
held	ActStatus	held
active	ActStatus	active

Anatomical Site Modifier

Value Set	Anatomical Site Modifier - 2.16.840.1.113883.3.2074.1.1.24
Code System	SNOMED-CT - 2.16.840.1.113883.6.96
Version	
Definition	

Code	Code System	Print Name
not found	SNOMED-CT	OUTER
11896004	SNOMED-CT	INTERMEDIATE
not found	SNOMED-CT	ROSTRAL
261089000	SNOMED-CT	INFERIOR
not found	SNOMED-CT	INNER
255554000	SNOMED-CT	DORSAL
46053002	SNOMED-CT	DISTAL
66787007	SNOMED-CT	CRANIAL
3583002	SNOMED-CT	CAUDAL
771000124106	SNOMED-CT	VENTROLATERAL
26283006	SNOMED-CT	SUPERFICIAL
not found	SNOMED-CT	VENTRAL
261183002	SNOMED-CT	UPPER
410679008	SNOMED-CT	SURFACE
49370004	SNOMED-CT	LATERAL
255549009	SNOMED-CT	ANTERIOR
40415009	SNOMED-CT	PROXIMAL
14414005	SNOMED-CT	PERIPHERAL
255561001	SNOMED-CT	MEDIAL
261122009	SNOMED-CT	LOWER
26216008	SNOMED-CT	CENTRAL
255551008	SNOMED-CT	POSTERIOR

Code	Code System	Print Name
761000124104	SNOMED-CT	DORSOLATERAL
57195005	SNOMED-CT	BASAL
43674008	SNOMED-CT	APICAL
264217000	SNOMED-CT	SUPERIOR

Criterion Category

Value Set	Criterion Category - 2.16.840.1.113883.3.2074.1.1.25
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
Generic	Laboratory test relationship	Generic
Race	Laboratory test relationship	Race
Sex	Laboratory test relationship	Sex
Species	Laboratory test relationship	Species
Breed	Laboratory test relationship	Breed
Strain	Laboratory test relationship	Strain
Geography	Laboratory test relationship	Geography
Age	Laboratory test relationship	Age

Event type

Value Set	Event type - 2.16.840.1.113883.3.2074.1.1.17
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
supine	Laboratory test relationship	supine
substance administration	Laboratory test relationship	substance administration
standing	Laboratory test relationship	standing
baseline	Laboratory test relationship	baseline
challenge NOS	Laboratory test relationship	challenge NOS
excision	Laboratory test relationship	excision
exercise	Laboratory test relationship	exercise
fluid fast	Laboratory test relationship	fluid fast
meal	Laboratory test relationship	meal

Code	Code System	Print Name
specimen count	Laboratory test relationship	specimen count
calorie fast	Laboratory test relationship	calorie fast
specimen time	Laboratory test relationship	specimen time

FHIM Specimen Rejection Reason

Value Set	FHIM Specimen Rejection Reason - 2.16.840.1.113883.3.2074.1.1.19
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
Container compromised	Laboratory test relationship	Container compromised
Label problem	Laboratory test relationship	Label problem
Sample compromised	Laboratory test relationship	Sample compromised
Inappropriate sample	Laboratory test relationship	Inappropriate sample

Lab Observation Method

Value Set	Lab Observation Method - Lab Observation Method
Code System	SNOMED-CT - 2.16.840.1.113883.6.96
Version	
Definition	

Lab Priority

Value Set	Lab Priority - 2.16.840.1.113883.3.2074.1.1.22
Code System	Lab Priority - 2.16.840.1.113883.12.485
Version	
Definition	

Code	Code System	Print Name
R	Lab Priority	routine
A	Lab Priority	ASAP
P	Lab Priority	preop
T	Lab Priority	timing critical
S	Lab Priority	stat
C	Lab Priority	callback
PRN	Lab Priority	as needed

Laboratory test relationship

Value Set	Laboratory test relationship - Laboratory test relationship
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
is panel member	Laboratory test relationship	is panel member
is revision of	Laboratory test relationship	is revision of
is reflex test for	Laboratory test relationship	is reflex test for

Results Release Categorization

Value Set	Results Release Categorization - Results Release Categorization
Version	
Definition	

Specimen Collection Method

Value Set	Specimen Collection Method - 2.16.840.1.113883.3.2074.1.1.35
Code System	SNOMED-CT - 2.16.840.1.113883.6.96
Version	
Definition	

Code	Code System	Print Name
235157009	SNOMED-CT	Endoscopic brushings of gastrointestinal tract (procedure)
232595000	SNOMED-CT	Bronchoscopic irrigation (procedure)
225109005	SNOMED-CT	Collection of nephrostomy urine specimen (procedure)
	SNOMED-CT	collection of urine specimen using pediatric urine collection bag
177788009	SNOMED-CT	Open drainage of pleural cavity (procedure)
175189006	SNOMED-CT	Pericardial biopsy (procedure)
168461002	SNOMED-CT	Postmortem examination (procedure)
129112001	SNOMED-CT	Aspiration from trachea (procedure)
121098002	SNOMED-CT	Transparent tape method for fungal identification (procedure)
312876006	SNOMED-CT	Taking urethral swab (procedure)
	SNOMED-CT	arterial sampling catheter procedure (procedure)
397394009	SNOMED-CT	Bronchoalveolar lavage (procedure)
386089008	SNOMED-CT	Collection of coughed sputum (procedure)

