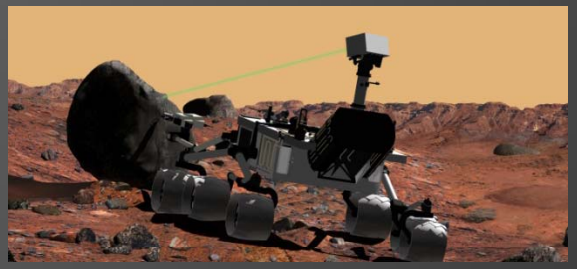
NASA IV&V Workshop 2012

A DATA OBJECT MODEL FOR IV&V ANALYSIS



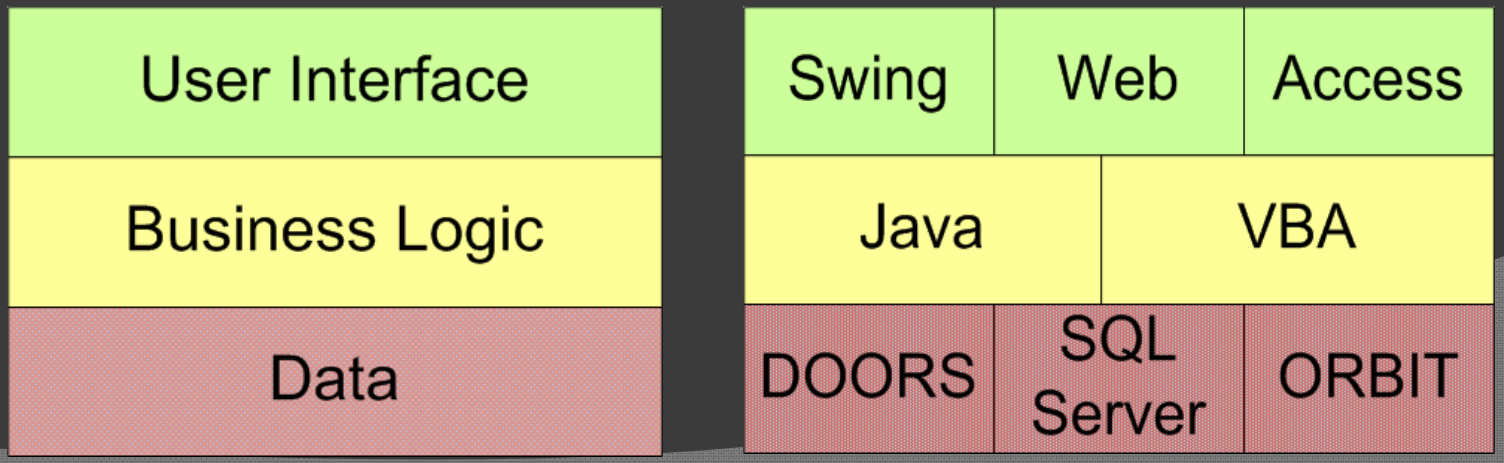
The MSL Experience

Developing a Data Object Model

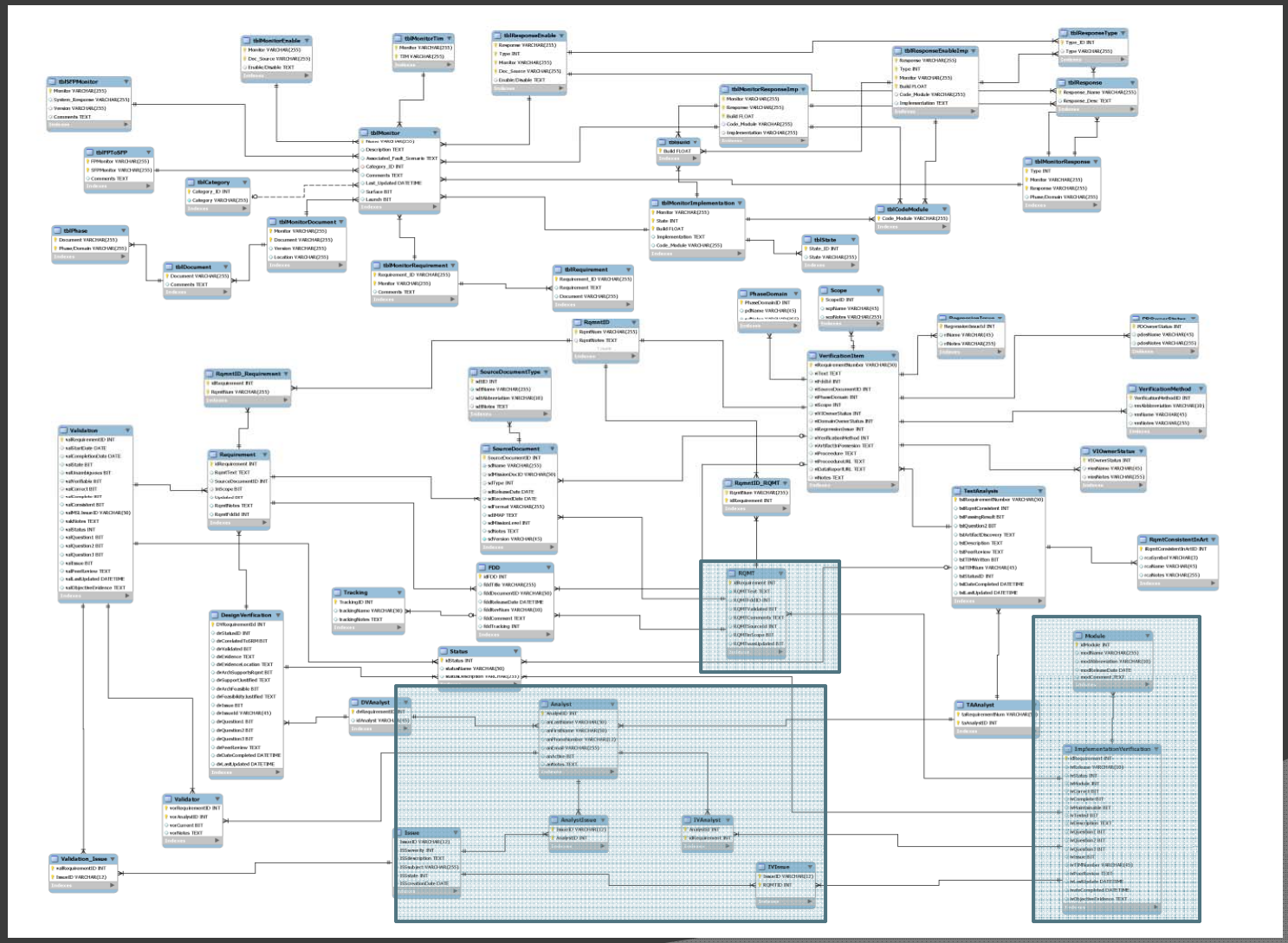
- Data Object Model – An implementation of the Data and Information Viewpoint (DIV) in DoDAF
- In support of the integrated analysis techniques being developed for the Mars Science Laboratory (MSL) IV&V project
- What we did on MSL
- What we could have done better
- Where we can take it

