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Introduction into CDISC BRIDG

Biomdecial Research Integrated Domain Group

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CD01

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Program Agenda

- 1 ➤ A little bit of history
- 2 ➤ A word about UML
- 3 ➤ Let's look into the model
- 4 ➤ Mapping example
- 5 ➤ What's new in Version 4

A little bit of history ...

.. BRIDG is getting 10 years old – or even older

(more than) 10 years of BRIDG

CDISC, HL7, NCI, FDA

- **2003-2004: CDISC and HL7 RCRIM WG** (protocol DAM)
- **2004-2005: The NCI caBIG[®] (and CDISC) Structured Protocol Representation Teams** (protocol DAM)
- **2005-2006: Maturation of the BRIDG Project**
(HL7 regulated submission & product labeling, CDISC all standards, and technical base for future standards)
- **2007 – 2012: BRIDG Evolution** (domain experts vs tech – rework / submodel, ISO)
- **2013 – Present: BRIDG Scope Expansion – Translational Research**
(Biospecimen, Molecular Biology, experiments)

Source: http://bridgmodel.nci.nih.gov/about_bridg/background

ISO & BRIDG



CDISC Strength Through Collaboration

Search...

ABOUT | STANDARDS | COLLABORATIONS | RESOURCES | NEWS/PUBLICATIONS | EDUCATION

CDISC Announces BRIDG Model for Research as Final ISO Standard

May 28, 2015

Austin, TX – 28 May 2015 – The Clinical Data Interchange Standards Consortium (CDISC) is excited to announce that the International Organization for Standardization (ISO) now recognizes the collaborative Biomedical Research Integrated Domain Group (BRIDG) Model version 3.2 as a published, Final International Standard for clinical research and its link with healthcare. This standard, which had previously passed through the ISO Draft International Standard (DIS) ballot, was unanimously approved on 24 April for publication by the ISO Technical Committee (TC) 215 for Healthcare Informatics.

The **BRIDG Model** is a domain analysis model representing the realm of protocol-driven research. The BRIDG Model was initiated by CDISC in 2003 to support harmonization among the CDISC standards for clinical research and to bridge research and healthcare. Shortly thereafter, the US National Cancer Institute (NCI), Health Level Seven (HL7) and the U.S. Food and Drug Administration (FDA) joined with CDISC to collaborate on the development and maintenance of this model. BRIDG became a CDISC and HL7 standard in 2012. The BRIDG Board of Directors had also made the decision in 2010 to begin the process of advancing BRIDG to the status of an international standard through the ISO process. Through the Vienna Agreement, ISO standards are automatically adopted by the European Committee for Normalization (CEN).

Source: <http://cdisc.org/cdisc-announces-bridg-model>

ISO/TC 215 and BRIDG

ISO/PRF 14199

Health informatics -- Information models -- Biomedical I Model

General information

Revisions

Corrigenda / Amendments

Document published on:

Edition: 1 (Monolingual)

ICS: 35.240.80

Status:  Under development

Stage: 50.20 (2015-07-17)

TC/SC: ISO/TC 215

Number of Pages: 8

40 Enquiry stage	40.00 DIS registered	40.20 DIS ballot initiated: 3 months	40.60 Close of voting	40.93 Full report circulated: DIS referred back to TC or SC	40.98 Project deleted	40.99 Full report circulated: DIS approved for registration as FDIS
50 Approval stage	50.00 FDIS registered for formal approval	50.20 Proof sent to secretariat. FDIS ballot initiated: 2 months.	50.60 Close of voting. Proof returned by secretariat	50.92 FDIS referred back to TC or SC	50.98 Project deleted	50.99 FDIS approved for publication
60 Publication stage	60.00 International Standard under publication		60.60 International Standard published			

35.240.80: IT applications in health care technology
Including computer tomography

Quick word to UML ...

.. as it needs to be introduced quickly

UML is ...

- Unified Modeling Language
- *"The Unified Modeling Language (UML) is a graphical language for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system. The UML offers a standard way to write a system's blueprints, including conceptual things such as business processes and system functions as well as concrete things such as programming language statements, database schemas, and reusable software components." - OMG*

UML diagram types

1. Structural Modeling Diagrams

Structure diagrams define the static architecture of a model. They are used to model the 'things' that make up a model - the classes, objects, interfaces and physical components. In addition, they are used to model the relationships and dependencies between elements.

1. Package Diagrams



Package diagrams are used to divide the model into logical containers, or 'packages', and describe the interactions between them at a high level ...[Learn More](#)

2. Component Diagrams



Component diagrams are used to model higher level or more complex structures, usually built up from one or more classes, and providing a well defined interface ...[Learn More](#)

3. Class or Structural Diagrams



Class or Structural diagrams define the basic building blocks of a model: the types, classes and general materials used to construct a full model ...[Learn More](#)

4. Deployment Diagrams



Deployment diagrams show the physical disposition of significant artifacts within a real-world setting ...[Learn More](#)

5. Composite Structure Diagrams



Composite Structure diagrams provide a means of layering an element's structure and focusing on inner detail, construction and relationships ...[Learn More](#)

6. Object Diagrams



Object diagrams show how instances of structural elements are related and used at run-time ...[Learn More](#)

7. Profile Diagrams



Profile diagrams provide a visual way of defining light-weight extensions to the UML specification. UML Profiles are often used to define a group of constructs with domain-specific or platform-specific properties and constraints, which extend the underlying UML elements ...[Learn More](#)

2. Behavioral Modeling Diagrams

Behavior diagrams capture the varieties of interaction and instantaneous states within a model as it 'executes' over time; tracking how the system will act in a real-world environment, and observing the effects of an operation or event, including its results.

8. Use Case Diagrams



Use Case diagrams are used to model user/system interactions. They define behavior, requirements and constraints in the form of scripts or scenarios ...[Learn More](#)

10. Activity Diagrams



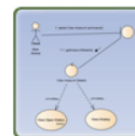
Activity diagrams have a wide number of uses, from defining basic program flow, to capturing the decision points and actions within any generalized process ...[Learn More](#)

12. State Machine Diagrams



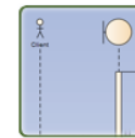
State Machine diagrams are essential to understanding the instant to instant condition, or "run state" of a model when it executes ...[Learn More](#)

14. Communication Diagrams



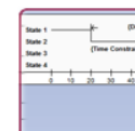
Communication diagrams show the network, and sequence, of messages or communications between objects at run-time, during a collaboration instance ...[Learn More](#)

9. Sequence Diagrams



Sequence diagrams are closely related to communication diagrams and show the sequence of messages passed between objects using a vertical timeline ...[Learn More](#)

11. Timing Diagrams



Timing diagrams fuse sequence and state diagrams to provide a view of an object's state over time, and messages which modify that state ...[Learn More](#)

