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Product Description and Classification - Part 1: New Property Library

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Foreword

The production of this draft CWA "New Property Library: Property Definition Schema" was agreed at the Workshop eCAT plenary meeting on 16 March 2005, as part of deliverables of the Gen -ePDC project.

Workshop eCAT «Multilingual ecataloguing and eclassification in ebusiness» combined two different projects – one on eCataloguing – which ran in 2003 and 2004 - and another on product classification (ePDC) – which ran from March 2004 to February 2006. Only catalogues and product classification schemas used in eBusiness were taken into consideration.

The ePDC project was divided into two parts. In the first part a modern architecture for a global, interoperable classification schema was designed. Two CWAs were published:

CWA 15294:2005 "Dictionary of Terminology for Product Classification and Description"

CWA 15295:2005 "Description of References and Data Models for Classification"

The second part – called Gen-ePDC –aimed at discussing with different organizations the possibility for their convergence towards a common base. The role of properties and attributes, the link between classification schemes and electronic catalogues were further explored.

Three CWAs summarise the findings of Gen-ePDC :

CWA 15556-1 «New property library»

CWA 15556-2 «Product classes with sets of properties»

CWA 15556-3 «Results of development in harmonization of product classification and in multilingual electronic catalogues and their respective data modelling»

The public comment period ran from 31 January 2006 to 31 March 2006.

The CWA "New Property Library" contains a conceptual description of a property definition schema as an extension of the current PLIB dictionary model (ISO 13584). Work **is** under way within ISO TC184/ SC4 "Industrial data" SG2 with a proposal to revise ISO 13584.

The draft CWA was submitted as input to the ISO TC184/ SC4 SG2 meeting in March 2006.

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1 Introduction

In product classification, the maintenance of a big set of properties is an important requirement as it is required by big classification systems (e.g. eCl@ss).

In the process of maintaining such a classification, new properties are submitted for specific classes, and it is important to identify duplicates, i.e. properties with the same meaning which have already been defined in the classification. For this purpose, a mechanism has been proposed which allows to further abstract properties and to unify different properties under a more abstract view.

Example: An abstract property “height” might be associated with a generalised data type including real and integer values. If this abstract property is being specialised to a concrete property, then the decision has to be taken which data type is associated to the concrete property. By organising properties in such an abstraction hierarchy, it is possible to guarantee uniform definitions and naming rules (top-down view) and to identify areas of potential overlap for new properties (bottom-up view). In addition, this mechanism might also be usable as a powerful means for supporting the harmonisation of different classifications because it can support the comparison and mapping of properties from different classifications.

Therefore, this CWA, a “New Property Library”, contains a conceptual description of a property definition schema as an extension of the current PLIB dictionary model (ISO 13584). The conceptual description has to be further formulated, using for example UML or EXPRESS, to formally become part of the ISO 13584 series of standards.

2 References

eCAT:

<http://www.cenorm.be/cenorm/businessdomains/businessdomains/iss/activity/wseCAT.asp>

eCI@ss: <http://www.eclass-online.com>

ePDC: http://linux.termnet.org/index.py?level=level2&id=5&lang=en&admin_parm

GPC: <http://www.gs1.org/gpc.html>

ISO 13584-24 *Industrial automation systems and integration – Parts library – Part 24: Logical resource: Logical model of supplier library*

ISO 13584-42 *Industrial automation systems and integration – Parts library – Part 42: Description methodology: Methodology for structuring part families (Including Cor. 1:2003)*

IEC 61360-1 *Standard data element types with associated classification scheme for electric components – Part 1: Definitions; Principles and methods*

IEC 61360-2 *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema*

IEC 61360-3 *Standard data element types with associated classification scheme for electric components – Part 3: Maintenance and validation procedures (to be superseded by a general maintenance procedure for standards in database format to be adopted into the ISO/IEC directives – IEC supplement*

IEC 61360-4 *Standard data element types with associated classification scheme for electric components – Part 4: IEC reference collection of standard data element types, component classes and terms*

IEC 61360-5 *Standard data element types with associated classification scheme for electric components – Part 5: Extensions to the EXPRESS dictionary schema*

pLIB: <http://www.plib.ensma.fr/>

UNSPSC: <http://www.unspsc.org>

3 Basic property definition in the current ISO 13584 standard

3.1 Properties

In ISO 13584 (PLIB), a property defines a specific aspect of product. Products are described by specifying values for these properties.

To define property templates as abstract properties, we start with a look at the conceptual composition of properties in the current version of ISO 13584-42. A property is characterised by the following elements:

- Unique identifier (BSU)
A property is identified by an identifier which is globally unique. This is ensured by a specific mechanism for identifiers defined in ISO13584-26.
- Definition class
Each property is defined in the context of specific class. This class defines the domain for which this property is meaningful. In PLIB terms the property becomes visible for the class.
- Domain
Each property has a domain which defines the data type of the property. The data type specifies the set of allowed values for this property in product descriptions. PLIB defines a number of possible data types for properties. In case of measurements, the domain also defines the unit.
- (potentially): Conditions
A condition is another property which defines conditions for the property. This is used for describing environmental conditions which determine the value for the property. Examples are temperature, pressure, etc.
- Descriptive information
The property contains a number of elements which serve for giving more information about the property (mainly for human understanding). These descriptive elements include names, synonyms, definition, graphical elements, additional documents, etc.

