A Uniform Data Model for Reuse Library Interoperability

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Abstract

Existing reuse libraries use different data models, classification schemes, and terminology. This diversity supports various domains, customers, and technology explorations. Unfortunately, the differences inhibit sharing assets between libraries. The inability to share reusable assets reduces the asset pool available to reusers, potentially causing redevelopment of assets. The Reuse Library Interoperability Group (RIG) formed in 1991 to examine interoperability between software libraries. One RIG technical subcommittee, TC2, has developed a data model defining information about assets that libraries should exchange to support interoperability, known as the Uniform Data Model (UDM).

Keywords: reuse libraries, interoperability, data models.

Workshop Goals: To share the UDM with workshop participants and receive feedback from them.

1 Background

The Reuse Library Interoperability Group (RIG) [1] formed in 1991. Terri Hobbs has chaired TC2 since its creation in July 1991. TC2 took the task of developing a general data model to support interoperability between many, widely divergent libraries. As part of this effort, TC2 first developed a subset data model for interoperability, the Basic Interoperability Data Model (BIDM) [2] that became a RIG proposed standard. TC2 also completed the draft of the UDM. The UDM includes the BIDM and expands upon it. In addition, TC2 has begun compiling a preliminary list of vocabulary terms for use in some of the UDM (and BIDM) attributes.

2 Position

The UDM solves some of the difficulties with sharing assets between diverse reuse libraries. In particular, it defines an important set of information that libraries should exchange about assets to support interoperabilty.

2.1 Why Interoperability?

In [3], Tracz identified access to reusable assets as a condition for fostering widespread reuse. Access involves locating reusable assets and having the ability to obtain them. Reusers working in one library might have no knowledge of assets in other libraries. Even if they discover that an interesting asset resides in another library, the reusers would still need accounts or other means of entering the other reuse library. Interoperability, however, would allow libraries to make their publicly available assets known to other libraries and would eliminate the need for reusers to have direct access to other libraries.

Without interoperability, reusers browsing an unfamiliar library or receiving assets from an unfamiliar library would need to learn how the library modeled assets, how the classification scheme worked, and how terms are defined. Reuse researchers and practitioners have long recognized understanding as a crucial problem. Without interoperability, reusers would spend increased time to understand an asset simply learning the other library's representation of that asset. With interoperability the other library's data model would map to the familiar library's model, eliminating one potential source of understanding problems for the reuser.

2.2 Brief Introduction to the UDM

The UDM and BIDM define a meta-model based upon the methodology and concepts of ALOAF [4] and CDIF [5]. The meta-model uses the following entities: classes, a class hierarchy, class attributes, bi-directional relationships between classes, and relationship attributes. Figure 1 shows the classes, attributes, and relationships of the UDM.

BasedIGObject class provides the basis for the other classes in the UDM. The Asset class contains descriptive information about a reusable entity, or "asset" (with lowercase "a"). The Element class models the discrete pieces of an asset, for example, documents, source code, and test cases. The Library class provides information about repositories needed for the exchange of assets. The Organization class describes entities like people, companies, and committees, defining only dat