13. Interaction Overview Diagrams

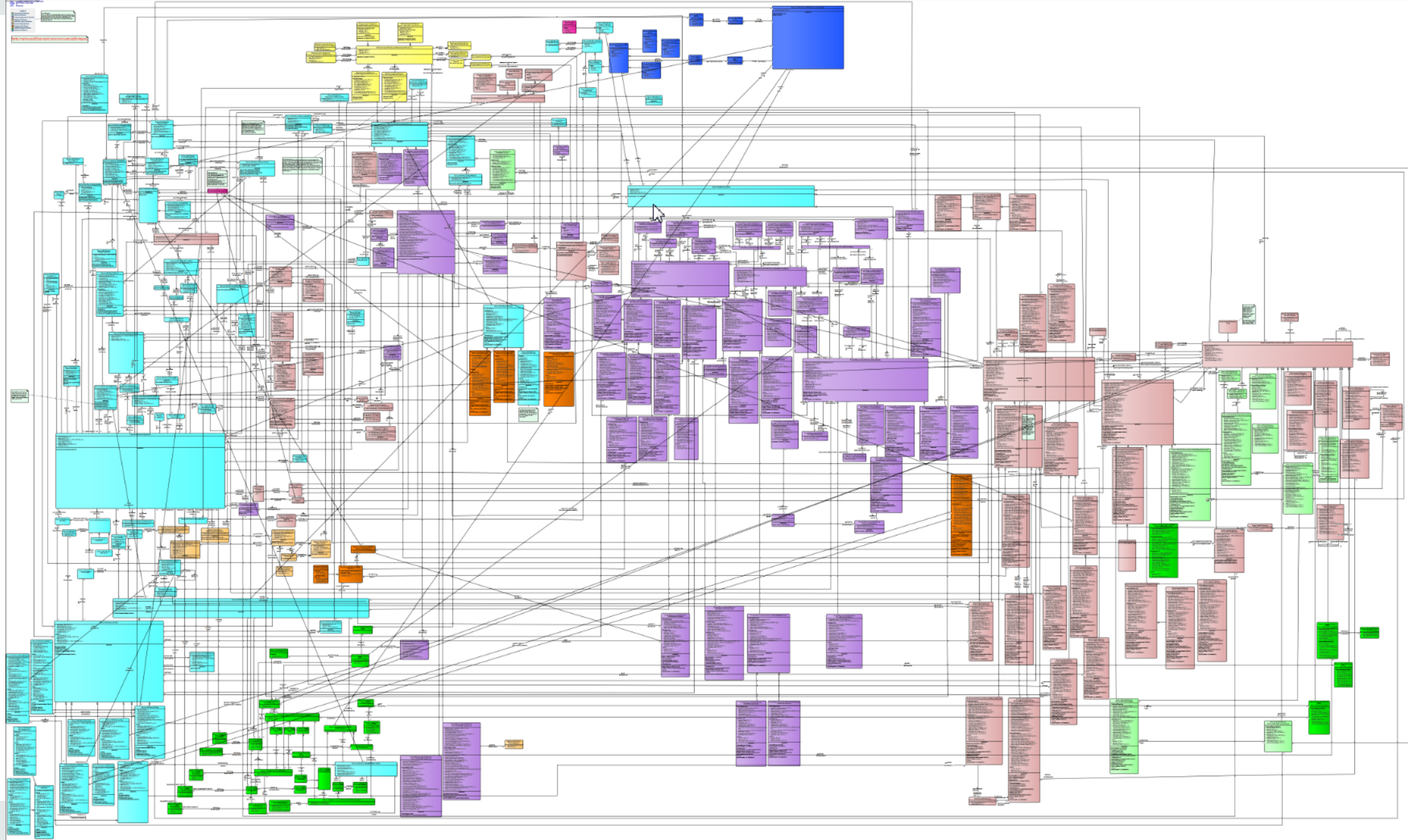


Interaction Overview diagrams fuse activity and sequence diagrams to allow interaction fragments to be easily combined with decision points and flows ...[Learn More](#)

Let's open the model the first time

DAM (Domain Analysis Model) for Clinical Research

- Conceptual model
 - To depict behaviour/process and static/data semantics in the domain
- Subject Matter Experts can integrate and harmonize their perspectives regarding use cases, activities & information
- Abstract should be robust enough to support analysts, architects and developers
- Foundation for semantic interoperability
- Structured way for description and documentation of the requirements in a domain



Hmm, and the documentation!?



BRIDG Model

<http://www.bridgmodel.org>

BRIDG 4.0 Comprehensive Domain Analysis Model

27 March 2015

Biomedical Research Integrated Domain Group (BRIDG)

prepared by

BRIDG Semantic Coordination Committee (SCC)
Wendy Ver Hoef (Samvit Solutions/NCI [C]/HL7)
Smita Hastak (Samvit Solutions/NCI [C]/HL7)
Lloyd McKenzie (Gevity/NCI [C]/HL7)
Julie Evans (CDISC)
Boris Brodsky (FDA/HL7)



ASSOCIATIONS	
Each <u>TargetAnatomicSite</u> always described one <u>PerformedObservationResult</u> . Each <u>PerformedObservationResult</u> might be described by one or more <u>TargetAnatomicSite</u> .	
DEFINITION: Indicates result being described by a particular site.	
EXAMPLE(S):	
OTHER NAME(S):	
NOTE(S):	
Constraints: be described by: Inverse Relation	
Source: Public describes <u>TargetAnatomicSite</u> (Class) <u>TargetAnatomicSite</u> Cardinality: [0..*]	Target: Public describes <u>PerformedObservationResult</u> (Class) <u>PerformedObservationResult</u> <u>Comment_Requested</u> Cardinality: [1]

1365

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Start here



BRIDG Model

<http://www.bridgmodel.org>

Release 4.0 User's Guide

27 March 2015

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prepared by

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Julie Evans (CDISC)

Boris Brodsky (FDA/HL7)



Name: UML-Based Comprehensive BRIDG Model Diagram
Package: BRIDG Domain Analysis Model
Version: 4.0
Author: BRIDG SCC

