Eurostep and Ontopia
Technology White Paper

Topic Maps in the PDT Domain

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Executive Summary

This white paper describes the potentials offered by Topic Maps to the Product Data Technology (PDT) Domain. We describe in particular how topic maps can be used to enhance the visualisation of product data and data warehousing of product related legacy data.

Introduction

Product data is highly structured, detailed and exact, in order to be used for calculations and simulations. It is formal and strict by necessity regardless of managing system, since it is created for usage in an engineering environment.

However, there is other information concerning products which has fewer requirements for structure and formalism, but which still interacts with engineering product data. Examples of such information are reference guides, installation instructions, sales and marketing material (brochures, leaflets, web sites), information in Enterprise Resource Planning (ERP) systems and Customers Relations Management systems (CRM) and sometimes even ordering systems, but also information created by external entities such as journalists and authorities. This information lives in other systems, and although this information is based on the product data, the integration with Product Data Management (PDM) systems has traditionally been very limited.

With products becoming more and more complex and more customized, with higher demands for tracking of individuals, and with harder regulations on product liability and traceability, the need for better integration of all information around a product increases.

For people that are not daily users of PDM systems, the systems can be perceived as being quite difficult to use, even for the simplest tasks. The user interface, created for engineers, and the strict structures are often seen as barriers by the casual user. And there is no ability to add “ad hoc” relationships dynamically between product data and other information, both temporary within a project and more long-lived across system boundaries.

In order to make product data more accessible to people outside the engineering environment (and for that matter, to engineers as well), we need to create new ways of visualizing product data, new ways of presenting complex relationships, and new ways of enabling an intuitive navigation within product families and features.

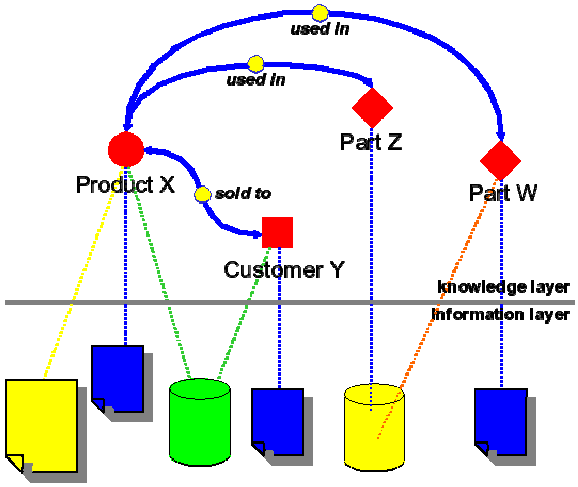
Now we have a golden opportunity to improve all this. This white paper suggests how “strict” product data can meet “dynamic” navigation using Topic Maps.

Topic Maps

Topic Maps are an international standard ISO/IEC 13250:2003. The standard defines a model of topics, associations, occurrences, etc and an XML interchange syntax called XTM. It is a means to collect the key concepts in the organization's information and tie it all together, creating the “Big Picture”.

With topic maps you create an index of information, which resides outside that information, as shown in the illustration. The topic map describes the information in the documents and the databases by linking into them using URIs.

The topic map takes the key concepts described in the databases and documents and relates them together independently of what is said about them in the information being indexed. This means taking a step back from the details and focusing on the forest rather than the trees. Or, to put it another way, it means managing the meaning of the information, rather than just the information.



A topic map, linking databases and documents as information resources.

The result is an information structure that breaks out of the traditional hierarchical straightjacket that we have gotten used to squeezing our information into. A topic map usually is a rich semantic network. This makes information easy to find even if you no longer act as the designers expected you to; there are multiple redundant navigation paths that will lead you to the same answer.

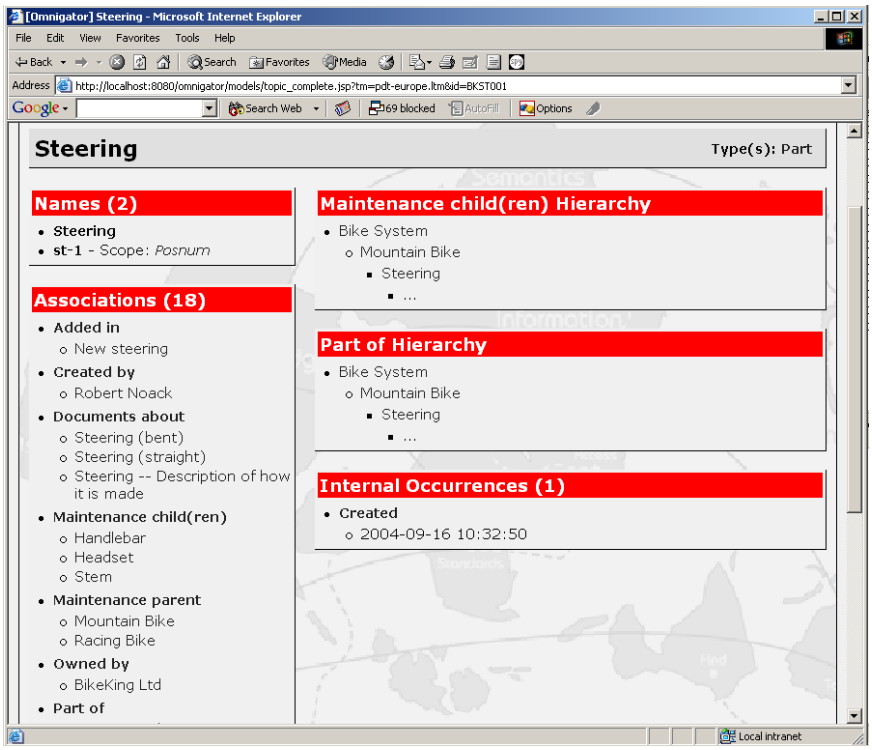
Product data is already well structured, so topic maps do not add in terms of better structure. However, topic maps are very useful to create links between information sources that currently have no common structure. An example of this could be to combine information from e.g. a glossary, maintenance documentation, marketing material, order system, and a product configuration system. The presentation of all this information interlinked with each other can be very powerful, at least when talking about search and navigation (primarily not for updating or editing).

