



An Aspect-Oriented Metamodel for Inter-Organizational Business Processes

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ABSTRACT

In this article, a proposal of business process meta-model is introduced. It shows a clear orientation to inter-organizational business processes, and, previously to its definition, a wider study on business-process meta-models was carried out. The result is a meta-model that adopts their best ideas and extends them to provide a canonic model translatable to process definition languages.

INTRODUCTION

Three requirements identify an inter-organizational business process: *interoperability*, *flexibility*, and *customer orientation* [WK02]. These three requirements are the key points of the CEPEME (Communication and Evolution of Processes in Multi-Enterprise Environments) project. A project carried out by our research group whose main goal is to provide a software solution to communication problems among inter-organizational and/or intra-organizational business processes, especially the first one. So, our research follows various directions: (a) to design an intermediate platform where several organizations collaborate in a business process; (b) to define a generic business process meta-model; (c) to define a meta-process for the development of business process; and (d) to develop a set of graphic tools for the design of business process and a web interface where a participant organization can consult the state of the process in a given moment. These lines fulfill the requirements of interoperability, flexibility and customer orientation introduced above.

The focus of interest in this article is the business process meta-model. Business processes, intra-organizational as well as inter-organizational, are supported by a meta-model that defines the different components attached to a business process. This meta-model must be the most generic and technology-independent, so its translation to a business process modeling language (XLANG, BPEL4WS, etc) can be tackled without problems.

This paper is structured as follows. Section 2 shows different proposals of business process meta-models. Section 3 describes our vision of meta-model. Finally, Section 4 gives some conclusions and possible extensions to this work.

RELATED WORKS

A business process meta-model specifies the elements in a business process and the main relations established between them. Although a standard meta-model accepted by the community does not exist, the Workflow Management Coalition (WfMC) meta-model [WfMC99] can be seen as a reference. Based on this meta-model, other business process meta-models have been proposed, some of them strengthening a characteristic in particular. In this article, the meta-model extensions proposed in [Pen02], [Kra00], and [Mar00] have been our main source of information.

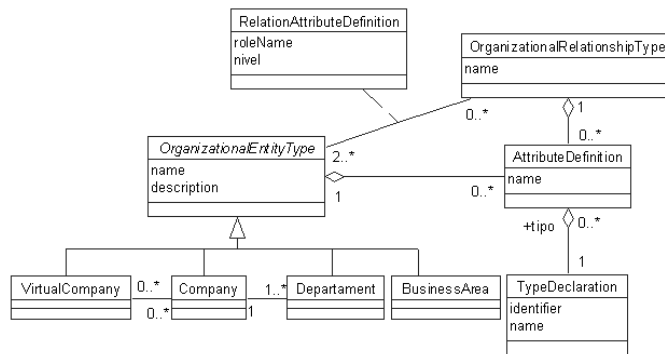
Splitting up the meta-model into aspects

The split-up approach taken in the UML language, where several diagrams (class diagram, object diagram, activity diagram, state diagrams) make more readable and comprehensible a software system, can be adopted in the definition of a business process meta-model. So, a business process meta-model can be seen as a composition of aspects [Jab95] (also called: dimensions [LR00], perspectives [CKO92], [KB97],...). Although the number of aspects varies, depending on the consulted literature, basically the following ones are identified:

- *functional (or structural) aspect*: describes the business process structure, i.e, the set of activities in the business process.
- *behavioral aspect*: describes the execution sequence and the dependencies among the structural components. In other words, the control flow among activities.
- *data (or information) aspect*: describes the information structures and the data flow established between them.
- *organizational aspect*: identifies the organizational units, actors, and external entities who participate in the business process, highlighting the relationships (subordination, cooperation, etc.) established between them.

Which are the advantages of this approach? Mainly, it improves the flexibility (see Section 1) and evolution, at the process level as well as at the meta-model level. Thus, an aspect can be modified with a

Figure 3. Organizational aspect



Organizational aspect

From our point of view, the inter-organizational perspective is not clearly defined in the classical organizational aspect. During business process lifetime, two or more organizations act as a whole in order to obtain a shared benefit. They make up what is known as a “virtual” organization. This “virtual” organization will last until the business process conclusion.