Code	Code System	Print Name
36213007	SNOMED-CT	Endoscopy and brush biopsy (procedure)
240977001	SNOMED-CT	Biopsy of skin (procedure)
301805004	SNOMED-CT	Taking high vaginal swab (procedure)
29240004	SNOMED-CT	autopsy examination (procedure)
285570007	SNOMED-CT	Taking of swab (procedure)
24619005	SNOMED-CT	Skin scraping for examination (procedure)
312879004	SNOMED-CT	Taking ear swab (procedure)
	SNOMED-CT	collection of first void specimen of urine
79121003	SNOMED-CT	Biopsy of stomach (procedure)
81723002	SNOMED-CT	Amputation (procedure)
8367003	SNOMED-CT	Clipping nails of patient (procedure)
75016008	SNOMED-CT	Biopsy of soft tissue (procedure)
	SNOMED-CT	tissue impression smear preparation (Synonym touch prep)
	SNOMED-CT	collection of early morning mid-stream specimen of urine by clean catch procedure
	SNOMED-CT	collection of urine via indwelling suprapubic catheter
	SNOMED-CT	one time collection of urine via sterile urethral catheter
	SNOMED-CT	Drainage via Penrose drain (45901004^Penrose drain, device (physical object))
	SNOMED-CT	venous sampling catheter procedure
89305009	SNOMED-CT	Abdominal paracentesis (procedure)
418622002	SNOMED-CT	Taking oral swab (procedure)
442148007	SNOMED-CT	Bronchioloalveolar lavage (procedure)
446775007	SNOMED-CT	Collection of urine via indwelling urinary catheter (procedure)
446860008	SNOMED-CT	Collection of cerebrospinal fluid via ventriculoperitoneal shunt (procedure)
67889009	SNOMED-CT	Irrigation (procedure)
48635004	SNOMED-CT	Fine needle biopsy (procedure)
68688001	SNOMED-CT	Curettage (procedure)
58088002	SNOMED-CT	Urine specimen collection, suprapubic (procedure)
54535009	SNOMED-CT	Cone biopsy of cervix (procedure)
176178006	SNOMED-CT	Diagnostic cystoscopy (procedure)
234319005	SNOMED-CT	Splenectomy (procedure)
225711009	SNOMED-CT	Collection of nasal pharyngeal aspirate (procedure)
225271002	SNOMED-CT	Collection of mid-stream specimen of urine (procedure)
24139008	SNOMED-CT	Endoscopy of urinary bladder (procedure)

Code	Code System	Print Name
173830003	SNOMED-CT	Gastric lavage (procedure)
14766002	SNOMED-CT	Aspiration (procedure)
122462000	SNOMED-CT	Drainage procedure (procedure)
178263003	SNOMED-CT	Biopsy of muscle (procedure)
387715005	SNOMED-CT	Peritoneal lavage (procedure)
386088000	SNOMED-CT	Collection of induced sputum (procedure)
32534001	SNOMED-CT	Biopsy of spleen (procedure)
236886002	SNOMED-CT	Hysterectomy (procedure)
312877002	SNOMED-CT	Taking low vaginal swab (procedure)
303995001	SNOMED-CT	Buccal smear procedure (procedure)
299693003	SNOMED-CT	Biopsy of jejunum (procedure)
277762005	SNOMED-CT	Lumbar puncture (procedure)
78533007	SNOMED-CT	Irrigation of urinary bladder (procedure)
80657008	SNOMED-CT	Bronchoscopy with brush biopsy (procedure)
83152002	SNOMED-CT	Oophorectomy (procedure)
86273004	SNOMED-CT	Biopsy (procedure)
287571005	SNOMED-CT	Diagnostic bronchial aspiration (procedure)
439336003	SNOMED-CT	Brush biopsy (procedure)
410729004	SNOMED-CT	Amniocentesis (procedure)
91602002	SNOMED-CT	Thoracentesis (procedure)
73416001	SNOMED-CT	Urine specimen collection, clean catch (procedure)
44414004	SNOMED-CT	Aspiration of Bartholin's cyst (procedure)
446847002	SNOMED-CT	Drainage of pleural cavity via chest tube (procedure)
448895004	SNOMED-CT	Sampling for smear (procedure)
6853008	SNOMED-CT	Nasogastric tube aspiration (procedure)
58088002	SNOMED-CT	Urine specimen collection, suprapubic (procedure)
56757003	SNOMED-CT	Scraping (procedure)
49401003	SNOMED-CT	Bone marrow aspiration procedure (procedure)

Specimen Condition

Value Set	Specimen Condition - 2.16.840.1.113883.3.2074.1.1.18
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
Contaminated	Laboratory test relationship	Contaminated

Code	Code System	Print Name
Room temperature	Laboratory test relationship	Room temperature
Cool	Laboratory test relationship	Cool
Live	Laboratory test relationship	Live
Hemolyzed	Laboratory test relationship	Hemolyzed
Clotted	Laboratory test relationship	Clotted
Frozen	Laboratory test relationship	Frozen

Specimen Process

Value Set	Specimen Process - 2.16.840.1.113883.3.2074.1.1.23
Code System	Laboratory test relationship - Laboratory test relationship
Version	
Definition	

Code	Code System	Print Name
modify NOS	Laboratory test relationship	modify NOS
aliquot	Laboratory test relationship	aliquot
component	Laboratory test relationship	component
pool	Laboratory test relationship	pool
group	Laboratory test relationship	group
isolate	Laboratory test relationship	isolate
culture	Laboratory test relationship	culture
add	Laboratory test relationship	add

Chapter
5

Datatypes Domain

Topics:

This package contains classes that serve as “data types” for FHIM attributes. The FHIM data types are common, reusable structures that are often needed in healthcare applications. For example, healthcare observations often need both a numerical value and a unit of measure, such as a weight of 150 pounds. Rather than modeling the value and units of measure separately in the main model (i.e., weightValue=150, weightUnits=pounds), we have chosen to create a Physical Quantity data type which can hold both the value and the units so the main model would only have weight:PhysicalQuantity=150 pounds.