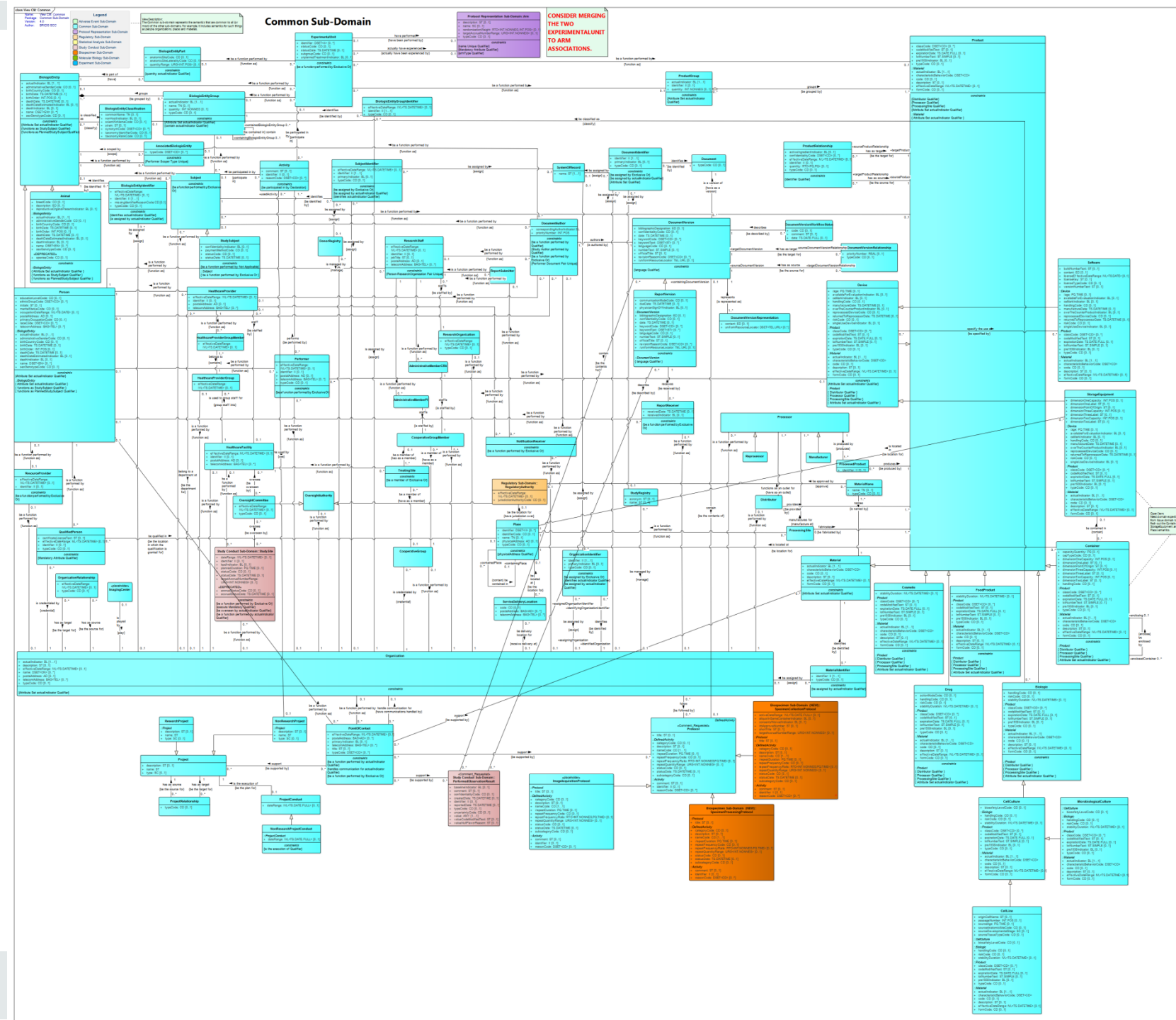
Legend

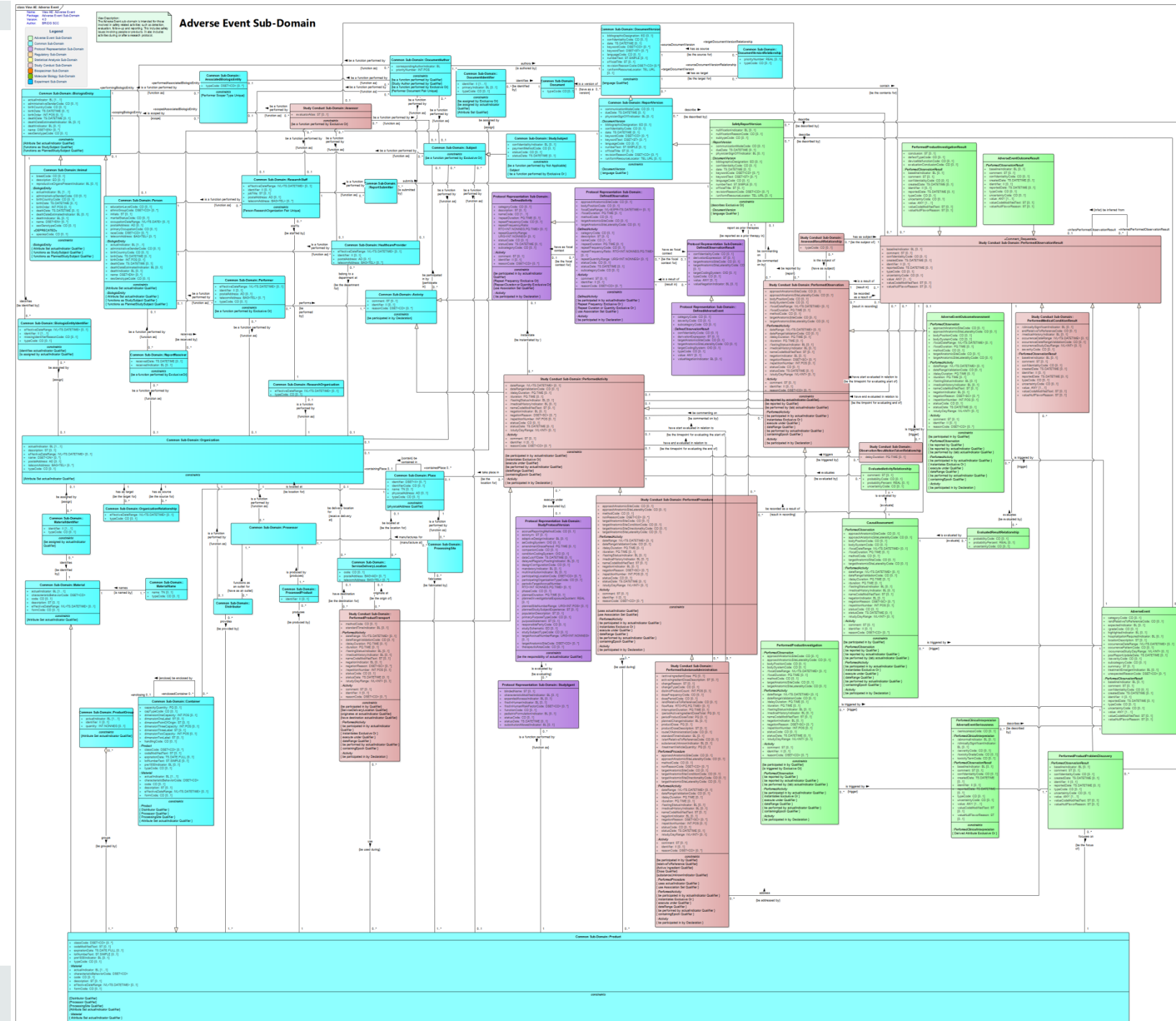
-  Adverse Event Sub-Domain
-  Common Sub-Domain
-  Protocol Representation Sub-Domain
-  Regulatory Sub-Domain
-  Statistical Analysis Sub-Domain
-  Study Conduct Sub-Domain
-  Biospecimen Sub-Domain
-  Molecular Biology Sub-Domain
-  Experiment Sub-Domain

View Description:

This View shows the complete BRIDG Model (current Release) and specifically shows, for each class where it's applicable, the complete set of attributes for the class, partitioning the attributes as to whether they are "local" to the class or inherited from the class' super-type hierarchy.

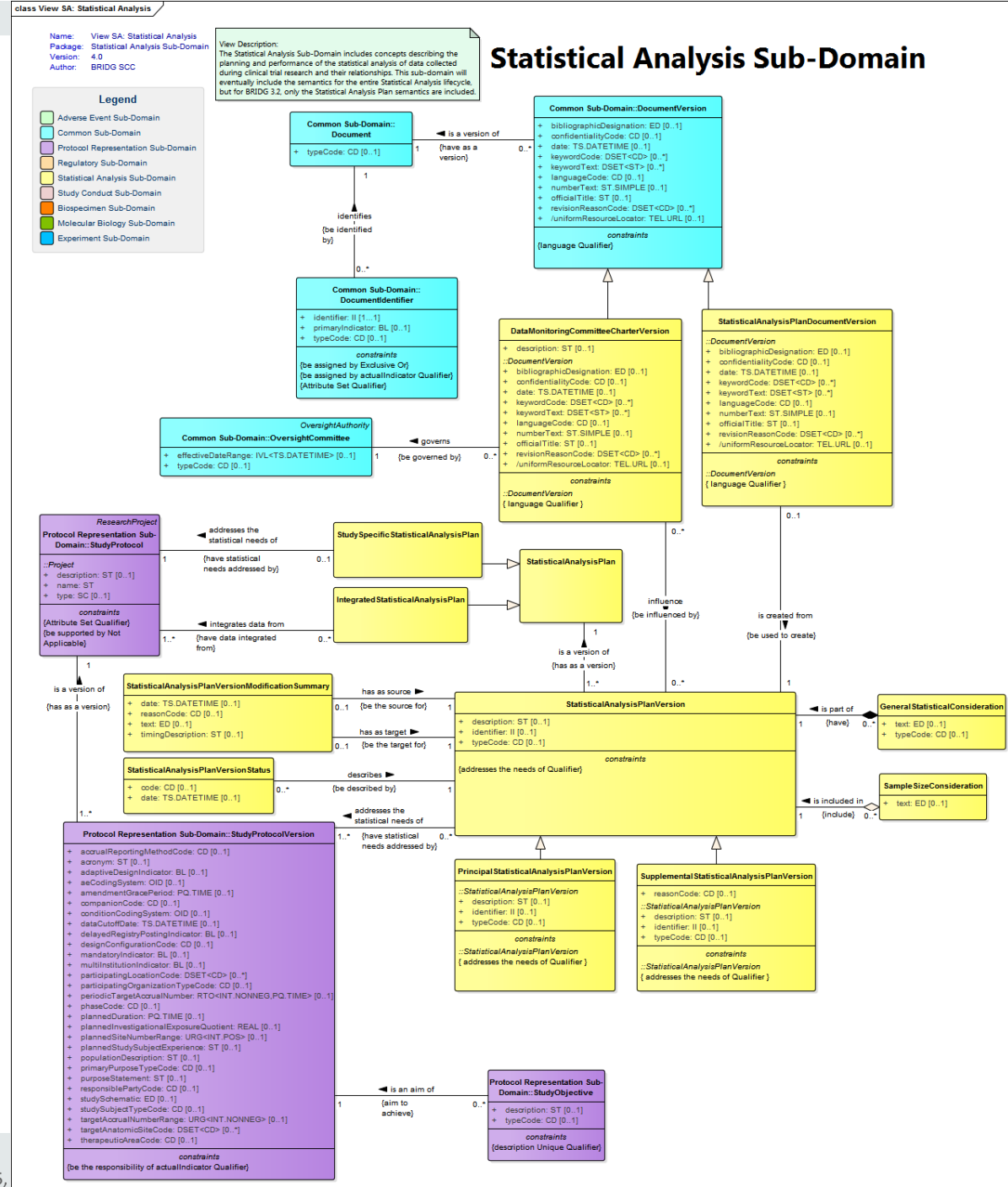
Please Note: This comprehensive view of the BRIDG model is not intended for users to learn the model. It is created by the BRIDG modelers to ensure model integrity. It is highly recommended that you look at the sub-domain views to learn and review the concepts and relationships in the BRIDG model.