The most common usage for topic maps right now is to build web sites that are entirely driven by the topic map. The topic map provides the site structure and the page content is taken partly from the topic map itself, and partly from the occurrences. In a topic map-driven web site, there is one page for each topic, called the topic page, from which all information about that topic can be found, together with links to the topic pages of related topics. This structure makes it much easier to find information, since the site structure becomes logical and easy to understand.

Topic map-driven web sites are perfect for all sorts of portals, catalogues, site indexes and so on. Since a topic map can be said to represent knowledge about the things it describes, topic maps are also ideal as knowledge management tools.

Visualization of Product Data

Topic maps are strong on expressing arbitrary relationships, and with professional software like the Ontopia Knowledge Suite (OKS) they are easy to maintain, extend and visualize. A web interface optimised for a particular data set may be set up in a matter of days in OKS, and the generic interface is often a good starting point.



Generic presentation in Ontopia's Omnigator.

Topic maps implemented in software such as OKS provide a simple and easy way to create high-quality visualizations of complex data. Users can see relationships easier and will understand the products better.

Working with topic maps to visualize product data and to combine it with any other product related information gives us several benefits compared to the more or less hard-coded GUIs of contemporary PDT solutions:

- Complex relationships can be visualised intuitively and simple
- Generic or highly optimised web interfaces
- Rapid deployment (changes can be made instantly)
- Ease of modifications (both graphical and relational modifications)

'Integrating' Legacy Data

Topic maps are extremely well suited to create order in all sorts of legacy information, such as documentation, old databases, Excel files and access databases. Creating a first topic map is quite easy, and the topic map can grow as the understanding of the legacy information increases. Due to the rapid deployment of topic maps in the OKS software, it is an ideal tool for incremental mapping of legacy data.

When a topic map is created for a specific information resource, it is the subject keywords and the relationships that are meaningful to business people. If the information resource happens to be well structured (such as an old product database), the topic map may have more relations and details than if it is unstructured (such as documents on an intranet).

There are various ways of mapping existing structures into a topic map automatically, and if no structure exists, it is quite easy to create the topic map anyway (it takes a topic map expert and a person that understands the business domain and the information resource well).

Making legacy data accessible within a modern product data environment is probably the most interesting application of topic maps within the PDT domain.

Extensibility

Topic maps can be merged together. This makes it quite simple to relate different data sets to each other. Each data set must be described by a simple topic map, and the objects or semantics that are common between data sets must be identified using common identifiers in all topic maps. When this exists, data can be exported from any source into a specific topic map, and then the topic maps containing data from different sources can be merged together automagically.

Users can in this way decide to extend their data set whenever they find a need to incorporate other data.

Handling product configuration

Topic maps can be seen as a knowledge representation, and as such perfectly suited to model complex rules and structures like those needed to capture the rules for the reuse of product components. With topic maps rules like "component X needs component Y", "component Y excludes component Z" and so on can easily be represented, together with any additional rules necessary to form a complete knowledge base for the product configurations.

The support for inference rules in the OKS's query language can then be used to quickly build an easy-to-use user interface for configuring products. A page of inference rules is generally enough to work out what are the legal options for any given product given its existing configuration and the product component knowledge base.

Since the topic map structure itself is so flexible, as are the inference rules based on it, it is easy to adapt such solutions to changing requirements and needs.

Future

Using topic maps combined with modern product data technologies promises much for the visualization of product data and data warehousing of legacy data. But other benefits may be uncovered in the near future.

There are two supporting standards under development, ISO 18048 – Topic Maps Query Language (TMQL), and ISO 19756 – Topic Maps Constraint Language (TMCL). The query language can be used for rule-based applications, e.g. rule-based product configuration, where complex rules and logic can be developed for each customer. The constraint language will permit topic maps to be more accurate and selective.

Make sure to future-proof your organization's information by basing your IS/IT systems on well-proven international standards!

Sources

Topics Maps	http://www.topicmap.com/

Contact

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