The FHIM data types are based on the HL7 Version 3 data types, but are simplified so that they might be more easily resolved into implementable specifications. Where possible, we have removed recursion from the data types, and where there are generalization relationships, the subtypes only add to the super types.

Besides the data types in this package, the FHIM only uses the basic data types defined in UML, and the properties of the data types in this package eventually all resolve to the basic UML data types. The FHIM modeling style requires that all FHIM attributes must be either a UML data type or a class contained in this Datatypes package. If a property requires any other kind of type, it is modeled as an association, not as an attribute. For example, a lab test references a Patient and a lab test code. In UML both the patient and lab test code properties could be modeled as either an attribute or an association of the lab test. Since Patient is not a FHIM Datatype, it is modeled as an association, but since the lab test is a code, which is a data type, it is modeled as an attribute. This style results in models similar in structure to HL7 models.

Note that every package in the FHIM is dependent on the FHIM Datatypes package. The FHIM Datatypes package must not be dependent on any other package. Indeed, the FHIM data types must all resolve to UML Primitives.

Diagrams

_Datatypes

Class Diagram

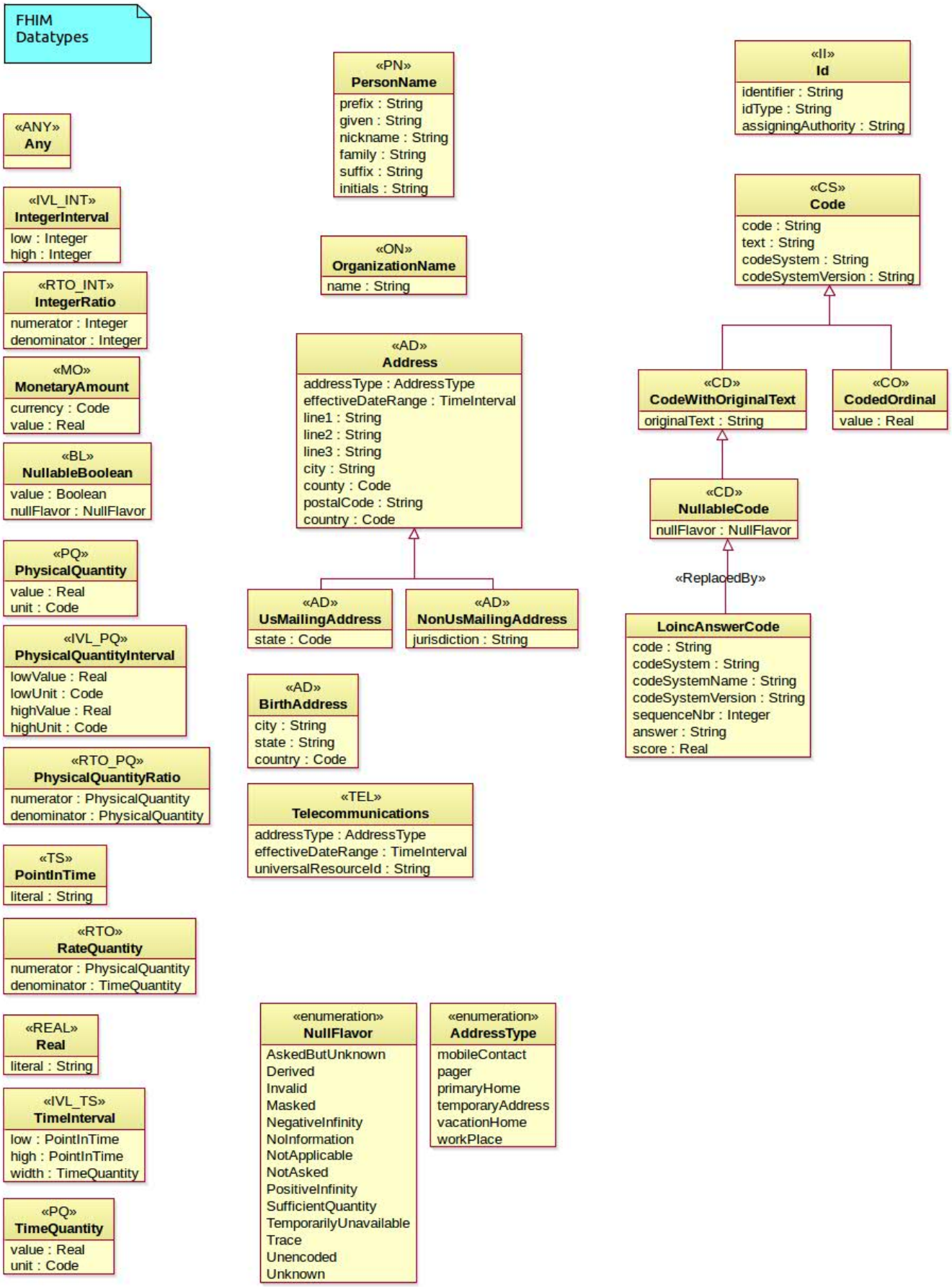
This diagram displays all the classes in the FHIM Datatypes package. The FHIM data types are based on the HL7 Version 3 data types, but are simplified so that they might be more easily resolved into implementable specifications. Where a FHIM data type maps to an HL7 data type, we have placed the HL7 data type mnemonic as a keyword, so for example, Person Name has a <<PN>> keyword.

