

BRIDG RIM Representation

This document provides an overview of the artifacts provided with the BRIDG model that describe how the semantics of BRIDG can be expressed in terms of the HL7 v3 Reference Information Model. It includes a listing of artifacts, a short explanation of how to interpret these artifacts and some background on the BRIDG mapping exercise.

Background

The BRIDG model is a domain-friendly information model reflecting the content around clinical trials and related areas. HL7 would refer to it as a Domain Analysis Model (DAM). This analysis model can be freely used with no requirement to understand HL7 or the RIM. However, to ensure that the semantic underpinnings of the BRIDG model were robust, a mapping was undertaken to express all of the classes, attributes and associations from BRIDG using HL7's RIM.

Not implementable

This mapping is **not** intended to produce implementable HL7 artifacts. Implementable artifacts are by definition created from “design” models. As a mapping of the BRIDG “analysis” model, the BRIDG RIM representation is therefore also at an “analysis” level and therefore inappropriate for direct implementation. As well, a number of modeling conventions have been followed that would prevent direct implementation. Specifics include:

- Rather than “copying” attributes and associations into each specialization (choice item) in which they are used, the models use notes with the style “All attributes and associations of Class X in Model Y also apply here”. This approach makes the maintenance approach much simpler when using HL7's tools and is sufficient to show the mapping. However, it results in the generated schemas being unusable for implementation purposes
- Many associations are “bi-directional” which prevents direct serialization into schemas
- Most models have multiple entry points which also prevents direct serialization into schemas
- The BRIDG model includes constraints that are not always enforced in the RIM representation of the model.

Because these models are not intended for direct implementation, the BRIDG team has chosen not to publish those artifacts that might lead to the temptation of direct implementation. We have not provided the Visio source files, the MIF files or the generated schemas. If any of these files are needed by a project to support analysis or some other appropriate use, please contact the BRIDG SCC and arrangements will be made to provide copies.

Use of the BRIDG RIM mappings

Though the BRIDG RIM mapping models are not intended for use as design models, it is completely possible to create HL7 v3 implementation models that realize BRIDG semantics. The availability of mappings from BRIDG into RIM-based models should significantly ease the process of developing or adapting standards to be “BRIDG compliant”. As well, the process can work in reverse. With a RIM view

of BRIDG available, it will be possible to compare existing HL7 implementation specifications against BRIDG and potentially identify deficiencies in the BRIDG UML model.

In the event of a discrepancy between the definitions and descriptions in the BRIDG UML model and those represented in the RIM mappings, the UML model takes precedence. The RIM models are an attempt to represent BRIDG semantics in a more formal way and may be consulted to gain a better understanding of BRIDG. However, the RIM models are secondary artifacts and cannot override what is declared in the main BRIDG level 1 and 2 models.

No direct alignment

While the BRIDG-to-RIM mapping is mostly complete, there is not a one-to-one mapping between each attribute, association or class in the BRIDG and a corresponding attribute, association or class in the RIM representation. Quite often, a single class in BRIDG may require 20 or 30 RIM classes with various associations in order to represent the attributes in a single BRIDG class. In other cases, multiple distinct BRIDG classes may be represented within a single RIM model class. In all cases, the intention is to ensure that the RIM representation is capable of expressing the same semantics and variations as would be possible with the BRIDG UML model. In some cases, completely different representations might be used. For example, a Boolean attribute in BRIDG might be represented as the presence or absence of a particular association in the RIM models.

In some cases, the decision to represent information within HL7 imposes particular constraints. When communicating using HL7 version 3, HL7 sometimes declares “universal” constraints on what vocabularies can be used for certain attributes and datatype properties. For example, HL7 requires the use of the Uniform Codes for Units of Measure (UCUM) code system whenever communicating units. It also requires the use of specific code systems for address types, name uses, etc. Because the intention is for the BRIDG analysis model and the HL7 RIM representations that instantiate that model to remain in sync, implementers should follow those constraints even when not using HL7 representations.