The Development Architecture

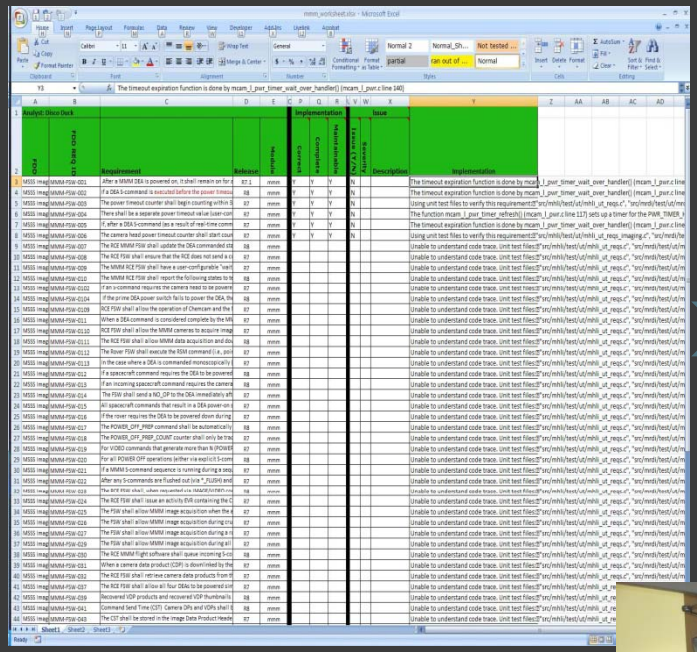
- Capture essential information from the integrated analysis
- Maintain data in a central repository
- Support multiple user interfaces (N-tier Development)



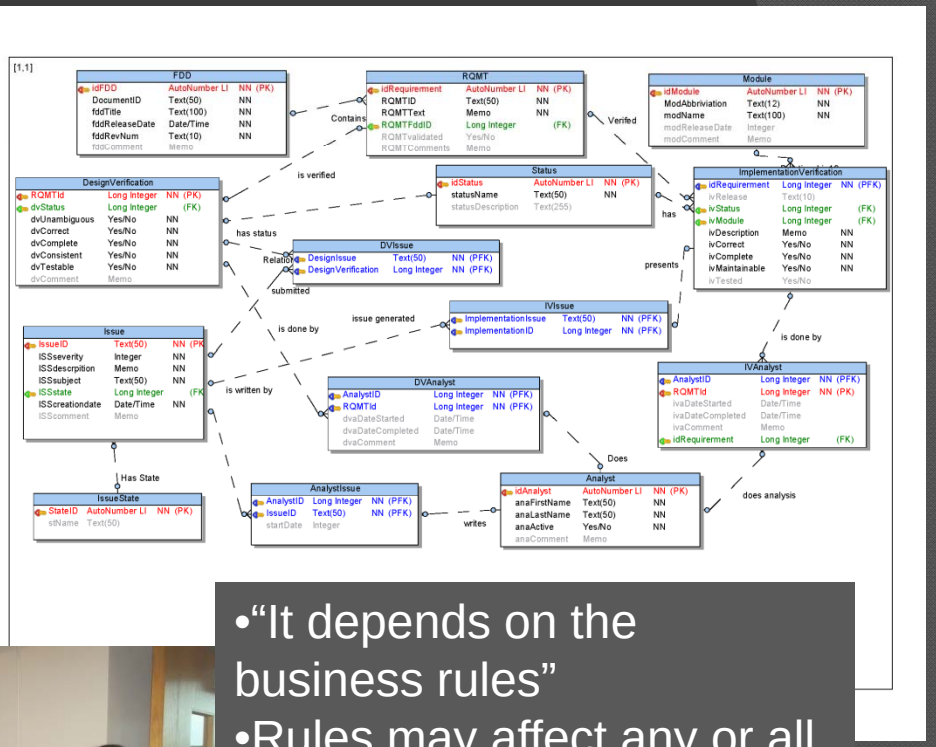
The Data Layer (SQL Server)