The organizational model proposed in [Kra00] has been extended (see Figure 3), by adding the “virtual company” class, used to establish a relation among two or more companies, represented by the *company* class, in the context of a shared business process.

Distribution aspect

In the “distribution aspect” the inter-organizational orientation of our meta-model is clearer perceived. It describes the “distribution”, that is to say, the allocation of the different activities in the business process among the organizational entities that participate on it. Although it is not shown in this paper, a relation between the *workflowDefinition* class and the *organizationalEntityType* class represents this new aspect.

Distribution and interoperability among business process are concepts that have been broadly investigated [WFMC02], although their importance is not reflected in a wide number of the metamodels consulted.

An advantage of including this aspect in the metamodel is that it facilitates the business process execution in distributed environments, a key factor in inter-organizational business processes.

User aspect

The user aspect is a representation, a view of the state of the business process (total or partial). It is an upper layer where a user with a given set rights can see the elements involved in that portion of business process and how they behave. Thus, a closer relation between the user aspect and the functional and behavioral aspects is established.

CONCLUSIONES AND FUTURE WORKS

In this article a proposal of business process meta-model with a clear inter-organizational orientation is given. At the present time, our research group is working in the definition of a meta-process for the development of business-process. As it was established in a previous work [GMG03], inter-organizational or intra-organizational communication can be achieved by means of a high-level process, technology-independent, from which one or more business process can be instantiated. This high level process is the meta-process. Our idea is to “transfer” or “translate” the effort made in that work (where a meta-process for software process development was defined) to a business environment. It implies a broad research on business processes, studying and comparing different proposals of business process lifecycle and the elements in each of them (phases, activities, task, resources, actors, etc.)

Another focus of study is the evolution and versioning, both in the meta-process and meta-model, following with the research line started at [Mar00].

Moreover, as the Web interface for business process display is used, interface aspects must be considered. So, a research on web-based user interfaces modeling languages must be done, with special attention to the user-workflow nexus [BBC+03].

REFERENCES

- [BCC+03] Brambilla, M., Ceri, S., Comai, S., Fraternali, P. and Manolescu, I.: Specification and Design of Workflow-Driven Hypertexts. Journal of Web Engineering (JWE), vol.1, number 2, pp.163-182, April 2003
- [Bic98] Bichler, P.: Conceptual Design of secure workflow systems: An object-oriented approach to the uniform modelling of workflows, organizations and security. Dissertation, Linz 1998.
- [Biz03] Microsoft BizTalk Server. <http://www.microsoft.com/biztalk/>
- [BU01] Bachmendo, B. and Unland, K.: Aspect-Based Workflow Evolution. Proceedings at the Tutorial and Workshop on Aspect-Oriented Programming and Separation of Concerns, Lancaster University, United Kingdom, August 23-24, 2001.
- [Cas98] CASATI, F.: Models, Semantics and Formal methods for the Design of Workflows and their Exceptions, PhD. Thesis, Department of Electronic & Information, Milan, Politecnico di Milano, Milan, November 1998
- [CKO92] Curtis, B., Kellner, M.I., and Over, J.: Process Modelling. CACM, vol. 35, no. 9, p 75-90, 1992
- [CMSA02] Cardoso, J., Miller, J.A., Sheth, A.P., and Arnold, J.: Modeling Quality of Service for Workflows and Web Service Processes, VLDB Journal, The International Journal on Very Large Data Bases (VLDBJ), Vol., No. (May 2002)
- [ebXML03] <http://www.ebxml.org/>
- [EG02] EDER, J. and GRUBER, W.L.: A Meta Model for Structured Workflows Supporting Workflow Transformations. Proceedings of the Sixth East-European Conference on Advances in Databases and Information Systems (ADBIS'2002), Bratislava, Slovakia, September 8-11, Springer Verlag (LNCS 2435), ISBN 3-540-44138-7, ISSN 0302-9743, page 326-339.
- [EP02] EDER, J. and PICHLER, H.: Duration Histograms for Workflow Systems. Proceedings of the Working Conference on Engineering Information Systems in the Internet Context (IFIP TC8/WG8.1), September 25-27, 2002, Kanazawa, Japan, Kluwer Academic Publishers, ISBN 1-4020-7217-1, page 239-253.
- [GMG03] Gómez, M.P., Martínez, A. and Garcí-Consuegra, J.: A meta-process model for process management and evolution. In Proceedings at the 2003 IRMA Conference, Philadelphia, USA, May 18-21, 2003
- [Gru03] GRUBER, W.L.: Modeling and Transformation of Workflows with Temporal Constraints PhD thesis, University of Klagenfurt, May 2003, <http://www.ifi.uni-klu.ac.at/Publications/Dissertations>
- [Jab95] Jablonski, S.: Workflow-Management-Systeme – Modellierung und Architektur, International Thomson Computer Press, Bonn, 1995.
- [KB97] Kwan, M.M. and Balasubramanian, P.R.: Dynamic workflow management: A framework for modeling workflows. Proceedings of the Thirtieth Hawaii International Conference on System Science. Volume IV, Maui, HI, January 1997
- [Kra00] Kradolfer, M.: A Workflow Metamodel Supporting Dynamic, Reuse-based Model Evolution, PhD Thesis, Wirtschaftswissenschaftlichen Fakultät der Universität Zürich, Mai 2000.
- [LR00] Leymann, F. and Roller, D. Production Workflow: Concepts and Techniques, 2000, Upper Saddle River, New Jersey: Prentice-Hall
- [Mar00] Martínez, A.: Examen y discusión del estado del arte en sistemas de gestión de flujos de trabajo con capacidades evolutivas. Trabajo de Investigación, Universidad de Castilla-La Mancha, 2000.
- [MGC01] Martínez, A., García-Consuegra, J., and Canós, J.M.: Estudio del estado del arte en modelado y ejecución de procesos