One example of the implications of HL7’s constraints on how semantics can be expressed in a RIM-based model can be seen in the various BRIDG “StatusCode” attributes. The RIM “statusCode” attributes are included among those that HL7 has defined a universal vocabulary for. However, when developing draft state machines for the BRIDG state attributes, there was not always a good match between the proposed BRIDG status codes and those that HL7 allows. The reason for this is the different scope of the state attributes in the two models. In BRIDG, statusCode is frequently used to convey “business process” states. In the RIM, the statusCode attribute is used to convey the internal state of a single information object. Reflecting business states often involves multiple information objects. To express a business state in the RIM therefore often requires the use of multiple classes and attributes. Where the BRIDG team has been able to develop draft state machines for the BRIDG statusCode attributes, we have provided a set of mappings that identify what values to express in the various attributes of the HL7 model to convey a given business state. These mappings can be found in the *Business Status RIM mappings* document.

In a few cases, BRIDG has expressed semantics that simply cannot be represented in a RIM model, or at least cannot be represented in a way that allows the same expressiveness of instances. In these rare situations, an issue or implementation note has been provided in the RIM model. The BRIDG SCC will work over time to resolve these. Some will be dealt with by submitting harmonization proposals to HL7 requesting changes in the RIM. Others may be addressed by revising how BRIDG represents the content.

RIM Model artifacts

The tools and artifacts used to create the BRIDG RIM mapping models are the same as those used to create all HL7 v3 static models. They contain the same information found in any HL7 v3 model, including representations of classes, attributes and associations; indication of rules around null values and conformance; vocabulary expectations, descriptive information, etc.

Graphical convention

HL7 has its own UML diagramming format that allows exposing more information more quickly in a smaller area than a typical UML diagram style. An overview of how to interpret HL7-style static model diagrams, can be found here: <http://www.hl7.org/v3ballot/html/help/v3guide/v3guide.htm#v3dmim>

The diagrams use colors and shapes to expose RIM semantics as well as exposing data elements such as vocabulary bindings that are not present in a standard UML model.

RIM metadata

In addition to class and attribute names, and cardinality, HL7 models allow capturing information about whether a data element is allowed to be null (not 'mandatory') and whether implementers are expected to support the element or not. Because BRIDG is such a high-level model, such assertions are difficult to make. As a result, the majority of elements are treated as non-mandatory and not required. Exceptions are made in three circumstances:

- When the minimum cardinality of an association end in BRIDG is 1, that association end is treated as 'mandatory' and 'required' in BRIDG
- Where there is a requirement to express a fixed value in the RIM model to properly represent BRIDG semantics, those attributes are made mandatory and required.
- Where a single data element is being represented as a long path of associations to reach the relevant attribute in the RIM model, all associations except the first along the traversal path will be treated as mandatory and required. This avoids having multiple locations at which the path could be truncated, simplifying the implementation process and making it clear that no additional semantics are intended.

Terminology

Use of terminology is a key element of representing semantics and is particularly important in HL7 models where much of the meaning of a given model element is determined by the values of 'structural' coded attributes. These must be set to the appropriate value (usually a fixed value) to enable

interpretation of the model. As well, non-fixed coded attributes are bound to vocabulary artifacts that indicate what the allowed set of codes might be.

Because BRIDG is generally terminology agnostic, the BRIDG RIM models try to be as well. This means that most model elements will reference Concept Domains rather than value-sets. Sometimes these concept domains already exist in HL7. In other cases, they are new and will eventually need to be submitted to HL7's RIM and terminology harmonization process. As well, sometimes appropriate fixed values do not exist within HL7's code systems. These are all flagged as codes from the TBD ("to be determined") code system. Official codes will be identified and adopted over the coming months and years. In some cases, they may be HL7-maintained codes. In other cases, they will be drawn from SNOMED, LOINC or other terminologies.

Comments

As part of the mapping process, there has often been a need to capture information about the mapping. These can be categorized into four areas:

Issues represent problems with the ability to expose BRIDG content in the RIM models. It may mean there is a problem with the BRIDG representation or that a change is required to the HL7 vocabulary, RIM, or potentially even datatypes.

Implementation notes identify information that will be needed for any developer attempting to represent BRIDG semantics using the RIM models. Examples include translation between BRIDG and RIM data elements where they are distinct or special rules on how to populate particular elements.

Design comments are notes to the SCC about "internal" actions that need to be taken around a model. They include "to dos", concerns about semantic accuracy of a given model representation, etc.

Constraints identify rules that must be followed in terms of which data elements are allowed to be or must be populated.

Note that descriptions are largely absent from the RIM mapping models. The descriptive and definitional information is maintained in the BRIDG UML level 1 and 2 models.

