Method for the Modeling and Specification of
Interface/Integration Business Processes and Service
 Oriented Architectures for B2B Collaborations

Ivanna M. Lazarte
CIDISI, Universidad Tecnológica Nacional-FRSF, Lavai se 610, 3000, Santa Fe, Argentina
ilazarte@frsf.utn.edu.ar

Supervisors: Dr. Omar Chiotti, Dr. Pablo Villarreal


Research topic. Methods and tools for the design and implementation of interface and integration business processes and B2B systems required by the organizations to support the execution of the collaborative processes in B2B Collaborations.

1 Introduction

Enterprises are applying collaborative business models for managing inter-enterprise collaboration with their business partners to improve their performance and competitiveness [1]. Collaborative models can be realized by implementing Business-to-Business (B2B) collaborations that entail a process-oriented integration among heterogeneous and autonomous enterprises. This integration must be achieved in a business level and a technological level [2].

In the business level enterprises focus on the design of collaborative processes to define and agree on the behavior of the inter-enterprise collaboration. A collaborative business process defines the global view of the interactions among enterprises to achieve common business goals [2, 3]. In the technological level enterprises focus on the integration and interoperability of their B2B systems for executing collaborative processes. This implies the generation of B2B specifications, i.e. interfaces of the partners’ systems and business process specifications, required by each enterprise for executing the role performed in a collaborative process and implement it in a business process management system (BPMS).

The design and management of collaborative processes in both levels implies new challenges, mainly the fulfillment of several requirements [2, 3, 4]: autonomy, decentralized management of collaborative processes, Peer-to-Peer interactions, negotiation and alignment between the business solution and the technological solution. To fulfill the above issues, an MDA-based method was proposed for the modeling and specification of collaborative processes [5, 6]. In this method, collaborative processes are modeled with the language UP-ColBPIP [5, 6] from which
business process specifications can be generated in technology languages such as BPEL [7] and WS-CDL [2].

2 Problems and Hypothesis Identified

Although collaborative processes define how partners will coordinate their actions, these processes are not executable. B2B collaborations require the definition of interface and integration processes each enterprise has to implement for executing collaborative. An interface process (also abstract process [8, 9] or behavioral interface [4]) defines the public behavior of the role an enterprise performs in a collaborative process. An integration process (also private [8], executable [3, 9] or orchestration processes [4]), which is derived from an interface process, adds the private logic of the enterprise required to support the role it perform in a collaborative process. In the technological level, partners have to generate the interfaces of their B2B systems and the executable specifications of integration processes by using a B2B standard language. Then, these specifications can be interpreted by BPMSs of the partners for executing the collaborative processes in a decentralized way.

The understanding of an interface process by business analysts in a higher abstraction level requires the use of process models defined with a high-level modeling language. Furthermore, interface and integration processes must be aligned with the behavior defined in collaborative processes and hence they have to be correctly defined in order to guarantee their interoperability and support to the logic of collaborative processes.

Although there are several approaches that exploit the benefits of model-driven architectures for B2B processes [11], they do not fulfill the above issues. In [3] the authors proposed an architecture to derive interface processes from collaborative processes. However, they focus on the use of a centralized broker to implement and govern B2B interactions, instead of execute collaborative processes in a decentralized way. Also, a method for generating BPEL specifications from UP-ColBPIP models was proposed in [7]. However, the addition of private logic to BPEL processes has to be done in a technological level, which is not appropriated in order to analyze the interface and integration processes from a business perspective without taking into account the low-level details of the B2B standard used to implement the processes.

Therefore, through the application of an MDA-based method it is possible the automatic generation of the interface and integration process model of each enterprise.