interorganizacionales. Technical Report, DIAB-01-06-21, Departamento de Informática de Albacete, Universidad de Castilla-la Mancha, España, 2000

[Mqs03] IBM MQSeries. <http://www-3.ibm.com/software/integration/mqfamily/>

[Mue04] zur MUEHLEN, M.: Organizational Management in Workflow Applications. Information Technology and Management Journal. Kluwer Academic Publishers, 5 (2004) 3.

[Pen02] Penadés, M.C.: Una aproximación metodológica al desarrollo de flujos de trabajo, PhD. Thesis, Departamento de Sistemas Informáticos y Computación, Universidad Politécnica de Valencia, España, Enero 2002.

[Sch99] Schmidt, R.: Aspektorientierte Komponentensysteme zur Unterstützung weitreichender Geschäftsprozesse Fakultät für Informatik, Universität Karlsruhe, December 1999

[Wes00] Weske, M.: Workflow Management Systems: Formal Foundation, Conceptual Design, Implementation Aspects. PhD. Thesis. Westfälische Wilhelms-Universität, 2000

[WFMC99] Workflow Management Coalition. Terminology & Glossary. TC-1011, Issue 3.0, February 1999. <http://www.wfmc.org>

[WFMC02] Workflow Management Coalition. Workflow Process Definition Interface – XML Process Definition Language, WFMC-TC-25, October 25, 2002

[WK02] Wetzel, I. and Klischewski, R.: Serviceflow beyond Workflow? Concepts and Architectures for Supporting Inter-Organizational Service Processes, In: Advanced Information Systems Engineering. Proceedings 14th CAiSE. Springer Lecture Notes in Computer Science, Berlin, pp. 500-515, 2002.

[ZCP01] ZHUGE, H., CHEUNG, T.Y. and PUNG, H.K.: A timed workflow process model Journal of Systems and Software, Volume 55, Issue 3, 15 January 2001, Pages 231-243

[Zha98] Zhao, J.L. Knowledge management and organizational learning in workflow systems. Proceedings of AIS 98, Baltimore, August 14-16, 1998. <http://citeseer.nj.nec.com/zhao98knowledge.html>

ENDNOTES

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