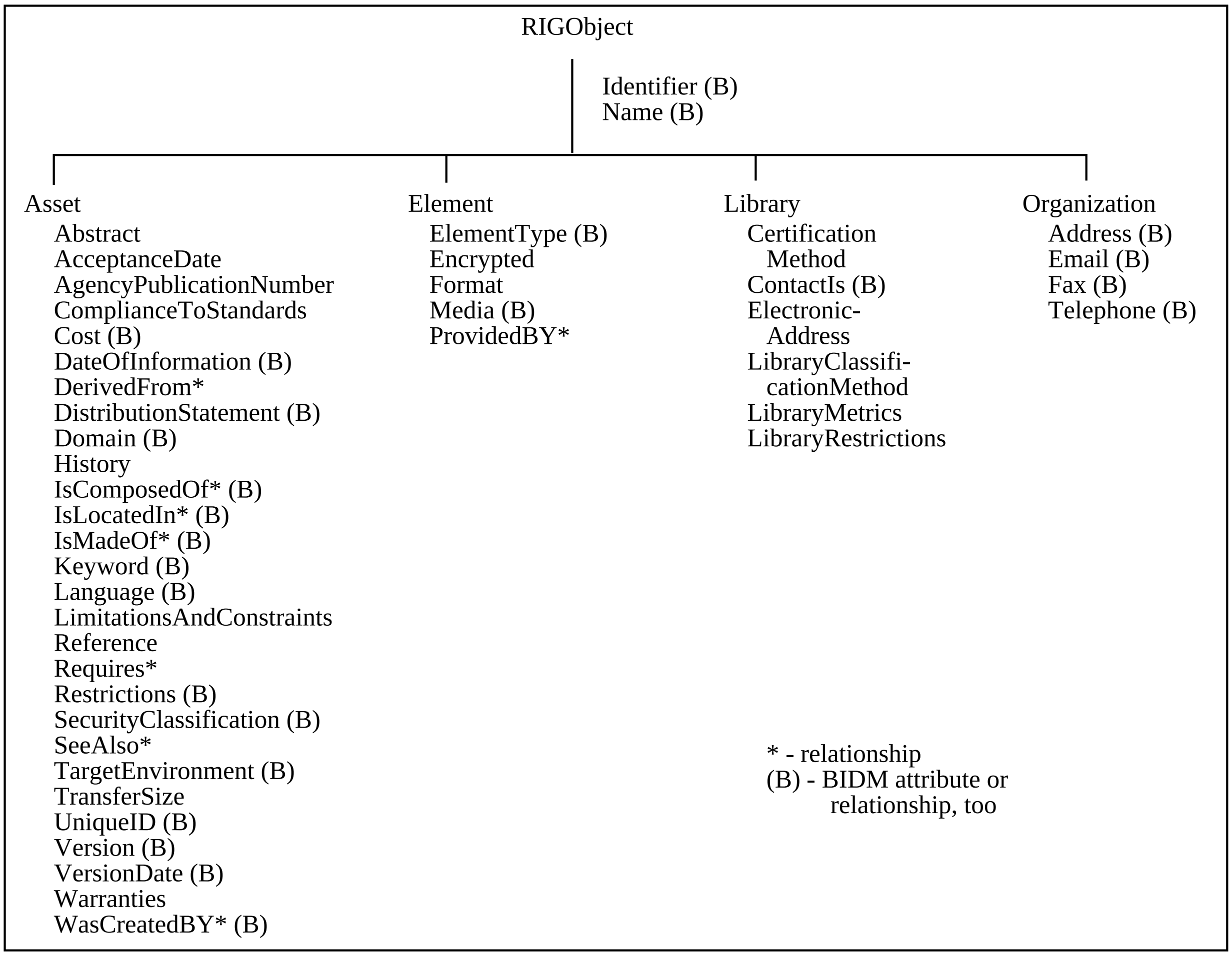

Figure 1: UDM Class Hierarchy

needed for the exchange of assets. During an asset transfer, the sending library must fill all mandatory attributes and relationships. As an abbreviated example, if IBM authored a reusable asset, Order_Tracking, in the application area, Manufacturing, with keyword Order, the appropriate data would appear as follows:

Asset	Organization
Domain = Manufacturing	Address = Owego, NY
Keywords = Order	Fax = (555) 555-5555
Name = Order_Tracking	Name = IBM
WasCreatedBy ————>	Telephone = (555) 555-0000

The UDM and its subset, the BIDM, contain attributes with restricted vocabularies. As a supplement to the UDM and BIDM, TC2 will produce a RIG document listing these vocabulary terms. The attributes Domain, ConformanceToStandards, Format, and LibraryClassificationMechanism, for example, require controlled vocabularies. The preliminary vocabulary list for Domain includes Expert_Systems, Configuration_Management, and Image_Processing, among many other terms. The attribute vocabulary document will contain term descriptions so that mappings to these terms remain consistent across libraries.

2.3 What the UDM Accomplishes

The UDM gives libraries a common representation for sending assets to each other, eliminating the need for every library to create mappings to all other libraries' data models. The UDM also identifies important characteristics for describing reusable assets, such as cost, certification, language, warranties, target environment, location (IsLocatedIn), author (WasCreatedBy), and contents (IsMadeOf). In addition, the BIDM subset of the UDM defines a data model that has formed the basis of the data model used by ASSET's (Asset Source for Software Engineering Technology) on-line asset catalog. The UDM also provides a term set, consisting of the UDM attributes, relationships, and attribute vocabularies, that libraries and people can use to associate their diverse terminology.

3 Comparison

The STARS (Software Technology for Adaptable, Reliable Systems) Asset Library Open Architecture Framework (ALOAF) project [4, 6] has examined many of the same issues as TC2 and helped direct early TC2 efforts. The ALOAF includes a meta-model, aspects of which appear in the UDM meta-model. The ALOAF also defines the Common Data Model for interoperability. The UDM uses some of the classes and attributes of the Common Data Model. The ALOAF, however, also considers services for interoperability, which TC2 has just begun investigating. According to Solderitsh [6], the ALOAF will incorporate the results of the RIG, bringing the two efforts into agreement. Finally, the ALOAF project implemented and demonstrated interoperation between STARS libraries.

Another effort, the ASSET-CARDS-DSRS (Central Archive for Reusable Defense Software) (Defense Software Repository System) project [7], also has investigated reuse library interoperability. The project incrementally prototyped interoperability first between ASSET and CARDS, and then among all three libraries. The implementation of interoperability among these libraries gave the project valuable lessons learned, both related to technical and business issues. The lessons learned included the need for a memorandum of understanding between the participating libraries, for an interoperability plan, and for authentication of user distribution classes. TC2 made immediate use of this effort by adding the DistributionStatement attribute to the BIDM.

The scope of both these projects and TC2 differ, making exact comparisons difficult. These two projects have addressed many issues that fall outside the scope of TC2. In the area of data modeling, which these projects and TC2 both tackled, TC2 considered a wider range of libraries in the development of the UDM than ALOAF and ASSET-CARDS-DSRS examined in the creation of their data models.

References

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4 Biography

Terri began her "official" involvement in reuse in 1988 when she joined the newly formed Westinghouse Reuse Working Group. She and another developer subsequently wrote the first version of the Westinghouse reuse library mechanism, ReuSE. In 1992, Terri also examined the feasibility of classifying software from source code automatically and developed a program to produce best-guess classifications for data structure and numeric function Ada source code. In addition, she has worked to put reuse principles into practice while developing and maintaining different types of software tools, written in FORTRAN, Ada, and C. Terri currently works for ConQuest Software, pursuing her interest in text search and retrieval that began during the development of ReuSE.