Capture the essential information



Data

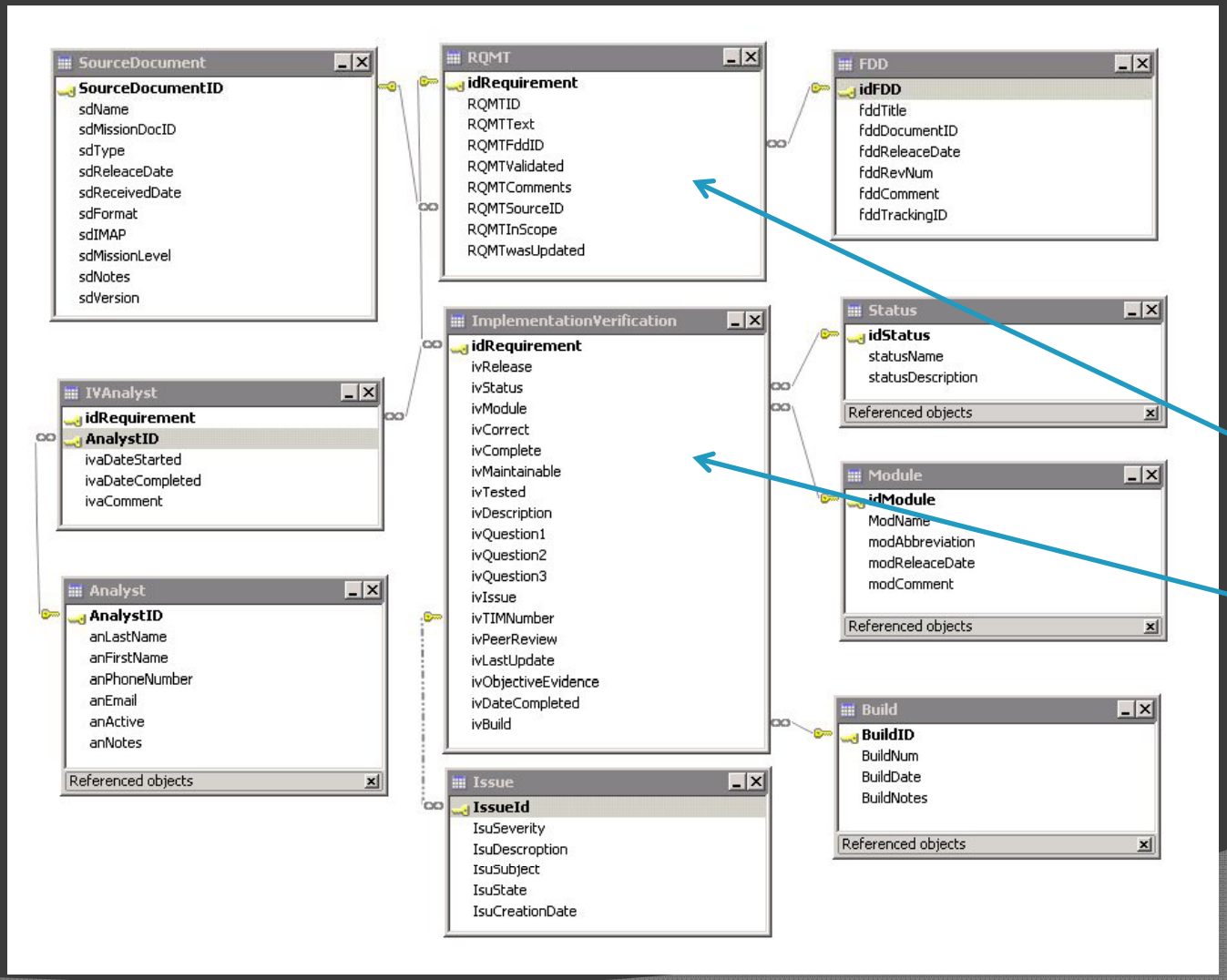


What "Hidden" data, such as status of the analysis, is not on the spreadsheet?

- "It depends on the business rules"
- Rules may affect any or all of the layers.
- Which rules define data?