It is important to keep in mind that many of these data types will not necessarily be implemented directly, but rather serve as logical placeholders that will be used to inform a transformation process to generate structures appropriate to the target platform. For example, note the Id data type. When targeting an HL7 V2 platform, FHIM properties referencing the Id data type will be modified to reference an HL72EntityIdentifier, HL72ExtendedCompositeId, HL72HierarchicDesignator, HL72OrganizationIdentifierExtended, or HL72PersonLocation, as needed. The knowledge of which HL7 V2 “flavor” of Id to substitute will be contained in a separate mapping model. Similarly, when targeting HL7 V3, multiple “flavors” of V3 Id data types are possible.

A note about Person Name is in order: We found the HL7 V3 notion that a person’s given name is an ordered list of names rather than a first name and middle name as traditionally modeled to be a useful construct. But we found that HL7’s modeling each part of the name separately to be overly complex, so we have modeled a single structure made up of several attributes each of which is a string. Also, we chose not to build a use code into the Person Name data type, rather, the use code is defined explicitly in the domain models. For example, the Person class contains a property called legalName, which by definition should contain the person’s legal name, thus no use code is required.

Similarly for addresses, we found HL7’s modeling each part of the address separately to be overly complex, so we have modeled a single structure made up of several attributes each of which is a string. Notably, the street portion of the address is simply line1, line2, and line3 rather than modeling each part of the street line separately.

However, unlike our approach for Person Name, for both addresses and telecommunications addresses, we chose a hybrid approach for the use code. We include an address type (the values of which come from the HL7 V3 vocabulary), and we explicitly model the use of the data element in the domain model. For example, Person has both a primaryHomeAddress and a workAddress. The Address.addressTypeCode property would be set to the appropriate value accordingly. This approach was taken in order to explicitly account for the concepts in the logical model (for example, it makes no sense for a hospital to have a home phone number), while acknowledging that phone numbers, addresses, email addresses, etc. will likely be implemented using a mixed bag of addresses, each of which would have some sort of type code.



Definitions

Address

Derivations

- *NonUsMailingAddress* is a kind of Address
- *UsMailingAddress* is a kind of Address

Description

A physical address at which the person resides or may be contacted. 7/8/10: Renamed from MailingAddress to Address. Moved county from Person to here.

Content	Description
addressType : *AddressType* (1..1)	Indicates the kind of address that is contained within this class. Examples include primaryHome, Work, etc. Note that in HL7 V3, this concept is part of the Address data type (the 'use code'). This concept is made explicit in this Address class, because this is a platform-independent model - non V3 implementations will need other mechanisms to deal with the type.
city : String (1..1)	An Address Part (ADXP) that contains the name of the city, town, village, or other community or delivery center. "The name of the city, town, village, or other community or delivery center." - HL7 V3
country : *Code* (0..1)	A state or nation An Address Part (ADXP) that contains the Country of the address.
county : *Code* (0..1)	A region created by territorial division for the purpose of local government. In the United States, a county (or parish in Louisiana) is the largest administrative district within a state. This property is used primarily for statistical and pricing information (i.e., the same service may be more expensive in an affluent section of the country than in a less-affluent portion).
effectiveDateRange : *TimeInterval* (1..1)	The time period for which the address is a valid location for the person or organization. The data type is a TimeInterval, which includes both a start date and end date, either of which may be empty.
line1 : String (1..1)	The first line of the street address. While this street address could be broken into several constituent parts, for the purpose of this logical model, the whole line is treated as a single concept. The first line of a mailing address. Unlike HL7, we have chosen not to break up the parts of each line.
line2 : String (0..1)	The second line of the street address. While this street address could be broken into several constituent parts,

Content	Description
	for the purpose of this logical model, the whole line is treated as a single concept. The second line of a mailing address. Unlike HL7, we have chosen not to break up the parts of each line.
line3 : String (0..1)	The third line of a mailing address. Unlike HL7, we have chosen not to break up the parts of each line. The first line of the street address. While this street address could be broken into several constituent parts, for the purpose of this logical model, the whole line is treated as a single concept. Note that the third line is rarely used.
postalCode : String (1..1)	A code designating a region defined by the postal service An Address Part (ADXP) that contains a postal code designating a region defined by the postal service.

Any

Description

This *abstract* class is used to represent a data type that is not known at the logical model level, but rather will be substituted with a (set of) real data type(s) when transformed to a given platform.

BirthAddress

Description

A simplified version of a Postal Address which contains only a city, state, and country, all of which are optional. This is used to record a person's place of birth, used for identificaton and statistical purposes.

Content	Description
city : String (0..1)	An Address Part (ADXP) that contains the name of the city, town, village, or other community or delivery center. "The name of the city, town, village, or other community or delivery center." - HL7 V3
country : *Code* (0..1)	A state or nation An Address Part (ADXP) that contains the Country of the address.
state : String (0..1)	An Address Part (ADXP) that contains the state or province. A state or provinces is a sub-unit of a country with limited sovereignty in a federally organized country. An Address Part (ADXP) that contains a sub-unit of a state or province. A sub-unit of a country with limited sovereignty in a federally organized country.

