Standards-based approaches to B2B workflow integration

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Abstract

E-business automates the overall activities of a company and allows distributed systems to communicate their information. Process automation and information sharing improve a company's productivity and responsiveness, while Business-to-Business (B2B) workflow systems electronically aid the progress of business processes among trading partners, and also help companies to monitor and administrate their process execution. This study analyzes the technologies and standards for B2B workflow integration, and extracts a reference model for B2B workflow integration. Based on the reference model, three approaches to B2B workflow integration will be introduced here. In addition, we have developed a prototype system of one approach and have illustrated an example for B2B workflow integration. The result of our research can help business partners understand the workflow standards and the messaging technologies for B2B workflow integration, and also help them understand how to implement workflow integration systems that are appropriate to their e-business environments.
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1. Introduction

Many companies have automated their business processes by workflow management systems (WFMSs) and have shared their information in distributed information systems by enterprise application integration (EAI) technologies. Process automation and information sharing help to improve their productivity and increase customer responsiveness. This trend is also emerging in B2B environments. In B2B integration, several companies, such as ones in supply chains or virtual enterprises, try to design their collaboration as business process models and automate them with process enactment engines. The current standards, such as XPDL (XML Process Definition Language), Wf-XML, WSCI (Web Service Choreography Interface), and BPEL (Business Process Execution Language), and the technology, such as web services and message-oriented middlewares, allow the B2B integration to be implemented more easily, extensively and robustly.

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This paper focuses on design and implementation methods for B2B workflow integration. First of all, we have analyzed the research and standards of B2B workflow integration, and then we have presented a B2B Workflow Reference Model, which contains three main interfaces: *Application Interface*, *Human Interface* and *B2B Interface*.

Based on the reference model, we have also introduced three approaches to B2B workflow integration, the *Workflow System Interoperability Approach*, the *Web Service Choreography Approach* and the *Multi-Phase Process Composition Approach*, with the aim of effectively implementing process integration among business partners. The first approach is used to implement system interoperability by extending existing workflow systems in the B2B area. In this approach, reusable private processes of business partners can interact with each other by using the workflow interoperability standard Wf-XML (WfMC, 2001a). The second approach is employed to implement loosely coupled process integration based on web services technology. Application services revealed into web services can be coordinated in a collaborative process by using web service choreography languages such as WSCI and BPEL. The last approach is used for implementing multiple-phase process design including both private and public processes. This approach offers high independency and controllability for each area's processes.

Finally, we have developed ebFMS a prototype system for B2B workflow integration based on the last approach. The system is composed of two process enactment engines: one is a workflow engine for internal workflows as private processes, and the other is a BPM engine for contract processes as public processes. We have illustrated workflow integration with an example of purchase order process through the prototype system.

This paper focused on what should be considered for workflow-based process integration and how we can adopt the recent standard technology, such as web services and business process languages, in implementing process integration. The research we have conducted can help business partners to understand the workflow related standards and the messaging technologies for B2B workflow integration, and to design workflow integration systems that are appropriate to their e-business environments.

2. Background and literature survey

2.1. B2B process integration

Business process management (BPM) has been a significant research issue in the recent decade. The survey of Zhao and Cheng (2005) shows the recent growth of BPM articles very well. In the Business-to-Business (B2B) area, business process integration was considered as one of the most important techniques for e-business application integration (eAI) or B2B integration (B2Bi) (Johannesson & Perjons, 2001; van der Aalst, 2000). Many researchers have been studied various frameworks and languages to realize B2B electronic business, such as B2B commerce, supply chain management and virtual enterprises. In the earlier architecture of electronic commerce, such as eCo (Tenenbaum, Chowdhry, & Hughes, 1997) and EBES/EWOS (1997), process integration was emphasized as a key technical component of the architecture. However, the architecture dealt with only business transactions in little consideration of internal processes. Recently, Baghdadi (2004) presented a layered framework for B2B e-commerce applications (ABBA), which took internal processes into account although he did not show the concrete model for process integration. Meanwhile, business process integration architecture for supply chain management was proposed by fusing workflow with application integration technology (Kobayashi, Tamakia, & Komodab, 2003). The workflow-based architecture aimed at integrating process from suppliers to customers and controlling their tasks, such as sales, manufacturing, logistics and finance. In addition, a process-based framework for virtual enterprises dealt with process modeling, analyzing and managing for virtual enterprises operations management (Gou, Huang, Liu, & Li, 2003). Although those articles suggested different approaches to extended enterprises to B2B area, they illustrated the importance of process integration to integrate enterprise applications, such as customer relationship management and enterprise resource planning systems, and implement the business integration environments, such as supply chain management and virtual enterprises. However, the recent emergence of new technology, such as web services, and several process standards, such as BPEL and ebXML, caused a great change of B2B process integration architecture.