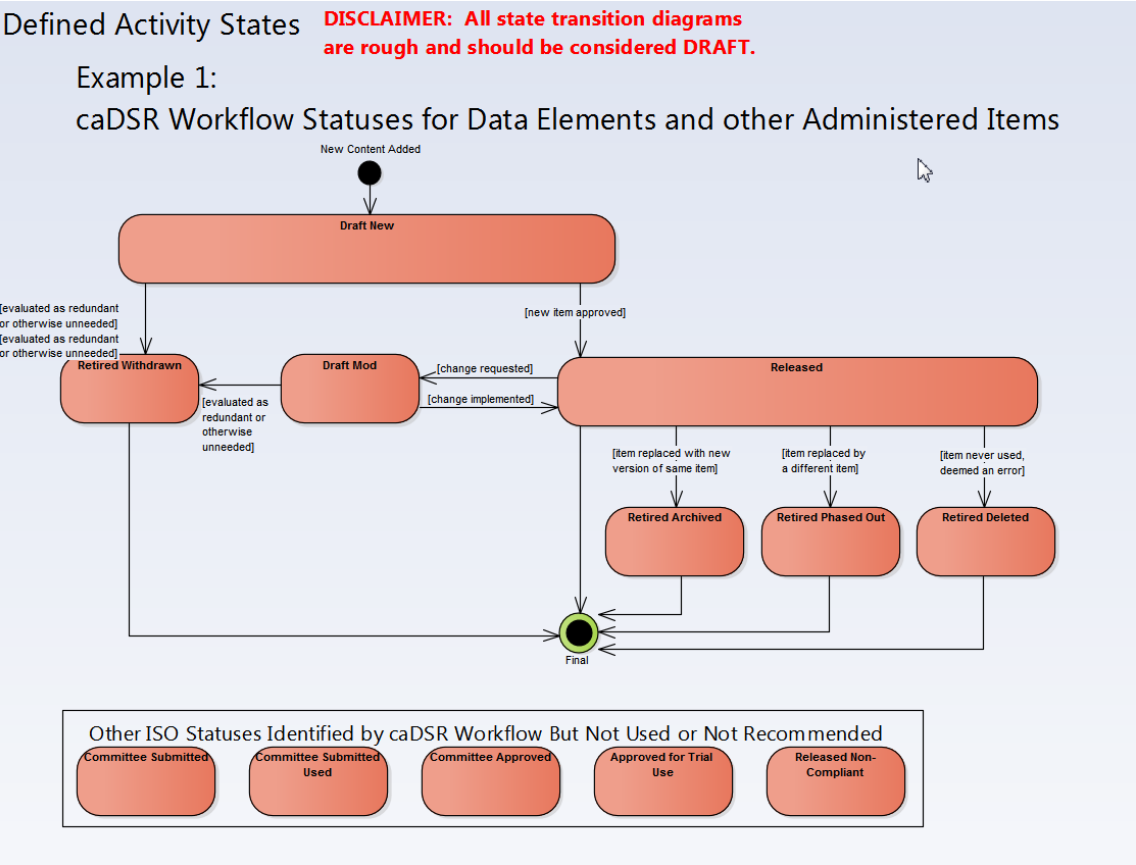
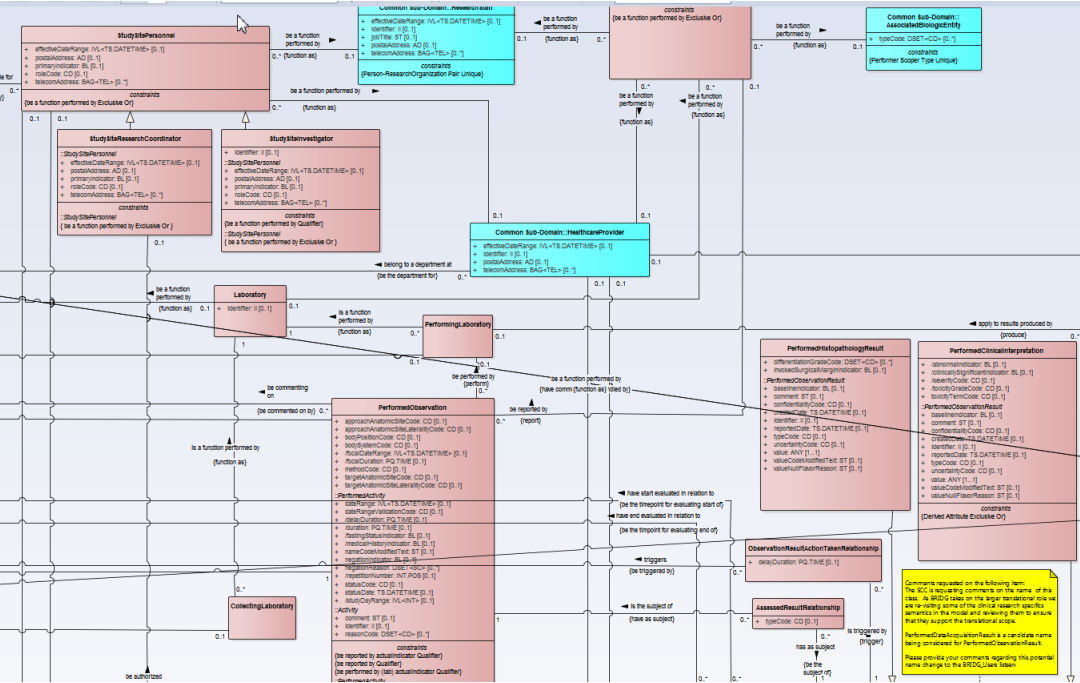


Statistical Analysis Sub Domain

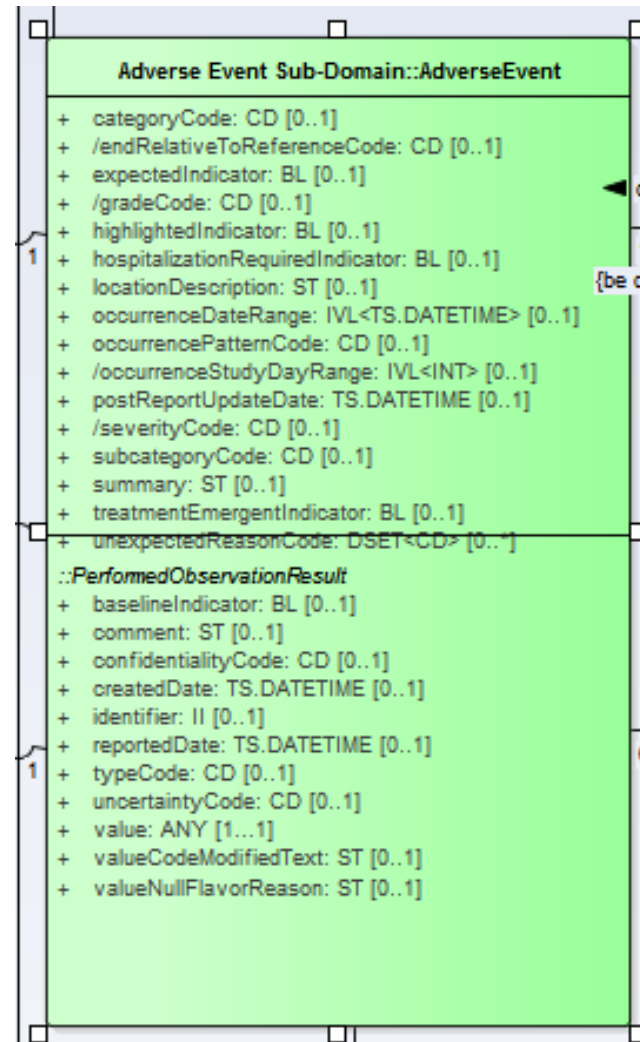
- Describing the planning and performance of the statistical analysis
- Contains semantics for Statistical Analysis Plan
- Future may include entire Statistical Analysis life cycle



