An Extensible Workflow Architecture through Web Services\textsuperscript{1,2}

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ABSTRACT

The growing availability of Web services provides a new opportunity for enabling new ways of system integration and interoperability, which are needed to meet the needs of global e-business. In this study, we propose an extensible workflow architecture based on Web services and object-oriented techniques. The proposed architecture contains three components, the Open Kernel Framework, the Universal Resource Manager, and the Process Definition Publisher. We show how this architecture can help extend workflow systems with new features dynamically such as new workflow patterns, new process semantics, new workflow resources, and even new process languages.

Keywords: adaptive workflow management; object-oriented frameworks; Web services; workflow resource management

INTRODUCTION

Business process management systems are becoming the central hub of enterprise applications in order to capture and dynamically manage business logic with integrated application services (Delphi Group, 2002). Today, workflow management systems (WfMS) are an important business process technology that automates organizational processes to support virtual corporations under e-business (Sheth et al., 1999). But several factors still hinder the widespread adoption of the current generation of workflow management systems, including the legacy system problems, the lack of universal standards, and the existence of low interoperability and inflexibility (Bussler, 1999; Sayal et al., 2002).

Figure 1 illustrates a Web service-based workflow interface model that extends the Workflow Interface Model from
Workflow Management Coalition (1995) by employing Web services as resources. Each interface from IF1 through IF5 is mapped with corresponding Web services standards. Each component in the interface model takes advantage of the Web services infrastructure such as dynamic composition of services, universal discovery, transaction management, and security management. In this way, the Web services technology offers workflow resource management capabilities based on existing standards. Web service composition languages (WSCL), like BPEL4WS, can be used as process definition languages. Web service wrappers for work lists of each end-user (IF2) or the non-human resources like software agents (IF3) can participate in the process. Sharing these Web service resources with other workflow engines results in enhanced workflow interoperability (IF4).

Recently, a number of studies have employed the Web service technology to resolve the heterogeneity and interoperability problems in implementing the inter-organizational workflow management. Bussler (2001) stressed clear separation between private processes, to be implemented by WfMSs, and public processes, to be exposed by B2B protocols. DySCo (Piccinelli et al., 2003) is an extension to traditional WfMS that enables Web services to be composed into business solutions. eFlow (Casati & Shan, 2001; Casati & Shan, 2002) is a service platform that facilitates service process composition and enactment by adapting the templates of predefined composite processes. Similar approaches with these studies are advocated in the development of Business Process Execution Language for Web Services (BPEL4WS) (BEA-IBM-Microsoft, 2003; Leymann et al., 2002). BPEL4WS, an XML based process language, provides control flow and data flow programming constructs to model the interaction between components of a composite service. Self-Serv (Benatallah et al., 2003) is a system that provides an environment where the composition is based on state transition diagrams consisting of compo-

Figure 1. Web service-based Workflow Interface Model.

![Organization Chart](image_url)
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