On Ontology-based Event-driven Process Chains

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Abstract

Event driven process chains (EPC) have become an established industry standard since a decade. Available tools are mainly used by highly educated experts. The great majority of processes are still developed with PowerPoint and Visio. With SemTalk an approach is presented how to enrich MS Visio in a way that it offers all modelling tool functionality required for EPC using an open meta model architecture. The concept of object-oriented EPC (oEPK) is being transferred to the new paradigm of Semantic Web in order to use ontologies and taxonomies while process modelling. Finally some extensions to EPML, the vendor neutral XML format for EPC, are proposed which allow to link process elements to Semantic Web classes.

SemTalk as a GPM Tool Based on MS Visio

SemTalk [FWW02] is a Microsoft Visio Add-On designed to support knowledge and process modelling. In contrast to conventional GPM tools, SemTalk is not built around a single modelling methodology, it is methodologically independent. Visio symbols can be combined freely to support or develop new modelling methods. A meta model defines the semantics of selected symbols so that the model can be checked for consistency. Visio is not longer just a drawing tool, it is a fully-fledged, easy to use, process modelling tool. Several GPM methods have been defined using SemTalk meta models. Important meta models, such as those using Event driven Process Chains (EPC) [KNS92], can be imported using existing import filters. Other supported methodologies include Communication Structured Analysis (CSA) [KFHK02] and the well known ABC FlowCharter flow charts. All these methods profit from SemTalk's broad modelling functionality, which can easily adapted to changing requirements.

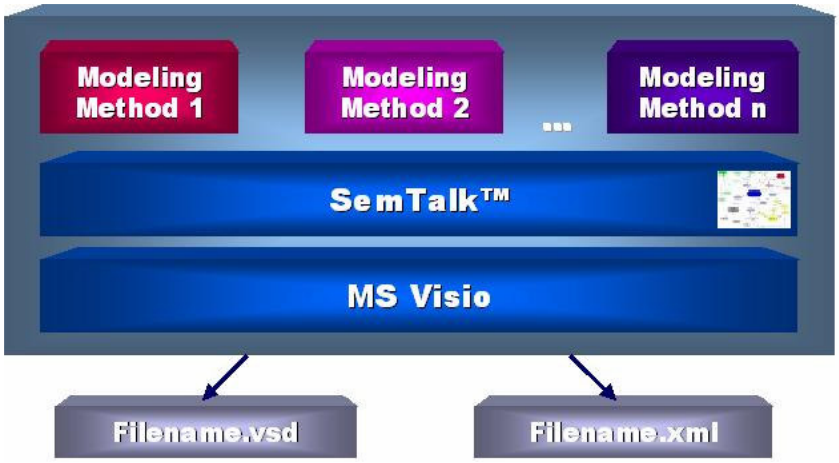

Figure 1: : SemTalk Architecture

Process models in SemTalk are represented in a SemTalk-specific XML schema. SemTalk also supports standard export schemata such as OWL for ontologies [OWL02].

Right now there is not one single standard for business process modelling because the concept of how to describe a process is not stable. It changes as needs change and it is widely used to describe any sequence of events. However tool specific export formats that can be mapped to a meta model, can be created in SemTalk with minimal effort.

EPC Models in SemTalk

„Event driven Process Chains“ (EPC) have been introduced by Keller, Nüttgens and Scheer [KNS92] and they have become a de facto industry standard in German speaking countries. Therefore a detailed description of the EPC methodology will not be covered in this article.

For users of Microsoft Office products, EPC shapes are being shipped with the diagramming tool Visio. A pure Visio-based creation of business processes using Visio's EPC shapes is a great bargain and very easy to use. For use in larger projects, some basic functions of professional modelling tools are needed. Especially important is the ability to show a distinction between model objects and how they are shown in drawings, navigation tools, export / import interfaces and reports. Traditional Visio shapes have no rules and they can be connected without regard of EPC methodology rules. Interfaces and reports require the syntactical correctness offered by other tools.

SemTalk perfectly fills this gap. By applying a meta model to the Visio shapes that appear in Visio drawings, consistency can be guaranteed. Once consistency has been assured, all of the other modelling tool functionality of SemTalk can be used.