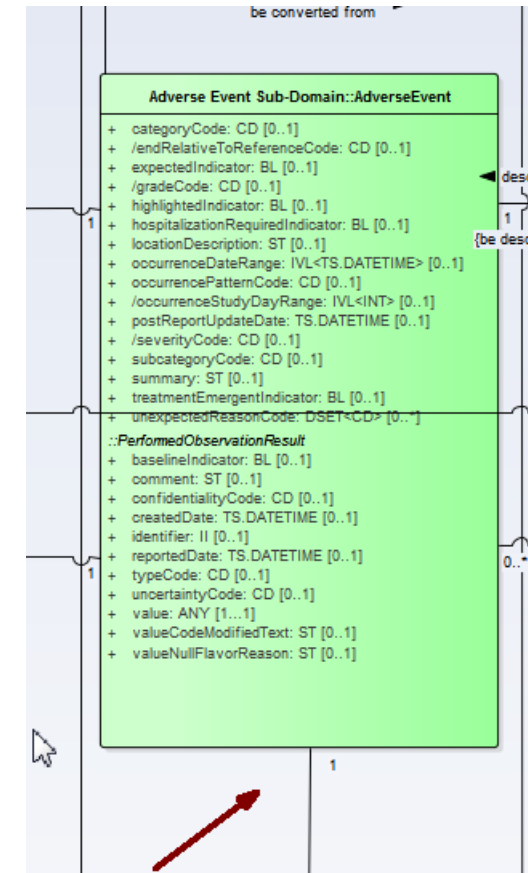
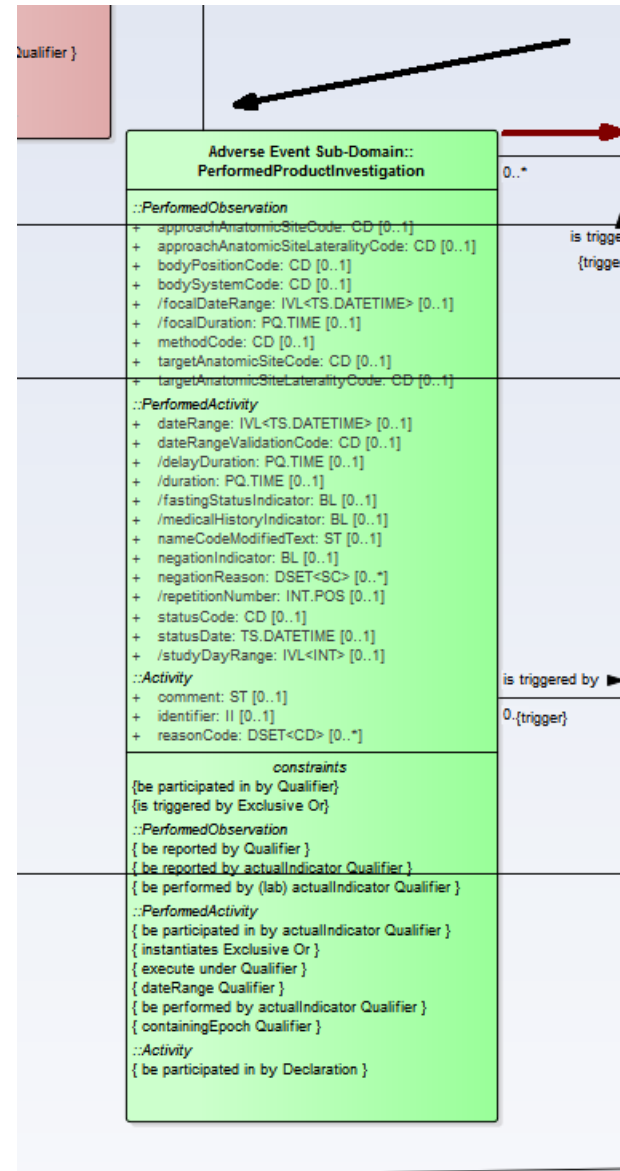
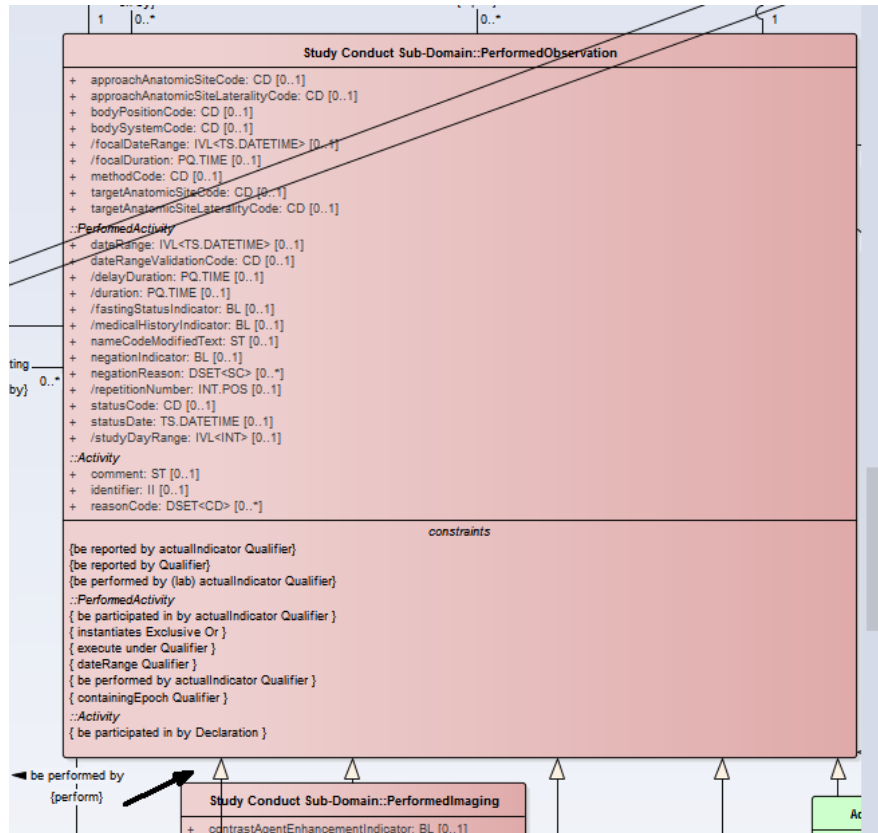
Class & State diagrams



Class & attributes



Class & inheritance



Data Types

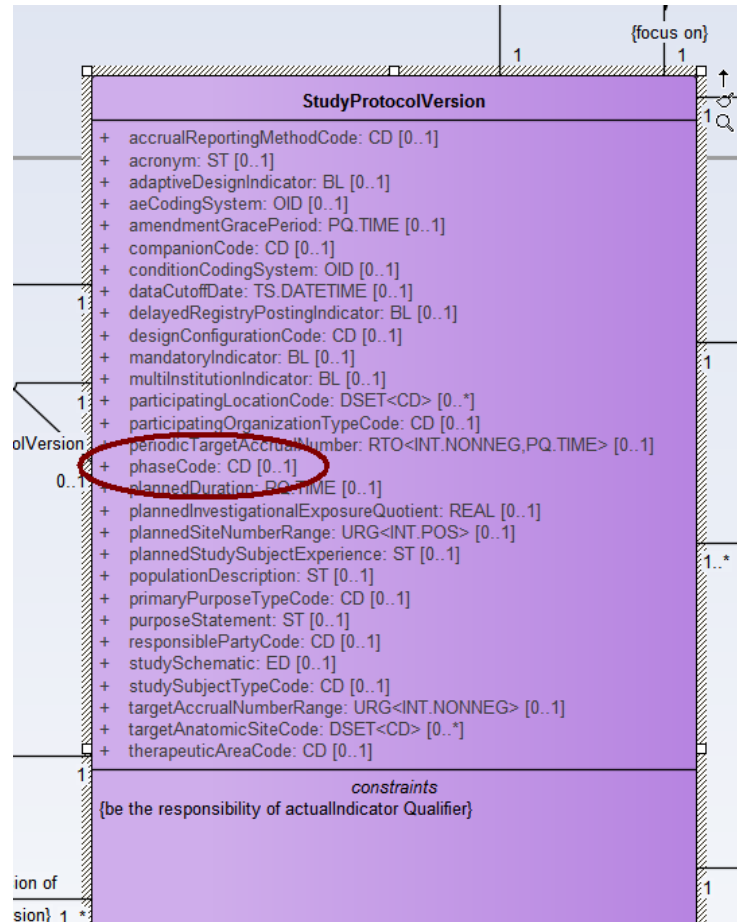
Some examples – defined by HL7 ADT (Abstract Data Types)

- ST, BL, INT, TS.DATETIME
- EN= Entity Name, AD = Address
- CD = Concept Descriptor (code list)
- PQ = Physical Quantity

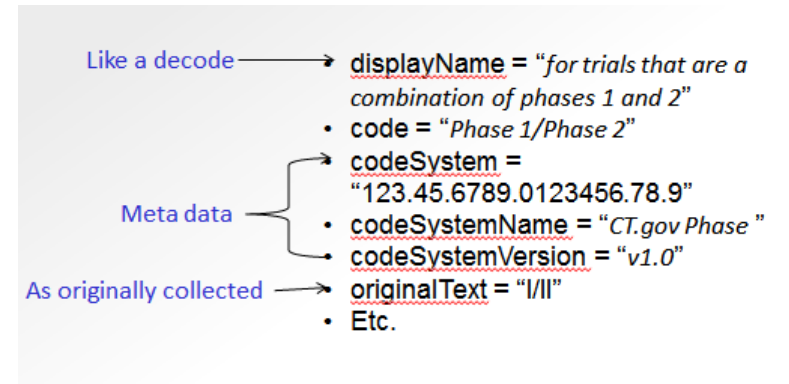
CD

- A CD is a reference to a concept defined in an external code system, terminology or ontology
- Important data type as it addresses the issue of binding of vocabulary/terminology to the model
- Used in BRIDG whenever the request has been seen for a particular attribute as a need for an enumerated list of values

