

A Collaboration Model: A Service Selection Mechanism to Support Companies' Interoperability

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ABSTRACT

The dynamic formation of a consortium, combining the most adequate set of competencies and resources to satisfy the needs of each new situation sounds indeed as a very appealing approach. However, reaching a rapid 'alignment' among a diverse group of heterogeneous entities is not simple and may require a considerable time to achieve. In this collaborative context, the integration of industrial partners depends strongly on the ability to use a collaborative model to interact efficiently. In this paper, the authors propose a model to tackle this point according to the fact that the partners of the collaboration may change. They propose the development of an approach to achieve a dynamic inter-company collaboration. In this cooperation mode, many companies share their resources, data services and processes. These companies have their own mechanisms and applications, which are heterogeneous. First, the authors define a framework to establish this kind of collaboration. The purpose of this solution is to keep the company architecture and to ask the mediator for playing an intermediary role between companies. Then, the authors propose a service selection mechanism based on the agent technology and on the decision tree paradigm. They present an offline composition service process. Finally, they illustrate their solution with an example of treating an emergency case to show the feasibility of the proposed model.

KEYWORDS

Agents, BPMN, Collaborative Systems, Composition Services, Decision Tree, Interoperability

INTRODUCTION

The markets openness, the variability of customer requirements, the communication performances and the constant search for innovation are all emerging phenomena, which are associated with globalization that the companies must face. Therefore, the companies seek continuously to improve their response and adaptation ability in order to stay in tune with their customers. One of the solutions is to develop a collaboration mechanism in order to become able to answer eventually to complex commercial opportunities that a single company can't face alone. This partnership operation mode allows companies to focus on their job core and to optimize the use of their resources and often to avoid the potential distribution of their competencies. Thus, they agree to provide the necessary goods and services to cover a part of the demand, in a trust and sharing spirit with their partners, which have to build and improve themselves sometimes for periods more or less long. In this context, several

characteristics of the partnership must be taken into account. Today the concept of interoperability is considered as one of the major challenges to be considered and mastered in any attempt of an inter-company collaboration, even within a company. Indeed, a failure of interoperability can induce the appearance of problems, dysfunctions and of slowdowns. More generally, a performance loss can induce a confidence loss between the partners. Thus, the analysis and the search for appropriate solutions for each partner, has now a strategic importance for every separate company, when it is involved in a collaborative process.

This research work attempts to answer to the on-demand cooperation problem or the dynamic cooperation defined as an occasional cooperation, without structural constraints in which the involved partners and their number are not predefined (Boukadi, Vincent, Ghedira, & Maamar, 2010). This definition is similar to the definition of virtual companies which are “formed within the context of a VBE (*Virtual organizations Breeding Environment*), and they are dissolved once the triggering business opportunity is achieved. But, in this company category, we can also find long term networks, reflecting some of continuity in production or servicing, such as supply chains, collaborative transportation networks, collaborative smart grids, and so on. In this case, given the long life cycle, it is affordable to invest some time in the initial preparation phase and thus the existence of a VBE is not a pre-requisite for them.” (Camarinha-Matos, 2014, p. 6).

Our study of some related work has revealed that the on-demand cooperation is a strategic choice that is difficult to achieve, when the IS (*Information System*) is not adapted to this type of operation. Membership of a company to cooperation scenarios is governed by dual concerns. Firstly, the company has a lack of flexibility in the IS that it a support for its job, as Rittgen (2009) said, “in the case of company and their ISs, the situation is complicated, they determine each other, which makes it impossible to design or study them in isolation” (p. 1). From the other side, the implementation of the on-demand cooperation requires the development of a clearly defined framework that allows companies to interconnect their different processes within a global process. In the company collaboration and particularly in the dynamic cooperation context, companies may have similar capabilities. However, they do not always solve the faced problems by the same way. Each company has its own ways of acting which differentiates it from the other partners. When we develop a dynamic collaborative process we can have a choice between several partners. This choice is conditioned by a set of strategic criteria. Furthermore, we can express the need of changing partners. Therefore, it is difficult to describe a cooperation scenario that defines in advance all the partners and their possible interactions. The analysis of the service problem based on intercompany cooperation has led us to decompose it into three additional issues that form our research problem which are respectively. I) the problem of the conception of a new framework that ensures the effectiveness and efficiency of the company cooperation based on the service approach, II) the problem of decision making in order to choose the best services for a given query and III) the problem of building of an on-demand collaborative process (or the composition of the different services). Our contributions answer to the limitations and the problems described previously by offering mediation architecture between the companies participating to the cooperation. The use of a mediator ensures interoperability between companies and also a security level as well. In order to facilitate decision-making and to be able to choose the services that best meet the customer needs, we propose the integration of decision trees in the software agents of our mediator. Another contribution is the implementation of the collaboration process. Such collaboration must use an interconnection of processes of different companies using the service composition paradigm.

The structure of this article is as follows. First, we discuss some related work and we make a synthesis, followed by a comparison between these works. After this study, we present an overview of the proposed solution and the general architecture of our system. The provided solution is based on

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