Code

Derivations

- *CodedOrdinal* is a kind of Code
- *CodeWithOriginalText* is a kind of Code

Description

"A word, letter, number, or other symbol used in a code system to mark, represent, or identify something: The code on the label shows the date of manufacture." - Dictionary.com This *abstract* data type represents a "coded element" - some series of letters or numbers which can be "looked up" in a code system or value set. In practice, this data type will be substituted with specific "flavors" of the code data type for use in particular standards-based payloads.

Content	Description
code : String (0..1)	This is a placeholder for the "code", which is a unique identifier of an entry in a coding system. Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform.
codeSystem : String (0..1)	This is a placeholder for the "coding system", which is a identifies the coding scheme or coding system of which the code is a member. Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform.
codeSystemVersion : String (0..1)	This is a placeholder for the "coding system version", which is identifies the version coding scheme or coding system of which the code is a member. Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform. This version number identifies the possible members of a coding system as of a particular time. If a coding system isn't formally versioned, such as NDC, the date on which the coding system was published could be used here.
displayText : String (0..1)	This is a placeholder for the "display text" or "designation", which is the human-readable string representing the concept. Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform.

CodeWithOriginalText

Hierarchy

CodeWithOriginalText is a kind of *Code*

Derivations

- *NullableCode* is a kind of CodeWithOriginalText

Description

A specialization of Code which additionally contains a property to hold the original text as seen and/or selected by the user who entered the data

Content	Description
originalText : String (1..1)	"The text as seen and/or selected by the user who entered the data which represents the intended meaning of the user." - HL7 V3

CodedOrdinal

Hierarchy

CodedOrdinal is a kind of *Code*

Description

"Coded data, where the coding system from which the code comes defines a partial or complete order on some or all of the codes in the system. Codes may be assigned a numerical value, but this is not required. [This datatype] adds semantics related to ordering and/or numerical values...." - HL7 V3.

Content	Description
value : *Real* (1..1)	The value assigned to this code in the code System. - HL7 V3.

Id

Description

An identifier that uniquely identifies a thing or object. This *abstract* data type represents a "identifier" - some series of letters or numbers which uniquely identifies something. In practice, this data type will be substituted with specific "flavors" of the Id data type for use in particular standards-based payloads.

Content	Description
assigningAuthority : String (0..1)	This is a placeholder for the "assigning authority", which is a unique identifier of the system (or organization or agency or department) that creates the data. Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform.
idType : String (0..1)	Indicates what kind of identifier is being represented. For example, the idType might be represent a Driver's License, in which case the assigning Authority might be the Virginia Department of Motor Vehicles. Note that: a) this information can (and probably should) be also be made clear by the name and definition of the property whose data type is an Id; and b) this property might be an enumeration in the future.
identifier : String (0..1)	This is a placeholder for the "entity identifier," which is usually defined to be unique within the series of identifiers created by the "assigning authority". Note that this property will be replaced by some other concept or group of concepts when this abstract class is replaced by a specific class for a given target platform.

IntegerInterval

Description

This data type represents an Interval, where the Low and High Limits are Integers. An Interval is a "set of consecutive values of an ordered base data type." - HL7 V3 "Integer numbers are precise numbers that are results of counting and enumerating. Integer numbers are discrete, the set of integers is infinite but countable. No arbitrary limit is imposed on the range of integer numbers." - HL7 V3

An interval of integer numbers stating the minimal and maximal number of repetitions of the Act.

Content	Description
high : Integer (0..1)	"The high limit of the interval. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists." - HL7 V3 The maximal number of repetitions of the Act.
low : Integer (1..1)	"The low limit of the interval. The low limit SHALL NOT be positive infinity." - HL7 V3 The minimal number of repetitions of the Act.

IntegerRatio

Description

This data type represents an Ratio, where the Numerator and Denominator are Integers. A Ratio is "a quantity constructed as the quotient of a numerator quantity divided by a denominator quantity. Common factors in the numerator and denominator are not automatically cancelled out. The RTO data type supports titers (e.g., "1:128") and other quantities produced by laboratories that truly represent ratios." - HL7 V3 "Integer numbers are precise numbers that are results of counting and enumerating. Integer numbers are discrete, the set of integers is infinite but countable. No arbitrary limit is imposed on the range of integer numbers." - HL7 V3

A ratio (numerator : denominator) specifying the relative quantities of the Entity playing the Role in the Entity scoping the Role, used for Roles that represent composition relationships between the scoping and playing Entities.

Content	Description
denominator : Integer (1..1)	"The quantity that devides the numerator in the ratio. The default is the integer number 1 (one). The denominator SHALL not be zero." - HL7 V3 The quantity that divides the numerator in the ratio. The default is the integer number 1 (one.) The denominator must not be zero.
numerator : Integer (1..1)	"The quantity that is being divided in the ratio. The default is the integer number 1 (one)." - HL7 V3 The quantity that is being divided in the ratio. The default is the integer number 1

LoincAnswerCode

Hierarchy

LoincAnswerCode is a kind of *NullableCode*

Description

A specialization of Code which contains properties necessary to support LOINC-coded answers to assessment questions.

