Comments on proposal: QER_library_instance_schema

Prepared for CADDETC PP SIG/EPISTLE Parts Library working group
Also distributed as ISO TC184/SC4/WG10 N69

1. Introduction

This document results from review of the document "QER_library_instance_schema" prepared by Guy Pierra. The version reviewed is dated April 25, 1996 and was downloaded from the FTP site ftp.lisi.uni-poitiers.fr/pub/wg10ftp.

1.1 Purposes of the review

The purposes of this review are:

- to provide input to discussions at the CADDETC PP SIG/EPISTLE Parts Library working group meeting held on May 20, 1996;
- to provide input to the meetings of ISO TC184/SC4/WG2 and WG10 in Kobe, Japan (June 1996).

The focus of this review is on the architectural and methodological issues raised by the proposal, and as such may also apply to the other QER proposals.

2. Editorial issues

As with many WG2/P-LIB documents, considerable background knowledge is assumed of the reader. For example, it is difficult to assess the technical details of the proposal without knowledge of the structure and content of several ISO 13584 'resource' schemas: no introductory explanation of these schemas is provided (either explicitly or by reference). This severely limits the capability of reviewers to make substantive comments on the document. For example, clause 1 distinguishes:

- products that are instances of classes whose dictionary definitions are specified in an ISO 13584 compliant dictionary;
- products that are instances of classes whose dictionary definitions and contents are specified in an ISO 13584 compliant library.

Some text to explain how these are different (and why) would be very helpful.

3. Architectural issues

In common with the other "QER" proposals, a change is proposed to the STEP architecture, and this change is nowhere stated explicitly. This change relates to the nature, within the STEP architecture, of Integrated Resources (IRs) and Application Protocols (APs), and their inter-relationships. As shown in Figure 1, the STEP IRs are a single conceptual model for product data, from which the normative exchange schema (application interpreted model, AIM) of each AP is developed by the process of *interpretation*, i.e., specifying the usage of a subset of the IRs for a given application context.

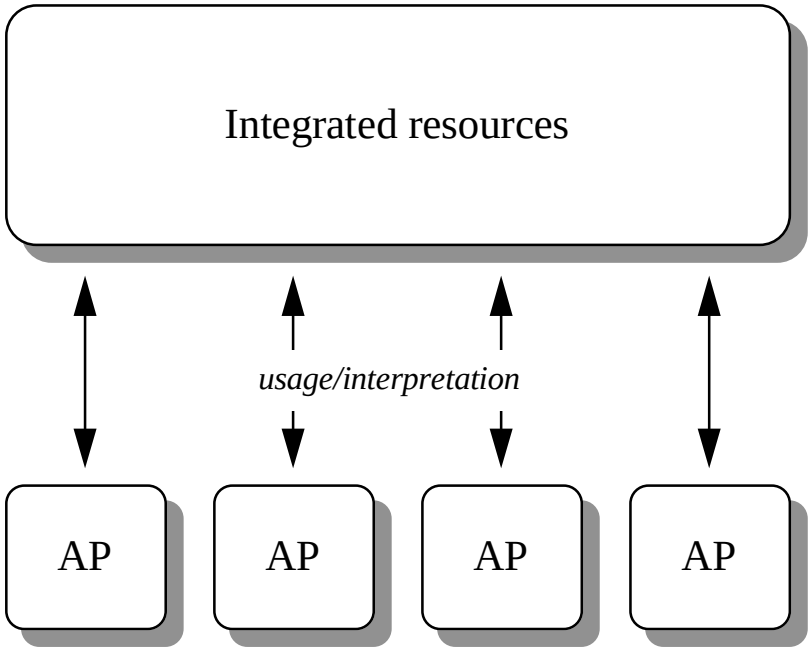

Figure 1: current STEP IR/AP architecture

In discussions within the CADDETC/EPISTLE group and WG2/WG10, the basis of the "QER" approach initially appeared to be that shown in Figure 2, i.e., that a Qualified External Resource takes the form of:

- some "other resource schema" whose capabilities are to be made available for use by STEP APs;
- an "interfacing schema" (QER) that is part of the STEP IRs and whose role is to make the "other resource schema" available to the interpretation process.