CD example – taken from the BRIDG training

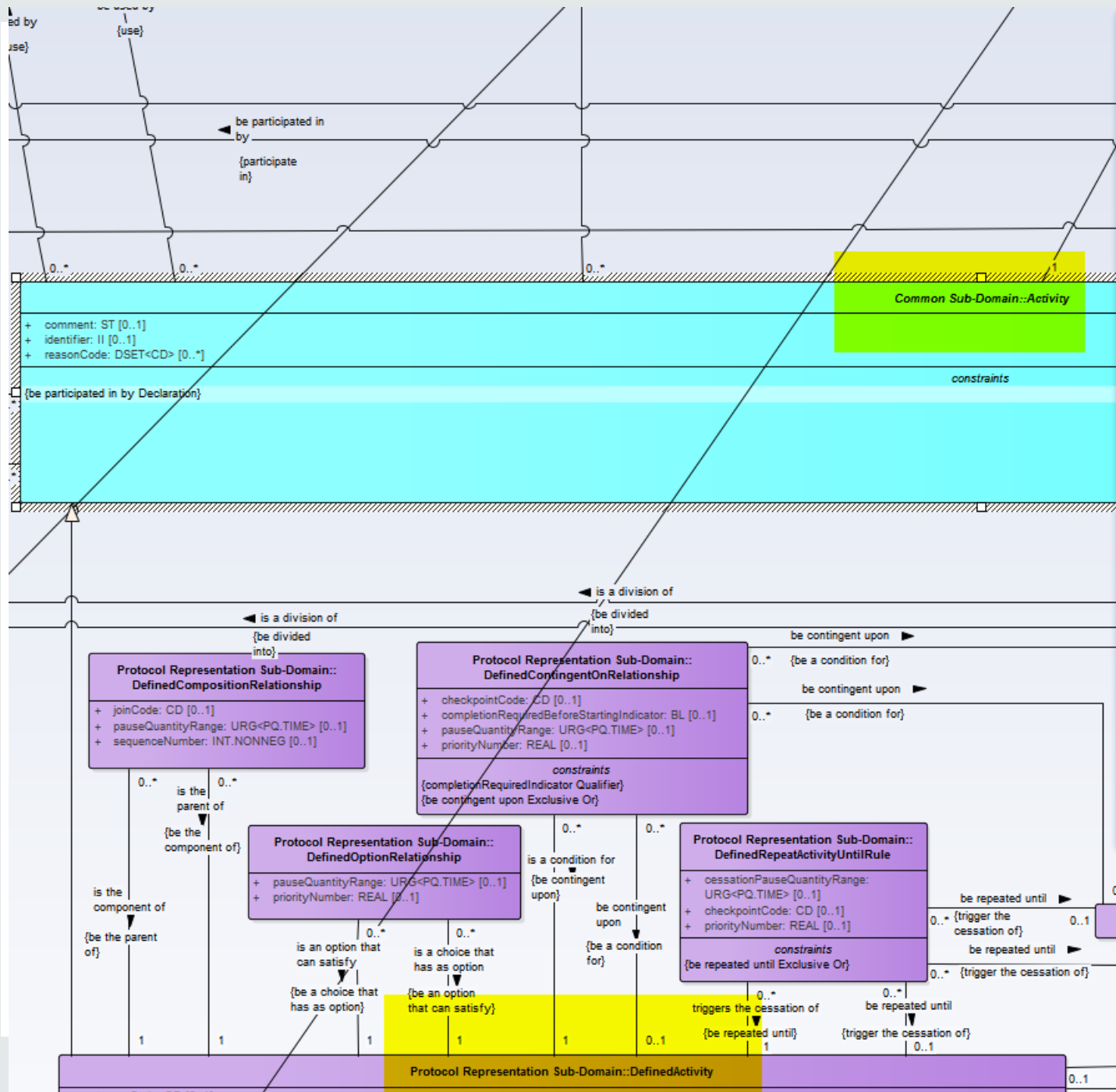


- Values for PhaseCode (defined by clinicaltrials.gov)
- N/A: for trials without phases
- **Phase 0:** exploratory trials, involving very limited human exposure, with no therapeutic or diagnostic intent (e.g., screening studies, microdose studies).
- **Phase 1:** includes initial studies to determine the metabolism and pharmacologic actions of drugs in humans, the side effects associated with increasing doses, and to gain early evidence of effectiveness; may include healthy participants and/or patients
- **Phase 1/Phase 2:** for trials that are a combination of phases 1 and 2
- Etc.



BRIDG is ACTIVITY driven

- Right side of the BRDIG model represents all activities / acts associated with a study protocol
- 4 subtypes:
 - Defined activity (define activities during protocol Authoring)
 - Planned activity (schedule of activities for the study and potential study subjects)
 - Scheduled activity (schedule activities for an actual study)
 - Performed activity (performing those activities on the actual study subject)
- Same idea like HL7 RIMs ,moodCode' attribute of the Act class



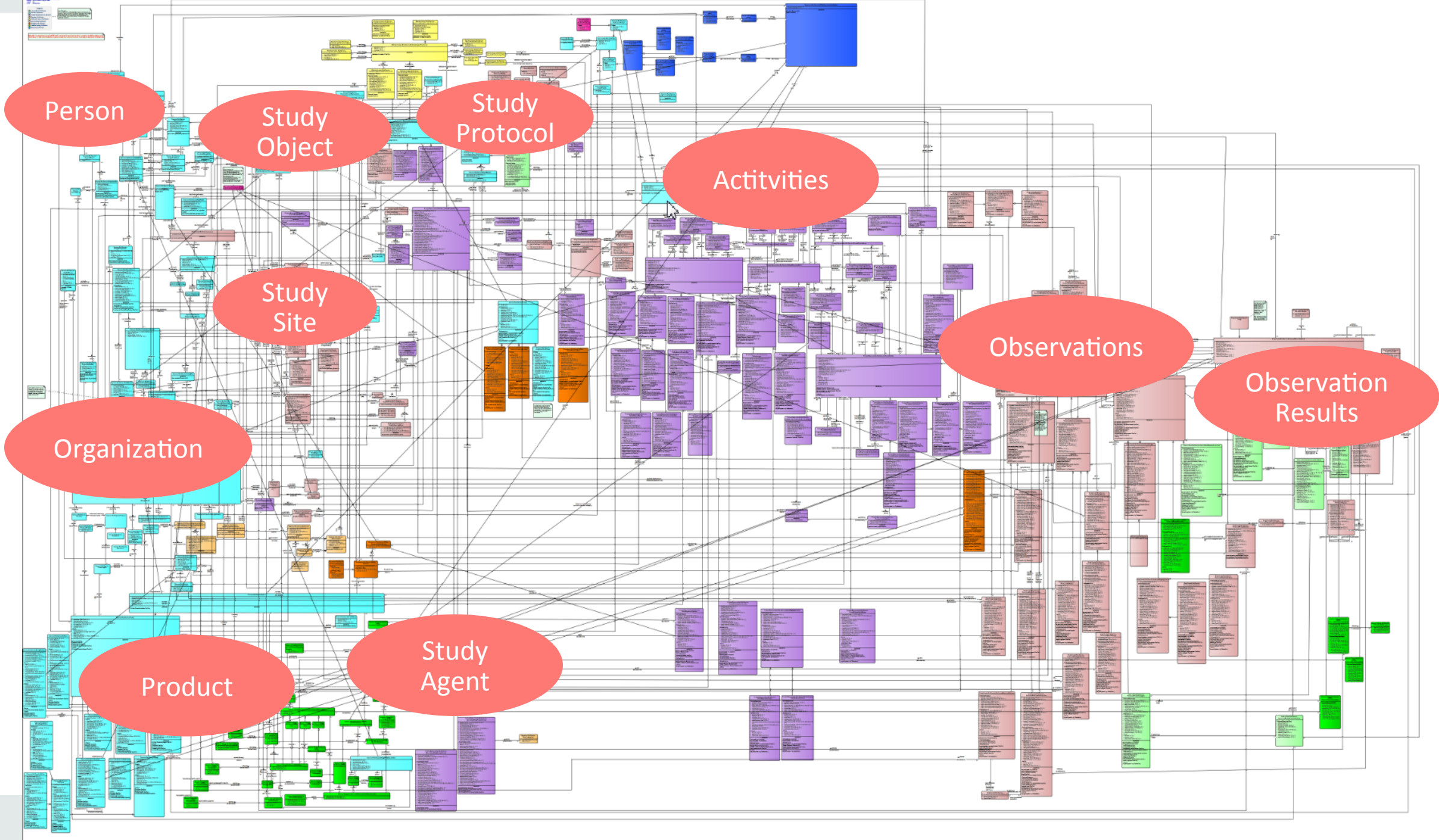
Class : Activity

Properties

- General
- Rules
- Requirements
- Constraints
- Scenarios
- Related
- Files
- Links

Relationships

Element	Element Ster...	Type	Connecti...
Experiment		Class	Association
ExperimentalActivityl...		Class	Association
ExperimentalUnit		Class	Association
NonResearchProject		Class	Association
Performer		Class	Association
Subject		Class	Association
DefinedActivity		Class	Generalizati...
PerformedActivity		Class	Generalizati...
PlannedActivity		Class	Generalizati...
ScheduledActivity		Class	Generalizati...