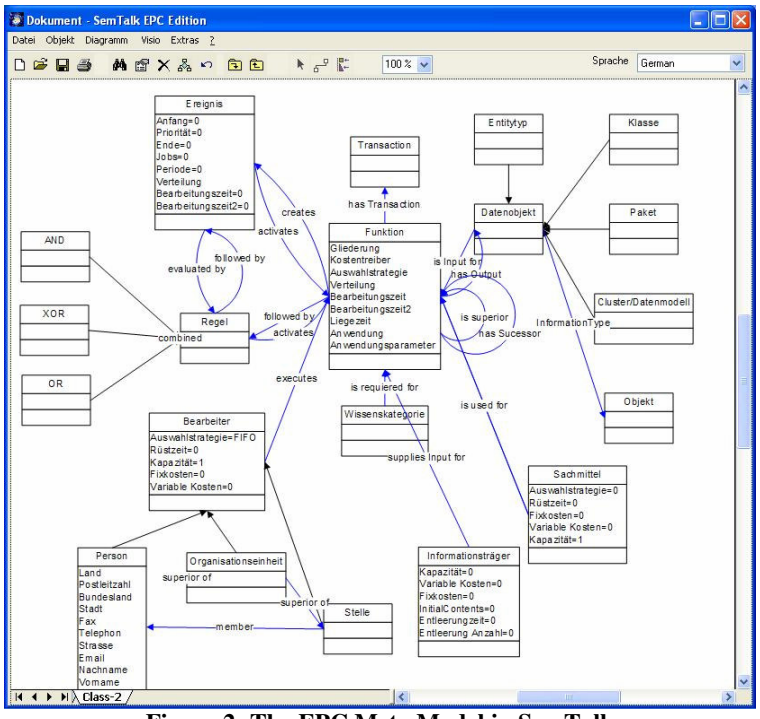

Figure 2: The EPC Meta Model in SemTalk

As visualized in figure 1, the EPC methodology can be defined graphically within SemTalk[1]. For each system class, one or more multiple Visio shapes can be associated to these classes. Each link corresponds to a Visio connector (line) that is drawn between two shapes.

Modelling methods defined this way can easily be customized to fulfil customer specific requirements. This is done by introducing new system classes, connections or attributes. While other tools filter from a predefined set of shapes or describe document modelling guidelines, we can define new tool variants to match problems to specific needs. Unlimited use of Visio shapes is possible. Instead of selecting from a set of highly abstract, vendor-specific, graphical symbols that are rarely needed and poorly understood, SemTalk users can access the entire range of Visio shapes, both those that are designed to support emerging or the wide range of standard, intuitive symbols that come as part of the basic Visio package.

The EPC method in SemTalk is basically compatible with the given standard (see figure 3). The concept of process references has been solved slightly different. There is no special symbol to denote a reference to a sub process. Functions can be refined by attaching a EPC diagram. Refined functions are being drawn with underlined characters similar to a hyperlink in a browser. If the standard process path shape is required a user may select that shape for a specific function call. Each sub process automatically gets copies of the start and end events inherited from the refined function.
All Visio symbols can be used in an EPC diagram after they have been assigned to the EPC system classes. E.g. any printer symbol found in Visio may be used, but it must be specified a being a resource before it can be added to an EPC diagram.

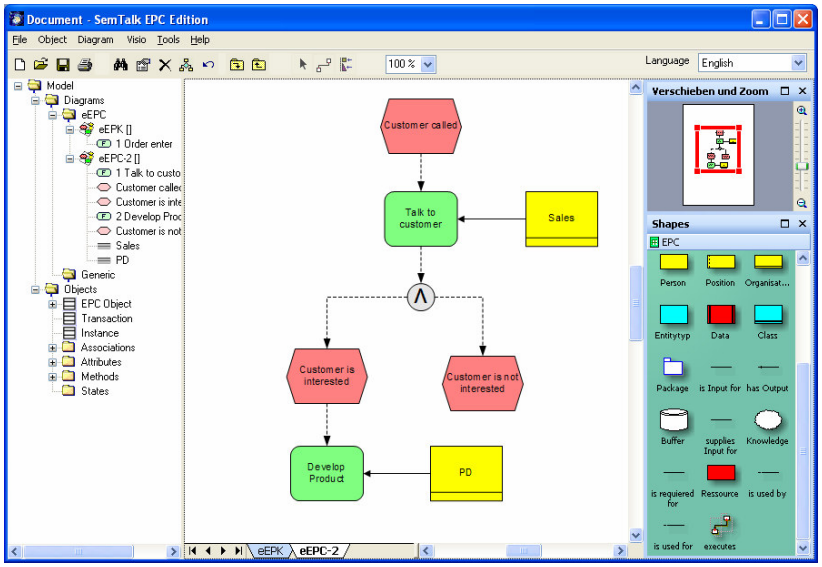

Figure 3: An EPC in SemTalk

People often use Visio's functional band to assign organizational units and persons to function instead of drawing them in the diagram. This is an equivalent representation supported by SemTalk. The tool also comes with org charts, value chains, and entity or object diagrams. Other diagram types can be defined upon request.