The SemanticAnalysis Object

The Data Layer



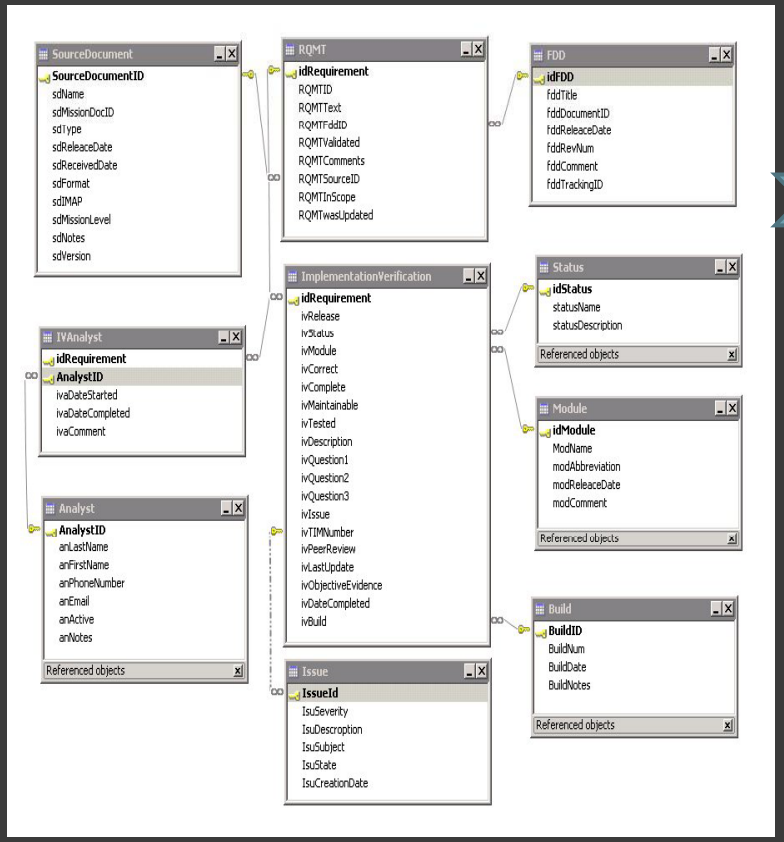
The object contains information about:

- The requirement being analyzed
- The analysis activity

Independent Verification and Validation Facility

The SemanticAnalysis Object

The Business Logic Layer



spGetSA

A set of stored procedures was written to facilitate object construction

SemanticAnalysis

-idRequirement : int
-RqmtNum : string
-RqmtText : string
-FddId : int
-FddTitle : string
-SourceID : int
-InScope : bool
-WasUpdated : bool
-AnalystId : int
-AnalystFirst : string
-AnalystLast : string
-ivStatus : int
-statusName : string
-ivModule : int
-modName : string
-ivRelease : string
-buildNum : string
-ivBuild : int
-ivCorrect : bool
-ivComplete : bool
-ivMaintainable : bool
-ivTested : bool
-ivQuestion2 : bool
-ObjectiveEvidence : string
-AnalystFindings : string
-PeerReview : string
-ivIssue : bool
-ivTIMNNumber : string
-lastUpdated : Date

+isEmpty() : bool
+cancelChanges()
+getSqlUpdate() : string
-initializeChanged()
-setChanges()
-boolToInt(in b : bool) : int
-getSqlDate() : string

A lesson learned:

- The object is one of several analysis objects
- An abstract Analysis class should have been designed
- The class should have been decomposed and common items such as Analyst or FDD should be independent classes