Content	Description
answer : String (1..1)	The text associated with the answer. In assessment instruments, each possible answer has a specific wording. This property holds that wording.
code : String (1..1)	"The plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept." - HL7 V3
codeSystem : String (1..1)	"The code system that defines the code." - HL7 V3
codeSystemName : String (1..1)	"The common name of the coding system." - HL7 V3
codeSystemVersion : String (0..1)	"If applicable, a version descriptor defined specifically for the given code system." - HL7 V3
score : *Real* (1..1)	The value assigned to this code in the code System. - HL7 V3.
sequenceNbr : Integer (1..1)	The order in which this answer is displayed among the list of possible answers, as defined bythe code system. The ordering of both questions and the possible answers to them are important, as they may influence the way people answer them. The sequencing of the answers is not necessarily related to the value (or score) of the answer.

MonetaryAmount

Description

Indicates the monetary amount to be transferred from the debit to the credit account.

"A quantity expressing an amount of money in some currency. While the monetary amount is a single kind of quantity (money) the exchange rates between the different units are variable. This is the principle difference between PQ and MO, and the reason why currency units are not physical units." - HL7 V3

Content	Description
currency : *Code* (1..1)	Currencies are the units in which monetary amounts are denominated in different economic regions. "The currency unit as defined in ISO 4217" - HL7 V3
value : *Real* (1..1)	The amount of money in some currency. "The magnitude of the Monetary Amount in terms of currency" - HL7 V3

NonUsMailingAddress

Hierarchy

NonUsMailingAddress is a kind of *Address*

Description

A specialization of Address for non-US postal addresses. Note that the Address class does not have a State or Province attribute - the US Mailing Address includes a code for the State, whereas the Non-US Mailing address merely has a string for the "jurisdiction", which would have the state or province as needed by that country's postal designation conventions.

Content	Description
jurisdiction : String (1..1)	This property is a string for the "jurisdiction", which would have the state or province as needed by the country's postal designation conventions. In some cases, this property will be blank, and the jurisdiction would be part of one of the street address lines.

NullableBoolean

Description

This data type represents a boolean value which may be unknown. In other words, this data type can represent Yes, No, and Unknown; unlike a traditional boolean which can only represent True and False. For this logical model, this class has been modeled in the HL7 V3 style, which has the advantage of being able to account for different kinds of "unknowns", but has the disadvantage of having two fields, one of which must always be populated while the other must always be empty. Implementers may choose to implement this class using a single field instead.

Content	Description
nullFlavor : *NullFlavor* (1..1)	This property indicates why the value property is empty. It uses the NullFlavor enumeration. This property must be valued when the value property is empty, and must be empty when the value property is valued.
value : Boolean (1..1)	This property contains either a True or a False (or Yes or No). If "unknown" is needed, this property will be empty, and the nullFlavor property will be valued.

NullableCode

Hierarchy

NullableCode is a kind of *CodeWithOriginalText*

Derivations

- *LoincAnswerCode* is a kind of NullableCode

Description

A specialization of Code which additionally contains a property to hold a reason why the value of the code is empty.

Content	Description
nullFlavor : *NullFlavor* (1..1)	This property indicates why the value property is empty. It uses the NullFlavor enumeration. This property must be valued when the value property is empty, and must be empty when the value property is valued.

OrganizationName

Description

"A word or term by which a person or thing is commonly and distinctively known." - Collins English Dictionary. This data type represents a organization's name.

Content	Description
name : String (1..1)	"A word or term by which a person or thing is commonly and distinctively known." - Collins English Dictionary. This property represents a organization's name. Note that the data type is simply a string, unlike HL7 V3's complex collection of name parts.

PersonName

Description

"A word or term by which a person or thing is commonly and distinctively known." - Collins English Dictionary. This data type represents a person's name.

The name of the person. Uses the VHIM-constrained Person Name data type.

Content	Description
family : String (1..1)	"The portion of a person's name that reflects the genealogy of the person. In western cultures, this is the 'last' name. In eastern cultures, the family name appears before the person's given name(s). In some cultures (e.g. Eritrea) the family name of a son is the first name of his father." - HL7 V3 'Family name, this is the name that links to the genealogy' (HL7)
given : String (0..*)	"A set of names given to a person at birth, but not including the family name. In western cultures, this property would contain the 'first' and 'middle' names. Note that in some cultures, the given name is placed after the family name. Note also that this property contains multiple elements, so it can handle those situations where a person has more than one 'middle' name." - HL7 V3 'Given name (don't call it 'first name' since this given names do not always come first)' (HL7)
initials : String (0..1)	The first letter of each part of a proper name. This property stores the initials of a person's name, which is used in research studies to identify the patient without divulging the person's entire name.

Content	Description
nickname : String (0..1)	'A callme name is (usually a given name) that is preferred when a person is directly addressed.' (HL7) A name added to or substituted for the proper name of a person.
prefix : String (0..*)	'A prefix has a strong association to the immediately following name part. A prefix has no implicit trailing white space (it has implicit leading white space though). Note that prefixes can be inverted' (HL7) A Person Name Prefix is usually an academic or nobility title. An Academic title includes a prefix like 'Dr.' There are still people with nobility titles (aristocrats). German 'von' is generally a nobility title, not a mere voorvoegsel. Others are 'Earl of' or 'His Majesty King of...' etc. Rarely used nowadays, but some systems do keep track of this. "Contains a set of honorific terms that typically appear before a person's name, for example Mr., Mrs., Dr., etc. Prefixes have a strong association to the immediately following name part." - HL7 V3
suffix : String (0..*)	'A suffix has a strong association to the immediately preceding name part. A prefix has no implicit leading white space (it has implicit trailing white space though). Suffices can not be inverted' (HL7) "Contains a list of honorific terms that typically appear after a person's name, for example Jr., Sr., MD, RN, etc. Prefixes have a strong association to the immediately following name part." - HL7 V3

PhysicalQuantity

Description

"A dimensioned quantity expressing the result of measuring" - HL7 V3

The amount that was or is to be supplied

Content	Description
unit : *Code* (1..1)	"The unit of measure specified in the Unified Code for Units of Measure (UCUM). The default unit is 1." - HL7 V3 The unit of measure specified in the Unified Code for Units of Measure (UCUM) [].
value : *Real* (1..1)	The magnitude of the quantity measured in terms of the unit. "The magnitude of the quantity measured in terms of the unit" - HL7 V3

PhysicalQuantityInterval

Description

The amount of the therapeutic agent or other substance given at one administration event.

