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Federated Process Framework in a Virtual Enterprise Using an Object-Oriented Database and Extensible Markup Language

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ABSTRACT

Process information sharing is a beneficial tool through which participating organizations in a virtual enterprise can improve their customer services and business performance. However, autonomy and agility of the organizations have placed limitations in the development of process information sharing, which the previous research has not satisfactorily addressed. This paper proposes a federated process framework and its system architecture that provide a conceptual design for effective implementation of process information sharing supporting the autonomy and agility of the organizations. First, in terms of autonomy, the federated process framework supports a flexible sharing policy to control the amount of shared data so that the framework can be applied to a wide variety of practical situations from loosely-coupled cases to tightly-coupled cases. Second, in terms of agility, the system architecture based on the federated process framework supports the entire life cycle of process information sharing by allowing sufficient adaptability to the changes of business environments. We develop the framework using an object-oriented database and Extensible Markup Language to accommodate all the constructs and their interactions within object-oriented message exchange model.

Keywords: information sharing; federated process framework; object-oriented message exchange model

INTRODUCTION

Recent studies on business-to-business electronic commerce increasingly emphasize effective business collaboration in a virtual enterprise in terms of order fulfillment, marketing, and customer services (D'Amours, 1999; Tuma, 1998). Especially, by streamlining and coordinating collaborating organizations' local business processes in their value chain, business collaboration satisfies customers' demands such as order tracking and just-in-time delivery. The key technique for achieving such goals is process information sharing (Alonso, 1999; Georgakopoulos, 1999). Process information sharing means that collaborating organizations provide visibility of their internal process information to

each other in order to enhance process monitoring capabilities and dynamic resource management coordinated in a virtual enterprise. In the example of an on-line store case, if an on-line store receives detailed delivery process information from a collaborating transportation company, it can effectively carry out and monitor full steps of order fulfillment processes from order capturing through picking and packing, finally to product delivery. Such process information sharing allows the on-line store to provide customers an extended order tracking service to monitor the overall process status for their orders. From the viewpoint of the transportation company, if the on-line store provides order handling process information prior to sending a delivery request, the transportation company can better plan its delivery schedule for car allocation, loading, and routing, and thus reduce the overall delivery time and cost. With such benefits of process information sharing, both the on-line store and transportation company can improve their business performance in a variety of ways including value-added customer service and decision support.

Most of the previous research on process information sharing has focused on demonstrating such benefits (Lee, 1997; D'Amours, 1999; Zhou, 1998) and providing appropriate underlying system architecture or design for process information sharing (Alonso, 1999; Georgakopoulos, 1999; Kuechler, 2001; Mori, 1999; Workflow Management Coalition, 2000). However, research efforts considering the autonomy and agility issues that are the inherent properties of modern organizations are few even though these issues make it difficult to accommodate process information sharing in many real situations.

Motivation and Research Questions

Autonomy means that each participating organization can decide whether to and how much of its local data to share with other organizations (Alonso, 1989; Sheth, 1990). In spite of strategic alliances, most organizations in a virtual enterprise are usually reluctant to expose their core business information on their internal business logic and status to each other (Bolcer, 1999; Georgakopoulos, 1999, Merz, 1999). Such unwillingness often conflicts with the need to share data and therefore these two conflicting factors determine the degree of autonomy for the amount of shared data. When the degree of autonomy is determined, each participant establishes a sharing policy on the amount of shared data. Regarding the autonomy issue, existing studies on process information sharing have addressed little about the mechanisms to establish a sharing policy and how to control the amount of shared process information according to the sharing policy. Specifically, the autonomy problem can be further articulated by the following questions:

i) How can the amount of shared process information be systematically represented as a sharing policy concerning the determined degree of autonomy between participants?
ii) How can the system for process information sharing restrict and control the amount of shared process information according to the sharing policy while accommodating seamless process information sharing?

On the other hand, agility means that organizations constantly refine their business strategies and information systems in order to meet environmental changes or to take new opportunities (Goranson, 1999). It is well recognized that agility is one of