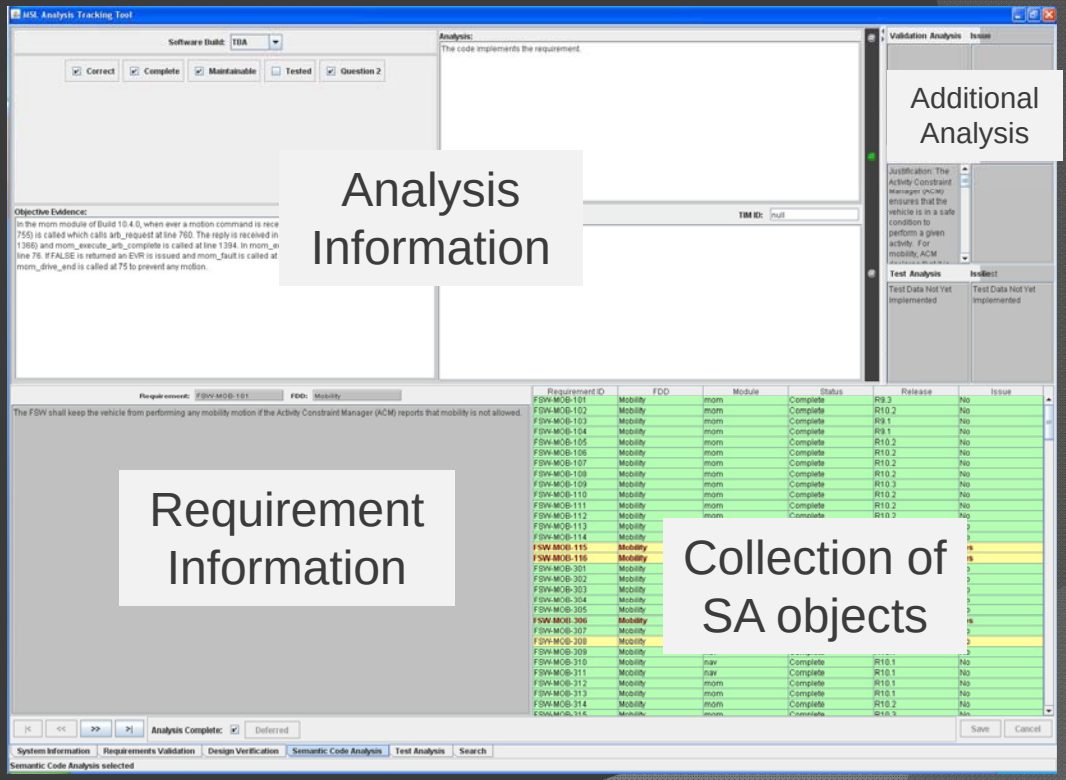
The SemanticAnalysis Object

The User Interface Layer

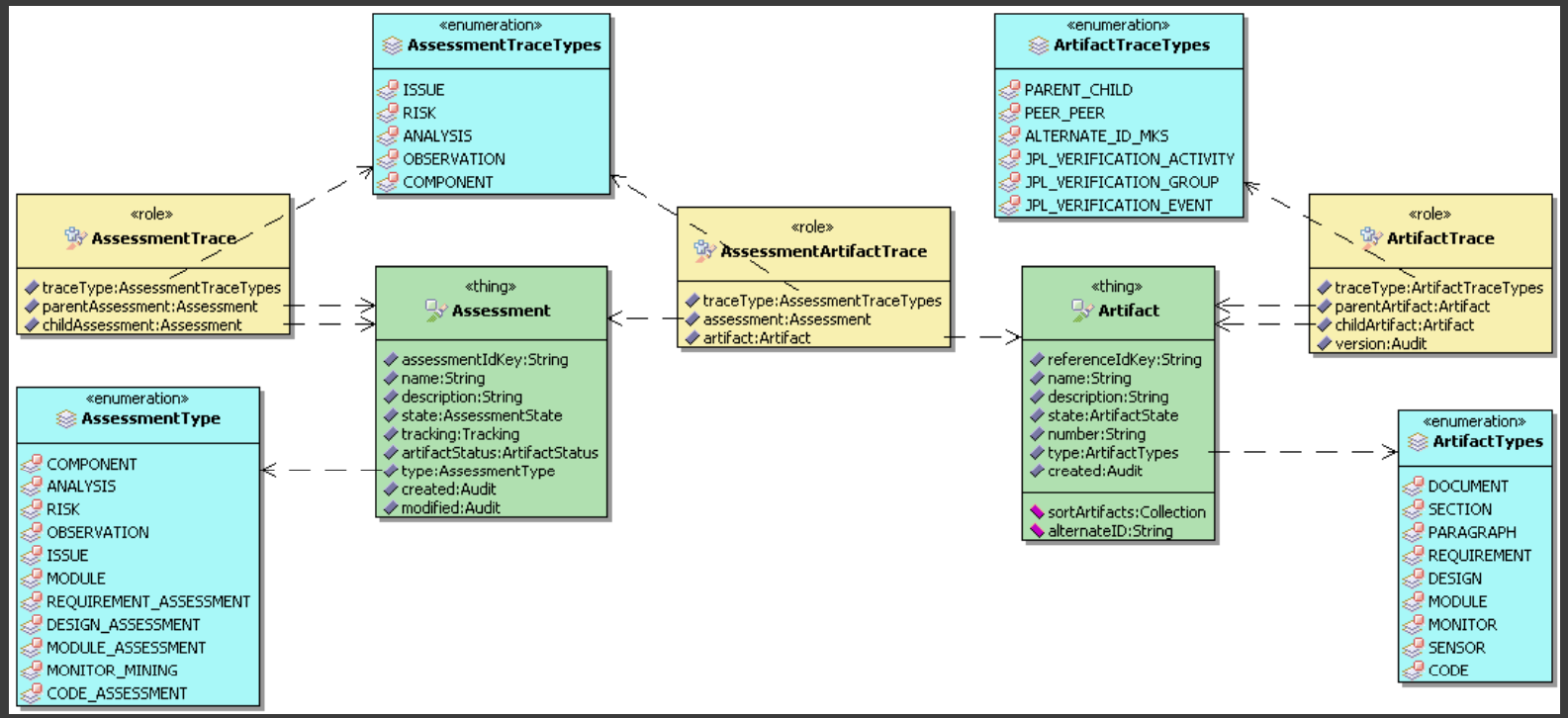
SemanticAnalysis
-idRequirement : int -RqmtNum : string -RqmtText : string -FddId : int -FddTitle : string -SourceID : int -InScope : bool -WasUpdated : bool -AnalystId : int -AnalystFirst : string -AnalystLast : string -ivStatus : int -statusName : string -ivModule : int -modName : string -ivRelease : string -buildNum : string -ivBuild : int -ivCorrect : bool -ivComplete : bool -ivMaintainable : bool -ivTested : bool -ivQuestion2 : bool -ObjectiveEvidence : string -AnalystFindings : string -PeerReview : string -ivIssue : bool -ivTIMNNumber : string -lastUpdated : Date
+isEmpty() : bool +cancelChanges() +getSqlUpdate() : string -initializeChanged() -setChanges() -boolToInt(in b : bool) : int -getSqlDate() : string

The class has been implemented in both Java, for a client for analysts, and Visual Basic for Applications, for an Access application to manage the database

MSL Analysis Tracking Tool



What an IV&V Domain Model Might Looks Like



Used by the SMAP team

Benefits of a Domain Model

- Supports a common definition of the IV&V analysis data architecture.
- Provides building blocks for evidence based IV&V analysis.
- Encourages creation and reuse of analysis support utilities across technologies
- Leverages current IV&V technology investments

Resources

- DoD Architecture Framework Ver. 2.02 Data and Information Viewpoint (http://dodcio.defense.gov/dodaf20/dodaf20_data.aspx)
- NASA, Office of the Chief Information Officer: Enterprise Portfolio Management (http://www.nasa.gov/offices/ocio/portfolio/index.html)
- The Java Tutorials: Object-Oriented Programming Concepts (http://docs.oracle.com/javase/tutorial/java/concepts/)
- U.S Department of Defense, Chief Information Officer: Data Strategy Community of Interest (http://dodcio.defense.gov/CommunitiesofInterest/DataStrategyCOITraining.aspx)