This data type represents an Interval, where the Low and High Limits are Physical Quantities. An Interval is a "set of consecutive values of an ordered base data type." - HL7 V3 A Physical Quantity is "a dimensioned quantity expressing the result of measuring" - HL7 V3

Content	Description
highUnit : *Code* (0..1)	The unit of measure specified in the Unified Code for Units of Measure (UCUM) []. "The high limit of the interval. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists." - HL7 V3. This property contains the Unit of Measure of the high limit.
highValue : *Real* (0..1)	The magnitude of the quantity measured in terms of the unit. "The high limit of the interval. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists." - HL7 V3. This property contains the numeric portion (i.e., not including any units of measure) of the high limit.
lowUnit : *Code* (0..1)	"The low limit of the interval. The low limit SHALL NOT be positive infinity." - HL7 V3. This property containsthe Unit of Measure of the low limit. The unit of measure specified in the Unified Code for Units of Measure (UCUM) [].
lowValue : *Real* (0..1)	The magnitude of the quantity measured in terms of the unit. "The low limit of the interval. The low limit SHALL NOT be positive infinity." - HL7 V3 This property contains the numeric portion (i.e., not including any units of measure) of the low limit.

PhysicalQuantityRatio

Description

A ratio (numerator : denominator) specifying the relative quantities of the Entity playing the Role in the Entity scoping the Role, used for Roles that represent composition relationships between the scoping and playing Entities.

This data type represents a Ratio, where the Low and High Limits are Physical Quantities. A Ratio is " A quantity constructed as the quotient of a numerator quantity divided by a denominator quantity." - HL7 V3 A Physical Quantity is "a dimensioned quantity expressing the result of measuring" - HL7 V3

Content	Description
denominator : *PhysicalQuantity* (1..1)	"The quantity that devides the numerator in the ratio. The default is the integer number 1 (one). The denominator SHALL not be zero." - HL7 V3 The quantity that divides the numerator in the ratio. The default is the integer number 1 (one.) The denominator must not be zero.
numerator : *PhysicalQuantity* (1..1)	"The quantity that is being divided in the ratio. The default is the integer number 1 (one)." - HL7 V3 The

Content	Description
	quantity that is being divided in the ratio. The default is the integer number 1

PointInTime

Description

A quantity specifying a point on the axis of natural time. A point in time is most often represented as a calendar expression. Semantically, however, time is independent from calendars and best described by its relationship to elapsed time (measured as a physical quantity in the dimension of time.) A point in time plus an elapsed time yields another point in time. Inversely, a point in time minus another point in time yields an elapsed time. As nobody knows when time began, a point in time is conceptualized as the amount of time that has elapsed from some arbitrary zero-point, called an epoch. Because there is no absolute zero-point on the time axis natural time is a difference-scale quantity, where only differences are defined but no ratios. (For example, no point in time is - absolutely speaking - 'twice as late' as another point in time.) Given some arbitrary zero-point, one can express any point in time as an elapsed time measured from that offset. Such an arbitrary zero-point is called an epoch. This epoch-offset form is used as a semantic representation here, without implying that any system would have to implement the TS data type in that way. Systems that do not need to compute distances between points in time will not need any other representation than a calendar expression literal

A data type containing date/time information. This data type is a placeholder, as various platforms have differing built-in date/time datatypes. It is anticipated that this data type will be replaced by a different data type when transforming to a particular implementation platform.

Content	Description
literal : String (1..1)	For the default Gregorian calendar the calendar expression literals of this specification conform to the constrained ISO 8601 that is defined in ISO 8824 (ASN.1) under clause 32 (generalized time) and to the HL7 version 2 TS data format. "TS literals are simple calendar expressions... [which] conform to the constrained ISO 8601... western calendar expressions begin with the 4-digit year; followed by the 2-digit month of the year; followed by the 2-digit day of the month; followed by the 2-digit hour of the day (beginning with zero); and so forth. For example, '200004010315' is a valid expression for April 1, 2000, 3:15 am. A calendar expression can be of variable precision, omitting parts from the right. For example, '20000401' is precise only to the day of the month. The least defined calendar period (i.e. the second) may be written as a REAL, with the number of integer digits specified, followed by the decimal point and any number of fractional digits. For example, '20000401031520.34' means April 1, 2000, 3:15 and 20.34 seconds. When other calendars are used in the future, a prefix 'GREG:' can be placed before the western (Gregorian) calendar expression to disambiguate from other calendars. Each calendar shall have its own prefix. However, the western calendar is the default if no prefix is present. In the modern Gregorian calendar (and all calendars where time of day is based on UTC), the calendar expression may contain a time zone suffix. The time zone suffix

Content	Description
	begins with a plus (+) or minus (-) followed by digits for the hour and, for non UTC times, minute cycles. UTC is designated as offset '+00' or '-00'; the ISO 8601 and ISO 8824 suffix 'Z' for UTC is not permitted." - HL7 V3

RateQuantity

Description

Identifies the speed with which the substance is introduced into the subject. Expressed as a physical (extensive) quantity over elapsed time (e.g., examples are 100 mL/h, 1 g/d, 40 mmol/h, etc.)