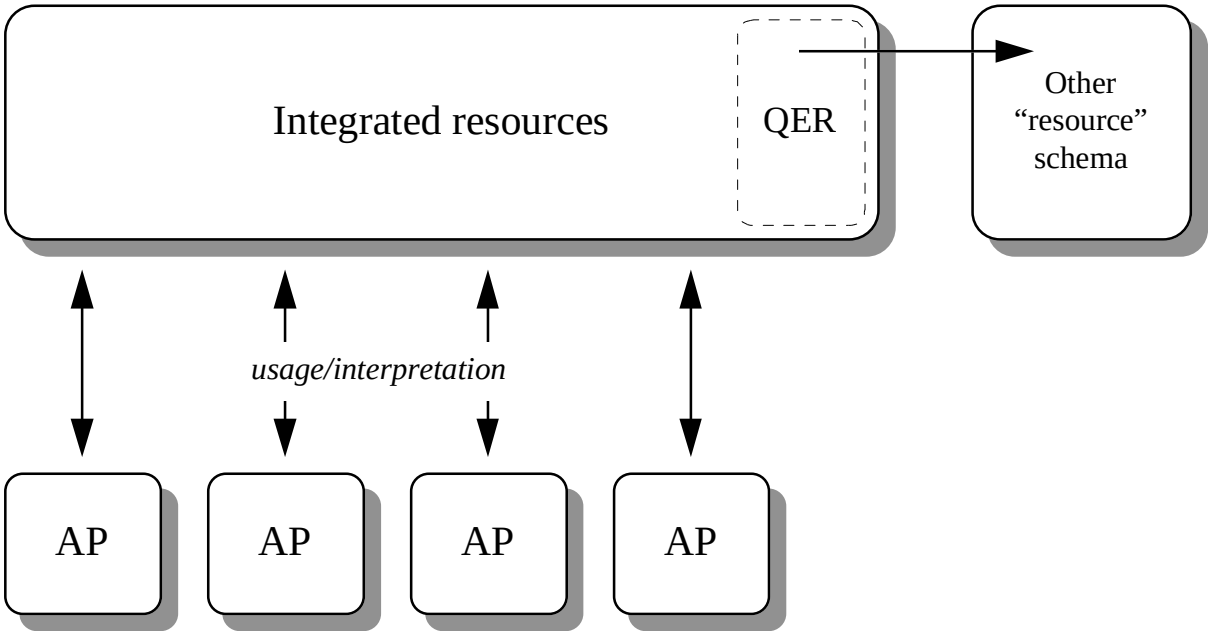

Figure 2: Assumed architectural basis for QER proposals

The architectural change proposed, therefore, is to move from a single resource model paradigm to a multiple resource model paradigm. *This proposed change should be made explicit and discussed by WG10, WG4, etc.* There is also impact on the work of WG11, since the current STEP implementation paradigm for file exchange is to treat the AIM specification as a single schema. This means that any constructs within the “some other schema”, selected through the QER, would be included in the “long form” AIM schema *and would not be distinguishable from STEP IT constructs*. The purpose of the QER in providing a “public” interface to the external schema is in this case negated.

4. Methodological issues

4.1 Requirement for integration of the QER schema

Looking again at Figure 2, the methods used within the development of STEP to extend the IRs are those of *resource integration*. In order to achieve the architecture shown in Figure 2, the contents of the QER_library_instance_schema should be used as inputs to the integration process, resulting in consistent extensions to the IRs. Without such integration, the result of the QER approach is as shown in Figure 3; i.e., an AP makes use of one non-integrated schema (the QER) to access another.

Also, creation of an “interfacing” schema highlights a number of issues regarding the usage of the

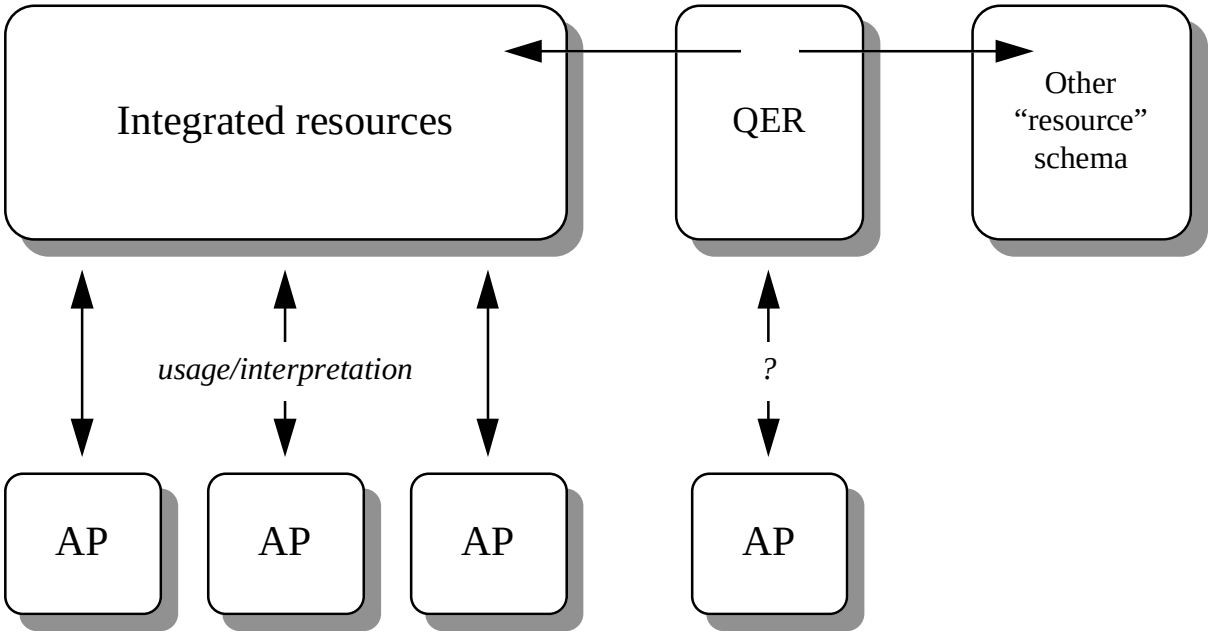

Figure 3: actual QER architecture?