On one hand, the interface process models can be automatically generated from a collaborative process model, by applying transformations of business process models. Collaborative process models can be defined with the language UP-ColBPIP (UML Profile for Collaborative Business Processes based on Interaction Protocols) [5, 6]. This language provides suitable abstractions to support the particular features of B2B collaborations and model technology-independent collaborative processes. This language encourages the use of interaction protocols to represent the behavior of collaborative processes and fulfills the requirements of B2B collaborations: enterprise autonomy, decentralized management, peer-to-peer interaction and representation of
Method for the Modeling and Specification of Interface/Integration Business Processes
and Service Oriented Architectures for B2B Collaborations

negotiations. Interface and integration process models can be expressed through the standard language BPMN (Business Process Modeling Notation) [8]. BPMN is a suitable activity-oriented modeling language to represent technology-independent business processes from the viewpoint of a partner. BPMN incorporates the concept of interface process and also provides suitable concepts to define the activities that represent the private logic to be incorporated for modeling integration processes.

On the other hand, the integration process model of each enterprise can also automatically generated from an interface process model that represents the role the enterprise has to perform in a collaborative process, by adding the private logic required to process or generate the information to be exchanged with their partners.

Finally, for interface and integration processes can be implemented is necessary generating the public interfaces of the B2B systems of the partners, which support the public activities of the integration processes, as well as the interfaces of the internal systems that support the private activities of the integration processes. This requires each enterprise can know, design, implement and manage a complex architecture of information systems. This architecture can be defined by using the principles of the Service Oriented Architecture (SOA), in order to design the architecture that allows internal and external systems to interact using common standards and protocols. The SOA of each partner can also be automatically derived and generated from an integration process model of the partner, by inspecting the attributes and input and output information required by the activities defined in that process model.

3 Proposed Solutions and Expected Contributions

The main purpose of this research is facilitating the implementation of B2B collaborations for enterprises interested in collaborating with its partners. The main expected contribution is the development of a MDA-based method for the design of interface and integration business processes, as well as the design of the service oriented architecture with the services of the B2B systems and internal systems required by the enterprises to support the execution of collaborative processes in B2B collaborations.

To achieve this, three model transformation processes are expected to be developed as part of the MDA-based method:

1. Model transformation process to generate the interface process model of each enterprise from a collaborative process model.

A collaborative process contains the public behavior of the enterprises participating, which makes possible the automatic generation of interface process of each participant to model the role it performs in the collaborative process. From an interaction protocol selected of a UP-ColBPIP model, a transformation process can generate as output the BPMN Business Process Diagrams (BPD) corresponding to the interface processes of the partners, one BPD for each partner involved in the protocol.

To carry out the transformation of a UP-ColBPIP interaction protocol into BPMN BPDs, a set of BPMN predefined patterns for each conceptual element of an interaction protocol will be provided. Thus, the semantics of each protocol element
can be represented in terms of the elements and semantics provided by BPMN, but from the viewpoint of a partner.

2. Model transformation process to generate the integration process model of an enterprise from its interface process models.

To do that, the internal activities required to generate the information to be sent and the process of the information to be received from the partners have to be added to the interface process models. This can be done by using predefined private activity patterns [10] which captures a recurrent business function to process or generate the information exchanged with the partners.

3. Model transformation process to generate the Service Oriented Architecture model of an enterprise from its integration process models.

The interface (public) and integration (private) process models of each enterprise are only one half of a complete collaborative business process realization [12]. The other half is the functionality performed by enterprises’ internal systems for supporting the collaborative process. This functionality can be exposed as Services and implemented as Web Services. Therefore, the Service Oriented Architecture model with the public and internal services that support the activities of the integration processes can be derived by analyzing the attributes and input/output parameters of the activities defined in the integration processes.

The different model transformation processes of the MDA-based method to be developed, along with their required input models and the output models to be generated are shown in Figure 1.

![Fig. 1. Different model transformation processes for the modeling of Interface/Integration Business Processes Models and SOA Models from a collaborative process model](image)

For designing and implementing the above model transformation processes, several techniques of metamodeling and model transformations will be applied. Techniques of graph-based model transformations and graph grammars [13] will be analyzed as well as relational and declarative languages such as ATL [14], in order to determine the best techniques for each type of model transformation process to use.
Method for the Modeling and Specification of Interface/Integration Business Processes and Service Oriented Architectures for B2B Collaborations

Reference

8. OMG. BPMN V1.1 (January 2008); http://www.omg.org/spec/BPMN/1.1/PDF.