Person

Study Object

Study Protocol

Activities

Study Site

Observations

Observation Results

Organization

Product

Study Agent

A mapping example

Tags / tagged values

The mapping spreadsheet



BRIDG Mapping Spreadsheet *prepared by*

BRIDG Semantic Coordination Committee (SCC)
Wendy Ver Hoef (Samvit Solutions/NCI [C]/HL7)
Smita Hastak (Samvit Solutions/NCI [C]/HL7)
Lisa Schick (Samvit Solutions/NCI [C])
Lloyd McKenzie (Gevity/NCI [C]/HL7)
Julie Evans (CDISC)
Boris Brodsky (FDA/HL7)

This document contains mappings of how source models/projects have been harmonized into the BRIDG model. Please refer to the "How to Read a Mapping Path" tab for instructions and conventions used in the mapping path column of each tab. Each source model/project version that has been harmonized with BRIDG has its own tab in the spreadsheet. Each tab indicates the specific versions of the source model /project and BRIDG model that have been harmonized. Once a harmonization is complete and that BRIDG release is finalized, mapping paths are rarely updated and may become out of date as BRIDG evolves from version to

Title Page	How to Read a Mapping Path	LSDAMv2.2.3Plus	SDTM IGv3.1.3x	PGxIG r1.0	CTRPv3.8	HCTv1.0 2012	FDA HL7 SD SD DSTU2012	Statisticsv1.0	CTRV1.0	CTRRr3	NCI CRF Round 3		
NCI CRF Round 3	NCI CRF Rounds 1&2	CTSA-HSDBv1.0	HCTv1.0 Apr2011	SDTM IGv3.1.2	CDASHv1.1	ICSRr2	C3PRv2.9	PSCv2.6	caAERSv2.2	LabViewer2.2	CTR&R R2	COPPA	Lab
PSC	AE	CTR&R R1 Comprehensive	SDTM IG	TDM	Study Design RMIM	HL7SP	RPS1	C3PR	CTOM				

TAGs for classes

TAGGED VALUES for properties

Name	Type	Scope	Stereotype	Alias	Initial Value
occurrencePatt...	CD	Public			
occurrenceStud...	IVL<INT>	Public			
postReportUpd...	TS DATETIME	Public			
severityCode	CD	Public			
subcategoryCo...	CD	Public			
summary	ST	Public			

Attribute (severityCode)

Map	Value
Map:CDASHv1.1	AE AESEV
Map:AE	AdverseEvent gradeOrSeverity
Map:SDTM IGv3.1.1	AE AESEV
Map:PSCv2.6	AdverseEvent description
Map:SDTM IGv3.1.2	AE AESEV
Map:CTRV1.0	AdverseEvent.severityCode

Class : AdverseEvent

DEFINITION:
Any unfavorable and unintended sign, symptom, disease, or other medical occurrence with a temporal association with the use of a medical product, procedure or other therapy, or in conjunction with a research study, regardless of causal relationship.

EXAMPLE(S):
death, back pain, headache, pulmonary embolism, heart attack

OTHER NAME(S):

NOTE(S):
The BRIDG SCC has a GForge Tracker Issue (#31893) indicating a need to validate the requirement that every AdverseEvent be described by a SafetyReportVersion.

Class (AdverseEvent)

Map	Value
Map:AE	AdverseEvent
Map:caAERSv2.2	AdverseEvent
Map:CTRV1.0	AdverseEvent
Map:ICSR1.2	AdverseEventAssessment (in Indi...
Map:NCI CRF Sta...	AdverseEvent
Map:PSCv2.6	AdverseEvent
Map:SDTM IGv3...	AE DOMAIN
Map:SDTMIGv3.1.3	AE
Map:TDM	Incidents
from PerformedObservationResult	
Map:C3PRv2.9	SubjectEligibilityAnswer
Map:CTRPv3.8	PerformedObservationResult
Map:HCTv1.0	CDE 2769634: Adverse Events. Sp...
Map:LSDAM	PerformedSpecimenReviewResult
Map:LSDAMv2.2	Data

Notes can direct further

Example Notes for Severity Code

Point to PerformedClinicalInterpretation

NOTE(S):

Derived from the maximum severity observed during the course of the AdverseEvent:

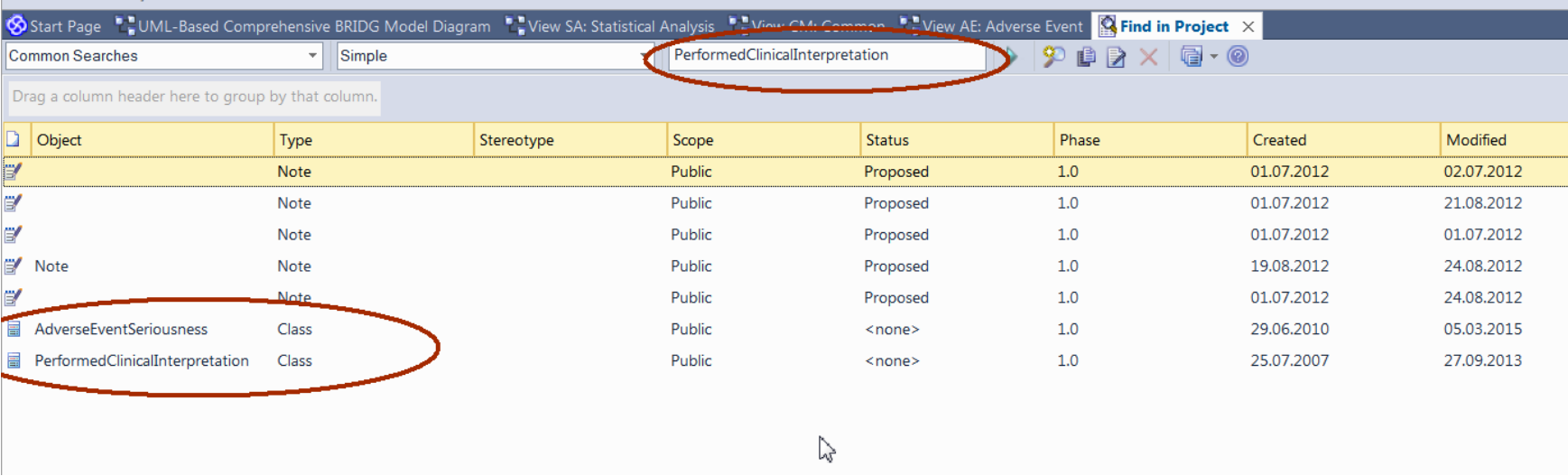
PerformedClinicalInterpretation.value(ANY=>CD).code

WHERE PerformedClinicalInterpretation >

PerformedObservation > DefinedObservation.nameCode =

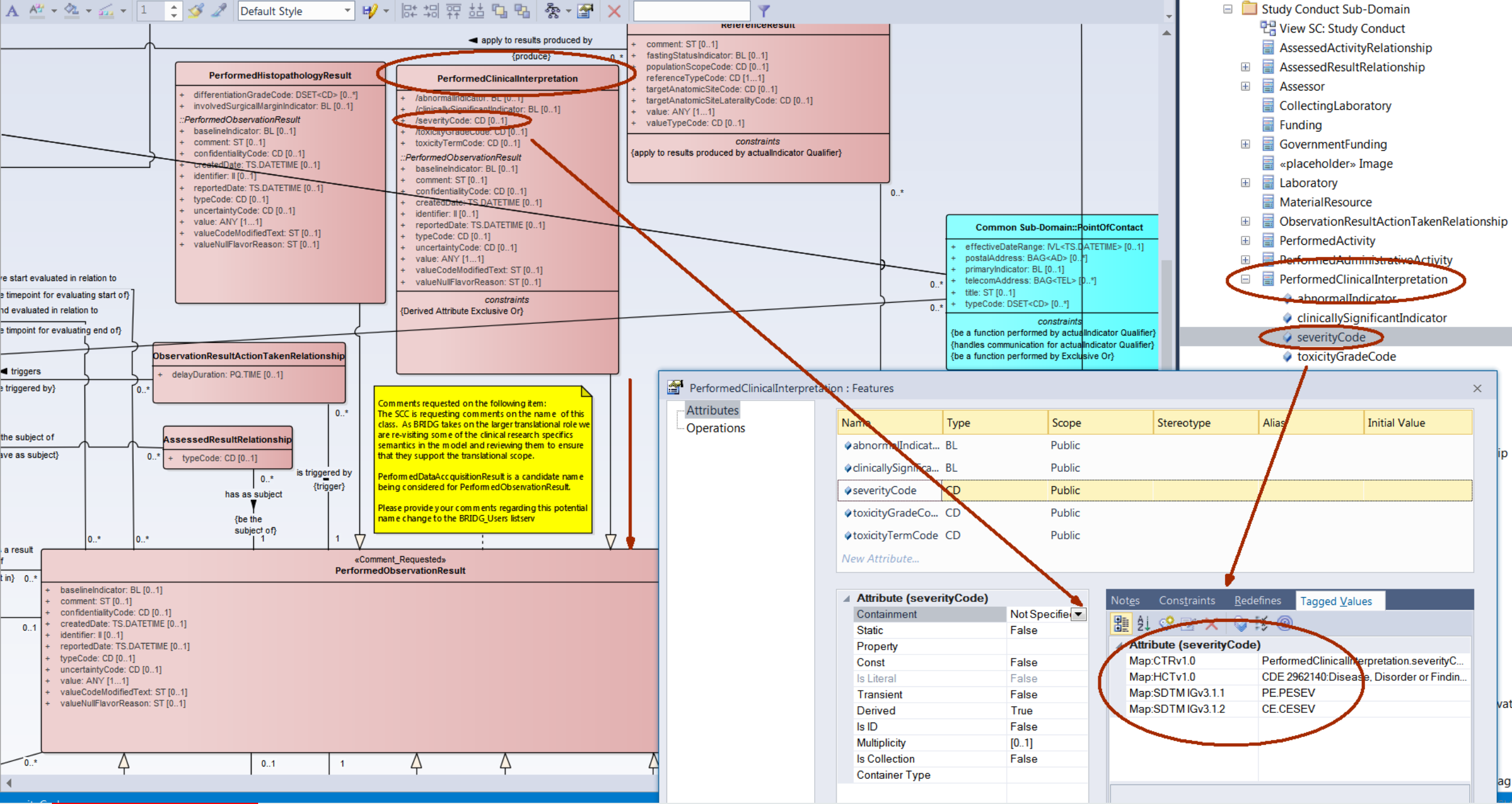
"assess severity" AND PerformedObservation >