Therefore, it should be established whether the intent of the QER proposal is that the document under consideration is a *draft* resource model, i.e., the *requirements* for extensions to the STEP IRs, rather than being a model proposed for use/standardization without use of the accepted integration process and procedures.

4.2 Integration *vs.* Interpretation

I believe that much of this proposal (and the other three QERs developed by Prof. Pierra) result from a misunderstanding of the fundamental nature of the STEP development process, the distinction between integration and interpretation, and the generic nature of the STEP IRs.

> NOTE: this should not be taken as a criticism, as such understanding is limited even within SC4 and, notwithstanding the work on ISO 10303-13 within WG10/P1, there is little documentation available in a form that facilities wider knowledge.

The goal of developing IRs is to provide generic product data constructs that are suitable for use, through interpretation, in many different APs. An example, from the domain of the QER_library_instance_proposal, is that of the **external_reference_schema** (ISO 10303-41). This provides generic constructs for:

- identification of an external source of data;
- identification of relationships between external sources of data;
- creation of references to data in an external source;
- creation of references to data of a “pre-defined” nature (which is the equivalent of an external reference when the identification of the source is predetermined in the specification).

To reviewer of Part 41, the semantics of these entity types may not be apparent, particularly if a specific set of requirements are in mind. It must be remembered, however, that “specific requirements”

are fulfilled within STEP by APs, not by the IRs alone. It is useful, therefore, to examine the *usage* of this constructs for a specific purpose[1]. It is the *interpretation* process that creates constructs that combine product data aspects (product, product_definition, etc.) with the external_reference_schema[2].

Constructs contained in the QER_library_instance_schema such as pre_defined_dic_product could *and should* be defined within an AIM. If such as interpretation is common to two or more APs, then this may be captured in the form of an application interpreted construct (AIC).

4.3 EXPRESS style and usage

The style and usage of EXPRESS in the QER_library_instance_schema are substantially different from those of the STEP IRs, including:

- use of ABSTRACT SUPERTYPE;
- use of DERIVE to specify constraints.

Mapping between two usage styles for EXPRESS makes review more difficult for the expert, and more confusing for those who are not *cogniscenti* of either STEP or P-LIB!

5. Schema specific technical issues

5.1 Schema interface

I do not understand why so many constructs are referenced from the ISO 13584_instance_schema. If my understanding of the intended architecture is correct (see Figure 2), then I would have expected that this would identify only those elements of the P-LIB schema(s) needed to make the full schema capabilities available through a USE from an AIM.

5.2 Classes and properties

The QER_library_instance_schema inherits from P-LIB the concepts that:

- instances of classes are specified by giving values for properties;
- some properties are “fundamental” to a class.

Neither STEP in general, nor AP221 (which is being used by EPISTLE as the source for test cases and scenarios for “co-operative use” of P-LIB and STEP) embody these concepts *in such a rigid form*. Within AP221, the idea of a class is associated with a set of criteria for membership. These criteria

[1] A detailed walkthrough of the usage of these constructs in AP221 was given by the author to the EPISTLE Parts Libraries meeting held on February 12-13, 1996.

[2] There is an exception to this in that Part 46 (Visual Presentation) includes as resources constructs that are subtypes of presentation entity data types and externally_defined_item or pre_defined_item. The author, in spite of having been a member of the integration team for Part 46, now believes this to be erroneous.

may include value ranges for properties. Similarly, associations may be made between classes such that it is recognized that members of one class (say, of material or facility) may possess certain properties.

I realize that part of this issue is the different usage of the term “class” in AP221 and in P-LIB (classification theory *vs.* object-orientation); however, if P-LIB’s capabilities to define classes, properties, and their relationships are more limited than those of STEP, then these limitations must be explicitly recognized in any “interfacing” schema.

5.3 Classification and identification

I do not fully understand the second bullet of clause 2.1. Why are characteristics assumed to be externally defined?

6. Conclusions

I believe that this proposal has great value in promoting greater understanding of the requirements for STEP/P-LIB interfacing and the technical issues raised. For the reasons stated above it is not, in my opinion, sufficient to meet the needs of STEP APs (such as AP221) which have requirements for use of parts libraries.

As an alternative approach, I propose that AP221’s requirements in this area should be re-interpreted on the basis that requirements for libraries and external references include specified use of ISO 13584-24 compliant dictionaries and ISO 136584-compliant libraries.

Respectfully submitted

Julian Fowler
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May 20, 1996

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