[1] German class names are inherited from ARIS™ 4.1 import. ARIS is a trademark of IDS Scheer AG.

Ontology based Process Modelling in SemTalk

Beyond Business Process Modelling another application area of SemTalk is graphical authoring of ontologies [GRU95] and semantic nets. SemTalk was one of the first tools supporting the W3C recommendation OWL (Web Ontology Language) for the so called Semantic Web [BHL01]. The Semantic Web accomplishes the vision to extend the current textual Internet by an Internet made out of data.

The combination of process modelling and ontologies has the advantage of allowing access to existing domain specific glossaries, taxonomies and ontologies from within the processes.

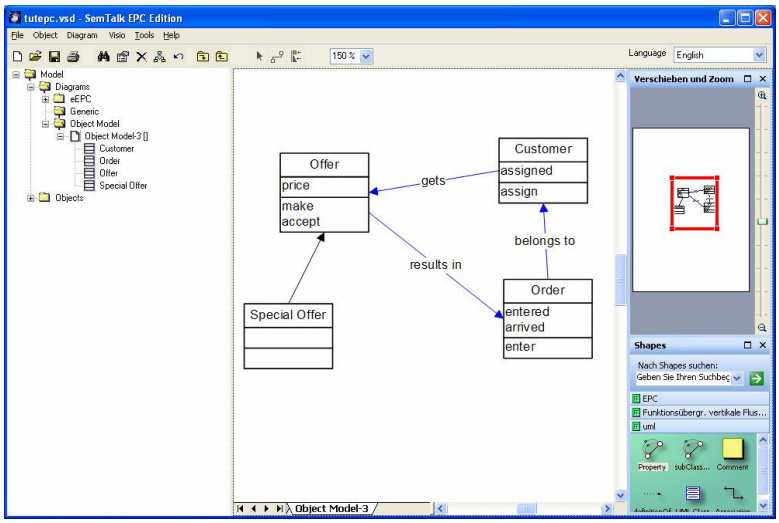

Figure 4: Simplified Ontology

Using ontologies helps to ensure a consistent language used for model elements such as functions and events. While conventional tools similar to Visio allow entering free text for those objects, SemTalk supports the separation of nouns and verbs and the selection of those items from an existing ontology. The main advantage of this approach is that synonyms and homonyms are usually already resolved in published ontologies and that flexions of objects are avoided. Objects are referenced by unique names (URNs) using Semantic Web conventions [HF03].

Separation of nouns and verbs or "Methods" for business process modelling has been introduced in the year 1997 by Scheer, Nüttgens and Zimmermann [SNZ97] and [B95] with the object oriented extension "oEPK" for Event-driven process chains. It has been picked up by several process modelling tools especially for the creating of reference models. For end users this approach is pretty hard to use because it forces them to think in object oriented structures while describing the process flow. Tools have been lacking support of inheritance, so that users end up entering arbitrary nouns and verbs for each function or select from a list of all verbs being in the system. A consequence is that the quality of the resulting model is only slightly improved compared to free text editing.

In SemTalk we are using a built-in inference engine to infer the legal verbs from the ontology. In the example shown in figure 4 "Special Offer" will inherit the attribute "price" and the methods "make" and "accept" from the class "Offer". Inheritance helps to structure the library

of possible verbs. Changes in the class model will be reflected in the functions and events of the resulting EPC diagram.
We follow the Semantic Web approach of building a network of distributed (data-) models rather than relying on a single database. Models are clusters of classes grouped by the level of abstraction, by domains or other aspects. Some clusters may be taken from the internet, others are valid companywide and contain central business objects, but most of them will be used in single working groups or department. Important is that classes are specified with unique names (URN) even if they are located in multiple locations (URL).
Referencing and specialization of common terms makes sure that people are meaning the same thing. Process models can be disambiguated while they are created. New words are automatically looked up in relevant ontologies. They can be converted into references if the right concept was found.