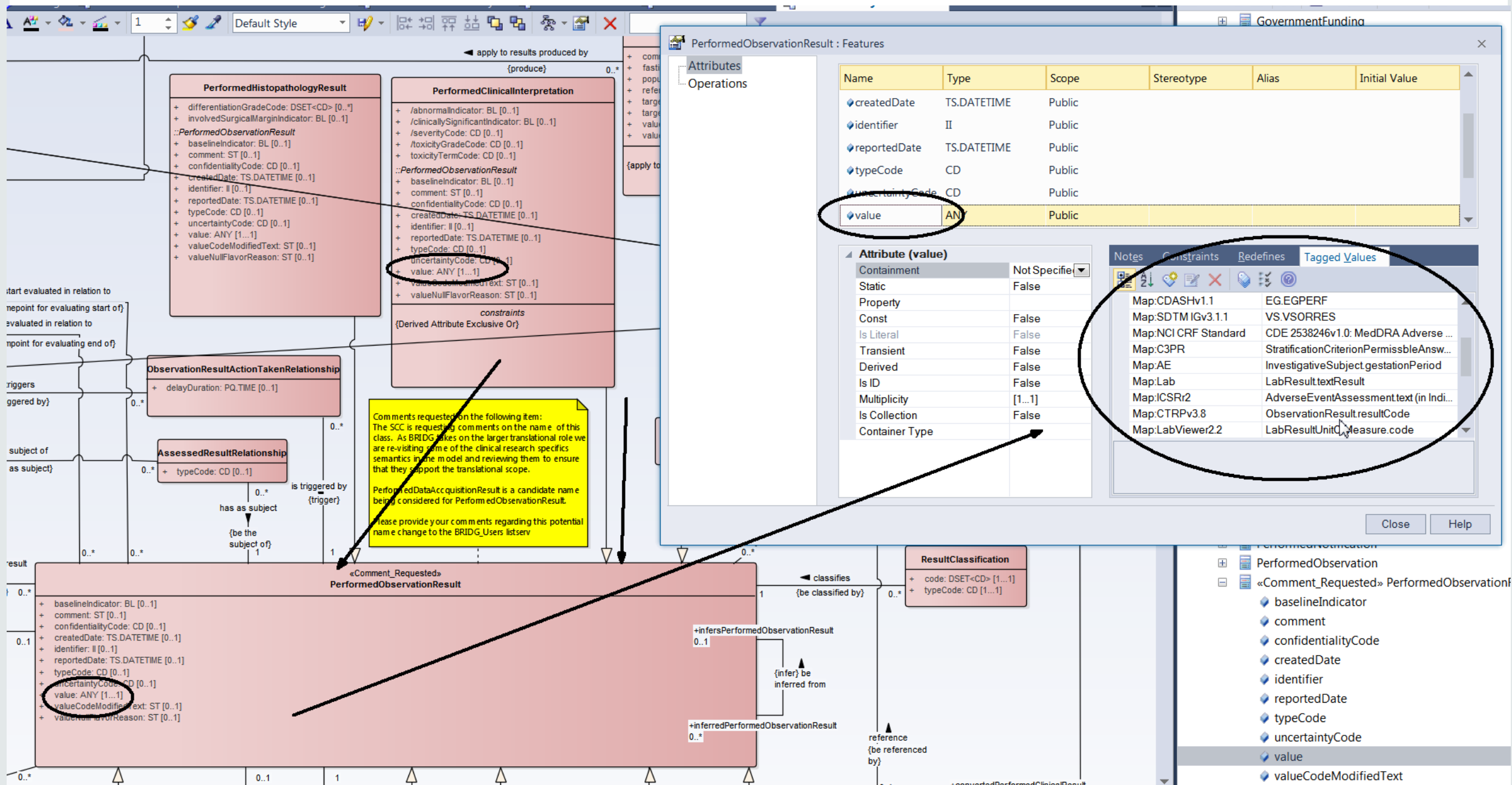
AssessedResultRelationship > AdverseEvent.



The screenshot shows the Oracle Health Data Services (OHDS) interface. At the top, there are tabs for 'Start Page', 'UML-Based Comprehensive BRIDG Model Diagram', 'View SA: Statistical Analysis', 'View CM: Common', 'View AE: Adverse Event', and 'Find in Project'. Below the tabs, there is a search bar with 'PerformedClinicalInterpretation' entered. The search results are displayed in a table with columns: Object, Type, Stereotype, Scope, Status, Phase, Created, and Modified. The table contains several rows, with the last two rows, 'AdverseEventSeriousness' and 'PerformedClinicalInterpretation', circled in red. The 'PerformedClinicalInterpretation' row is highlighted in yellow.

Object	Type	Stereotype	Scope	Status	Phase	Created	Modified
	Note		Public	Proposed	1.0	01.07.2012	02.07.2012
	Note		Public	Proposed	1.0	01.07.2012	21.08.2012
	Note		Public	Proposed	1.0	01.07.2012	01.07.2012
Note	Note		Public	Proposed	1.0	19.08.2012	24.08.2012
	Note		Public	Proposed	1.0	01.07.2012	24.08.2012
AdverseEventSeriousness	Class		Public	<none>	1.0	29.06.2010	05.03.2015
PerformedClinicalInterpretation	Class		Public	<none>	1.0	25.07.2007	27.09.2013





Hmmm

Study Data Tabulation Model Im

Mapped Group Name	Mapped Element Name
AE	AESEV



BRIDG Model

<http://www.bridgmodel.org>

Release 4.0 Release Notes

27 March 2015

Biomedical Research Integrated Domain Group (BRIDG)

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Mapping					
Type	Review by	Status	Comments / Issues / Rationale	Mapping Path / Derivation	Class Name
Supported		Applied		AdverseEvent.severityCode	AdverseEvent

teD...	TS.DATETIME	Public
	CD	Public
e	CD	Public
	ST	Public
entI...	BL	Public
onC...	DSET<CD>	Public

severityCode)		Notes	Constraints	Redefines	Tagged Values
	Not Specified				
	False				
	False				
	False				
	True				
	False				
	[0..1]				
	False				
		Attribute (severityCode)			
		Map:CDASHv1.1	AE.AESEV		
		Map:AE	AdverseEvent.gradeOrSeverity		
		Map:SDTM IGv3.1.1	AE.AESEV		
		Map:PSCv2.6	AdverseEvent.description		
		Map:SDTM IGv3.1.2	AE.AESEV		
		Map:CTRV1.0	AdverseEvent.severityCode		



Checkout the Mapping sheet ...

What's new in Version 4

New in Version 4

- LS DAM – Life Sciences Domain Analysis Model
 - Hypothesis driven basic and pre-clinical research as well discovery sciences
 - Collaborative engagement between NCI, HL7 Clinical Genomics WG
 - was a sibling to BRIDG for a few years
 - Integration into BRIDG to support semantic interoperability
- 3 new sub domains
 - Biospecimen
 - Experiment
 - Molecular Biology

New in Version 4 (cont.)

- CDISC SDTM 3.1.3
 - Include changes / add in SDTM 3.1.3 like cover of changes in trial design, inclusion of TA Oncology
- CDISC SDTM PGx (v 1.0 Domains)
 - Pharmacogenomics & Pharmacogenetics
 - Focus on genetic data for human and viral studies

BRIDG 4.0

- With the release of BRIDG 4.0, the scope of BRIDG is now officially expressed as “basic, pre-clinical, clinical, and translational research and associated regulatory artifacts. 4.0 is the first release of BRIDG as a translational research model and therefore some of the newer sub-domains are not fully fleshed out as yet.

Ressources

Ressources

- BRIDG home: <http://bridgmodel.nci.nih.gov/>
- HL7: <http://www.hl7.org/special/committees/bridg/index.cfm>
- EA Sparxsystems:
- UML Tutorial: http://sparxsystems.com.au/resources/uml2_tutorial/
- ISO TC-215:
http://www.iso.org/iso/home/store/catalogue_tc/catalogue_tc_browse.htm?commid=54960&published=on&development=on

Integrated Cloud

Applications & Platform Services

ORACLE®