Mappings

Given that the purpose of the RIM models is to provide a mapping of BRIDG semantics to the RIM, mappings make up a large part of the content of the RIM BRIDG models. High-level mappings are exposed on the diagrams via diagram-level notes on classes and "business names" on attributes. More formal detailed mappings are captured as a special type of comment. They are captured with a syntax that will eventually allow the generation of reports showing the correspondence between BRIDG model and RIM model elements. However, the tooling needed to generate those reports is not available as part of this initial release.

Model files

The number of classes and associations in the BRIDG UML model already places it at the borderline of users to be able to navigate and comprehend it. Representing the equivalent semantics in the RIM

requires roughly double the number of attributes and 4 to 5 times the number of classes and associations. To make the RIM mapping models manageable, it was necessary to split the content across multiple model files. Each file contains collections of related elements that are “most likely” to be used as a group. Where there is a need to reference content in one file from another file, we make use of HL7’s “CMET” construct to allow cross-model referencing. The division of content into different files is not fixed and may change over time as future versions of BRIDG are published.

Naming convention

HL7 has a naming convention for static models that provides the user with an idea of what the content of a given model is likely to be and to help ensure filename uniqueness. The first four characters identify the “healthcare domain” the artifact is associated with. For example, PORX is pharmacy while REPC is patient care. The next two characters identify the type of artifact. DM stands for DMIM, which is a type of artifact that can be entered at multiple points. RM and MT stand for RMIM and Message Type, respectively. These models can only be entered at one point. The identifier then continues with a unique number and an indication of the country with which the artifacts are associated.

For the purposes of the BRIDG mapping models, a couple of different approaches were used to selecting file ids. In cases where there was a corresponding HL7 international model, the same id was used. In other cases, the id was picked somewhat at random from the appropriate business domain for the type of content in the model. While BRIDG is intended to be international in scope, the “UV” (universal) suffix is reserved for use by HL7 committees. Because this work was done outside of the HL7 committees, a different suffix needed to be selected and US was chosen. The model ids are **extremely** likely to change as this content is balloted and adopted within HL7.

File organization

The BRIDG RIM mapping models are organized into three directories. Each directory contains different sets of files, though all are derived from the same source.

Graphical View

These files are a rendering of the HL7-style model diagrams as constructed in Visio. Instructions on how to interpret these files can be found here:

<http://www.hl7.org/v3ballot/html/help/v3guide/v3guide.htm#v3dmim>

This view exposes the classes, attributes and associations used as well as their relationship to the HL7 RIM. Class names have followed one of three approaches:

- Using the default HL7 name
- Using a custom name aligned with the constraints used in the class
- Using the same names as those for equivalent concepts within ballot HL7 universal artifacts

Over time, most names will move to the last approach.

Files are provided for each of the “source” models used to perform the mappings.

Table View

This view provides a rendered HTML representation of each of the models. It lists all of the tables and for each table provides a listing of the attributes and outbound associations. It also exposes descriptive elements not present in the graphical view. This is one of the same views used when publishing HL7 ballot material. Hyperlinks for datatypes and vocabulary will only function if these files are placed in the correct location within an HL7 ballot package. However, hyperlinks between classes will still function.

Table views are provided for each of the “source” models as well as auto-generated “serializations” of the source models, one for each model entry point.

Excel View

The Excel view exposes similar information as the Table view. However rather than being a flat listing of tables, the class model is shown in hierarchical form, starting with the “entry point” class. This helps convey what a schema or instance might look like if the model were actually used in an implementation environment.

Because not all of the “base” models can be serialized (some of them have bi-directional associations and multiple entry points), only the serializable models are exposed in this view.

Balloting

The BRIDG RIM mapping models are considered part of the BRIDG package for voting considerations. Comments on appropriate modeling mechanisms to represent the BRIDG semantics are welcome. However, feedback about requirements included or excluded in the BRIDG model should be addressed to the BRIDG UML model not the RIM mapping model.

Final comments

The BRIDG RIM mapping models represent a first draft of the representation of BRIDG semantics in the HL7 RIM. The models will continue to evolve as the BRIDG SCC works with HL7 committees to align the content with their work, as we develop and migrate to new tools and as we are provided with feedback. If there is something you would like to see in how these models are presented and published, please provide your feedback to the SCC.