Rate: "A certain quantity or amount of one thing considered in relation to a unit of another thing and used as a standard or measure: at the rate of 60 miles an hour." - Dictionary.com This class represents a ratio of some Physical Quantity over a period of time. This class is structurally similar to other Ratio classes (e.g., IntegerRatio), except the denominator is by definition a TimeQuantity.

Content	Description
denominator : *TimeQuantity* (1..1)	The quantity that divides the numerator in the ratio. The default is the integer number 1 (one.) The denominator must not be zero. "The quantity that divides the numerator in the ratio. The denominator SHALL not be zero." - HL7 V3 This property is by definition a period of time, with the unit almost always one. For example, one hour, one minute, etc.
numerator : *PhysicalQuantity* (1..1)	"The quantity that is being divided in the ratio. The default is the integer number 1 (one)." - HL7 V3 The quantity that is being divided in the ratio. The default is the integer number 1

Real

Description

"A scalar magnitude. Typically used whenever quantities are measured, estimated, or computed from other real numbers. The typical representation is decimal, where the number of significant decimal digits is known as the precision." - HL7 V3 A data type containing non-whole numbers. This data type is a placeholder, as various platforms have differing built-in floating-point datatypes. It is anticipated that this data type will be replaced by a different data type when transforming to a particular implementation platform.

Content	Description
literal : String (1..1)	This is a placeholder for an actual data type that will be substituted via transformation to a platform-specific datatype.

Telecommunications

Description

A collection of electronic addresses at which the person or organization may be reached. This includes telephones, email addresses, etc.

Content	Description
addressType : *AddressType* (1..1)	Indicates the kind of communications address that is contained within this class. Examples include primaryHome, Work, etc. Note that in HL7 V3, this concept is part of the Telecom data type (the 'use code'). This concept is made explicit in this Telecommunications class, because this is a platform-independent model. Non V3 implementations will need other mechanisms to deal with the type.
effectiveDateRange : *TimeInterval* (1..1)	The time period for which the phone number or communications address is valid for the person or organization. The data type is a TimeInterval, which includes both a start date and end date, either of which may be empty.
universalResourceId : String (1..1)	Represents a telecommunications address at which the person or organization may be reached. Note that this property is a simply a string, the formatting of which will depend on the type of communications address employed.

TimeInterval

Description

An interval of time specified as an interval of points in time - TS.

This data type represents an Interval, where the Low and High Limits are Points In Time. An Interval is a "set of consecutive values of an ordered base data type." - HL7 V3 A PointInTime is "a quantity specifying a point on the axis of natural time. A point in time is most often represented as a calendar expression." - HL7 V3

Content	Description
high : *PointInTime* (0..1)	"The high limit of the interval. The high limit SHALL NOT be negative infinity, and SHALL be higher than the low limit if one exists." - HL7 V3 This is the high limit of the interval.
low : *PointInTime* (0..1)	This is the low limit of the interval. "The low limit of the interval. The low limit SHALL NOT be positive infinity." - HL7 V3
width : *TimeQuantity* (0..1)	The difference between high and low boundary. The purpose of distinguishing a width property is to handle all cases of incomplete information symmetrically. In any interval representation only two of the three properties high, low, and width need to be stated and

Content	Description
	the third can be derived. "The difference between HIGH and LOW boundary. The purpose of distinguishing width is to handle all cases of incomplete information symmetrically. In any IVL representation only two of the three properties HIGH, LOW, and width need to be stated: the third can be derived. When both boundaries are known, width can be derived as HIGH minus LOW. When one boundary and width is known, the other boundary is also known. When no boundary is known, width may still be known. For example, one knows that an activity takes about 30 minutes, but one may not yet know when that activity is started." - HL7 V3

TimeQuantity

Description

A length of time specified as a Physical Quantity, e.g., 5 minutes, 2.5 hours.

This class represents an amount of time, such as 10 minutes, 3.2 seconds, etc. This class is structurally identical to a Physical Quantity, although the units of measure are by definition time units (e.g., hours), rather than physical units (e.g., kilograms).

Content	Description
unit : *Code* (1..1)	"The unit of measure specified in the Unified Code for Units of Measure (UCUM)." - HL7 V3 The units of measure used by this class are limited to those measuring time (e.g., minutes, hours, years, etc.) The unit of measure specified in the Unified Code for Units of Measure (UCUM).
value : *Real* (1..1)	"The magnitude of the quantity measured in terms of the unit" - HL7 V3 Value of the number of time units

UsMailingAddress

Hierarchy

UsMailingAddress is a kind of *Address*

Description

A specialization of MailingAddress that is used for U.S. addresses. Note that the state property may only contain a code for a U.S. State, territory, or APO.

Content	Description
state : *Code* (1..1)	An Address Part (ADXP) that contains the state or province. A state or provinces is a sub-unit of a country with limited sovereignty in a federally organized country. The State code is defined in the USPS Publication 28. Note that while technically, each state "code" should be

Content	Description
	an Id, the enumeration of states has historically treated as a code.