Thus, we can specify a property as a five-tuple: $P = (ID, C, D, Cd, I)$.

3.2 Specialisation of properties in ISO/CD 13584-42

In the CD version of ISO 13584, a specialisation mechanism is proposed which allows basically to specialize a property in a subclass of its definition class by adding a domain constraint. This allows to restrict the potential values in the context of this class and gives a number of possibilities to accurately define the set of allowed values.

The domain constraint is an element which relates the constraint to a property and a class. It is a rule that the class has to be a subclass of the definition class of the associated property:

$$DC = (P, C', Cstr)$$

In a different notation, we can incorporate the domain constraint in the definition of a property:

$$P = (ID, C, C', D, Cstr, Cd, I)$$

With setting $D' = (D, Cstr)$, we can write:

$$P = (ID, C, C', D', Cd, I).$$

This shows that for a given property by this form of specialisation exactly the domain can be specialised, whereas the other elements remain unchanged.

4 Property Templates

4.1 Basic Idea

As already mentioned in the introduction, the goal of the introduction of property templates is to support the management of big sets of properties. For this purpose, an administration level for properties is supposed to associate similar properties to a common “abstract property”. If all properties are linked to their abstract properties and these abstract properties possibly are organised in a hierarchy themselves, then it should be possible:

- To identify similar properties and potentially unify them;
- to easily spot if newly registered properties have duplicates which are already in the data dictionary;
- to identify specific kinds of properties which have to be handled in a similar way in processing systems.

To support these goals, property templates are defined in the following as abstract properties which can be seen as generalisations of properties as they are used for the description of products.

4.2 Characteristics of property templates

One basic difference between properties and property template is that property template cannot be used to define aspects of products: property templates cannot be associated with values in product catalogs or part libraries. They only play a role for the administration of properties – and these properties define which values can be used to describe a specific aspect of a property.

Basically, a property template consists of the same ingredients as a property. As such, it may have the same elements as a property and can be defined as

$$PT = (ID, C, D, Cd, I).$$

But opposed to the strong criteria of properties, here a number of relaxations of constraints or additions of possibilities are given. They will be described in the following.

- Unique identifier (BSU)

A property template is identified by an identifier which is globally unique. This is ensured by a specific mechanism for identifiers defined in ISO 13584-26.

- **Definition class**
A property template may be defined in the context of definition class, but this is not mandatory. Thus, general property templates may be defined without definition class. Possible examples are general measurement dimensions like mass, length, etc.
- **Domain**
Each property template has a domain. In contrast to regular properties, a property template may have more general domains, i.e. it may possess a set of domains (e.g. string and integer). Within the domains, it may possess a number of units.
- **(potentially): Conditions**
A property template may have a condition similar to the property.
- **Descriptive information**
The property template contains a number of elements which serve for giving more information. This is similar to the property. But for some descriptive elements (e.g. the property class) more than a single value may be specified for the property template (which is not allowed for a property). The goal is to allow the collection of similar properties under a property template, and e.g. the properties classes of H01 and H02 both specify temperatures with different units.

4.3 Is-a relationship between property templates

It is the goal to organise the property templates in a generalisation/specialisation hierarchy in the form of a tree. For this purpose, the “is-a” relationship relates a property template to its ancestor, a more general property template. The basic background for this hierarchy is to organise the property templates in a way that the potential values which can be specified are getting smaller from the top of the tree down to the leaves.

The rules for this relationship are as follows:

- Each property template may have at most one ancestor and zero, one, or many descendants (i.e. the property templates build a tree structure)
- Property templates are specialised along the “is-a” relationship. This specialisation is defined by the following rules:
 - **Definition class:**
If property template PT-UP has no definition class, then its descendant PT-DOWN may have no definition class either, or it may have selected a specific class as definition class.

If property template PT-UP has specified a definition class, then its descendant PT-DOWN may specialise this definition class, i.e. it can select a subclass of this class as its definition class.
 - **Domains:**
If the property template PT-UP has a set of domains, then it may be specialised in PT-DOWN by dropping one or more of the domains. The number of remaining domains has to be at least 1.

A domain D in PT-UP may be restricted in PT-DOWN, i.e. the number of possible values may be reduced. This can be done by means of domain constraints as defined in the current version of ISO/CD 13584-42.

- **Conditions**
If PT-UP is dependent on some conditions, then for PT-DOWN the domains of these conditions may be specialised – down to a single value.

In PT-DOWN, additional conditions may be added to the “inherited” conditions.

- **Descriptive Information**
In PT-DOWN, the descriptive information may also be changed. This may affect the definition, which might be adapted to the specialisation of the property template. It may also mean that specific elements of a “definition template” are filled or added to support a structured building of definitions by means of the property template hierarchy.

5 Linking properties and property templates

Properties have to be linked to the layer of property template. By this mechanism, they are bound to template which collects similar properties, and by going one step higher in the property template hierarchy, the set of related properties becomes even bigger.

Thus, we introduce a relationship between properties and property templates. This relationship follows the rules of the “is-a” relationship between property templates. That means that a property is always a specialisation of its property template in the sense of the “is-a” relationship. And a property may be only related to a single property template. In addition, the property has to follow the strict rules of properties: It has to have a definition class, and it has to have exactly one domain.

If a property is inherited by a subclass of the definition class, then this has no effect on the relationship to the property template. Regardless, in which class this property is considered, the link to the property template is always the same. This link cannot be changed by a specialisation of the property.