EPML & Ontologies

EPML (Event driven Process Chain Markup Language) was proposed by Mendling und Nüttgens in the year 2002 [MN04]. It is a vendor neutral XML based exchange format for EPC diagrams. Compared to the XML export format of ARIS named AXML, it has human readable tags for the process elements. While AXML is a method independent format exporting internal ARIS structures as there are nodes, definitions and links, EPML exposes the elements of EPC as tags. There are tools available to transform AXML to EPML.
Figure 5 gives an impression how EPML looks like. SemTalk offers export and import of EPML.

EPML provides standardized tags for the main EPC elements as well as some attributes such as “description” and “position”. We would appreciate to extend the list of common attributes to cover the most common attributes available in other tools. A review of XMI implementations will be a good starting point to proceed.

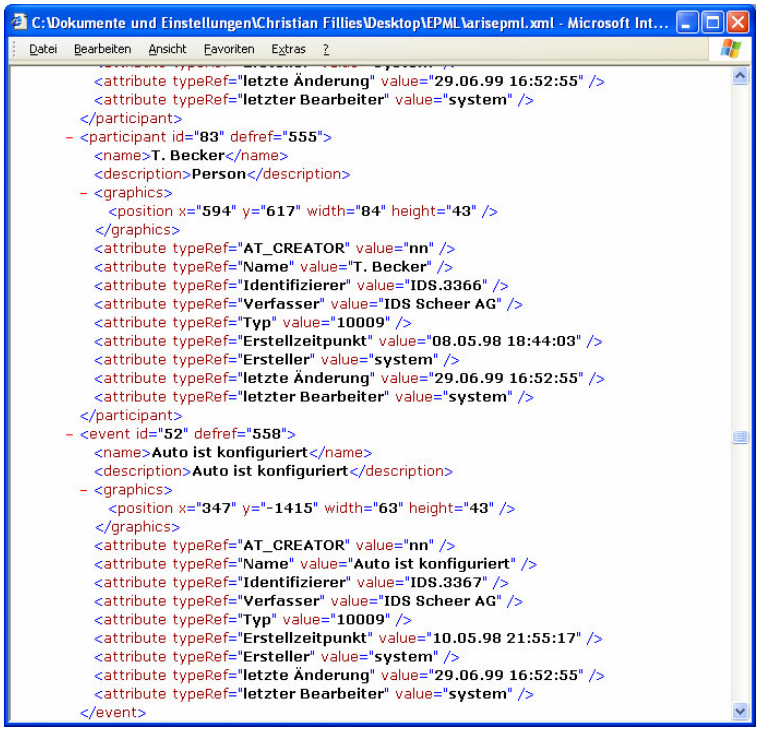

Figure 5: EPML

In order to be able to use ontology based EPC in the way we have described above, we propose to extend EPML by tags denoting the classes, methods and states, which are combined to build to function and event names:

…
<function id="1234" defref="567"
<name>configure car</name>
….
<composition>
<class>http://www.things.org#car<class>
<method> configure<method>
</composition>
</function>

and

<event id="1234" defref="567"
<name>car configured </name>
….
<composition>
<class>http://www.things.org#car<class>
<state> configured<state>
</composition>
</event>

Locations or path names to find an ontology containing the referenced classes can easily be added to EPML in a similar fashion as this is done in OWL.

Integration of these simple pointers to ontologies has the great advantage, that processes can be better exchanged and reused between databases and tools, because the semantics of the process elements has been made explicit.

Process models can be regarded as the procedural part of the Semantic Web, which is mainly about static structures and rules. In order to allow reasoning on process models a foundation of their elements in ontologies is required.

Independent of the Semantic Web the use of ontologies has great advantages while merging and translation of process models, because classes and verbs have to be translated only once if the class model is correct.

5. Summary & Outlook

In this paper we have explained how Visio can be extended in a way that it is usable for professional EPC modelling. Distributed modelling scenarios have been shown where process models make use of prebuilt domain specific ontologies. Using the open EPML standard even a casual user is able to create process models which will be compatible to a given company standard. We are expecting an increasing number of tool vendors to commit themselves to this new standard.
EPC diagrams gained a lot of popularity from the SAP R/3 reference model which has been maintained with EPC until release 4.6c. Even if SAP terminated their use of EPC for Netweaver™ the new upcoming process modelling methods can be expected to be mapped to open formats such as EPML.

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