Chapter I

Dynamic Workflow Restructuring Framework for Long-Running Business Processes

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ABSTRACT

This chapter presents a framework for dynamic restructuring of long-running business processes. The framework is composed of the ActivityFlow specification language, a set of workflow restructuring operators, and a dynamic workflow management engine. The ActivityFlow specification language enables the flexible specification, composition, and coordination of workflow activities. There are three unique features of our framework design. First, it supports a collection of specification mechanisms, allowing workflow designers to use a uniform workflow specification interface to describe different types of workflows involved in their organizational processes. A main objective of this characteristic is to help increase the flexibility of workflow processes in accommodating changes. The ActivityFlow language also provides a set of activity modeling facilities, enabling workflow designers to describe the flow of work declaratively and incrementally, and allowing to reason about correctness and security of
complex workflow activities independently from their underlying implementation mechanisms. Finally, it offers an open architecture that supports user interaction as well as collaboration of workflow systems of different organizations. Furthermore, our business process restructuring approach enables the dynamic restructuring of workflows while preserving the correctness of ActivityFlow models and related instances. We report a set of simulation-based experiments to show the benefits and cost of our workflow restructuring approach.

INTRODUCTION

The focus of office computing today has shifted from automating individual work activities to supporting the automation of organizational business processes. Examples of such business processes include handling bank loan applications, processing insurance claims, and providing telephone services. Such a requirement shift, pushed by technology trends, has promoted the workflow management systems (WFMSs) based computing infrastructure, which provides not only a model of business processes but also a foundation on which to build solutions supporting the coordination, execution, and management of business processes (Aalst & Hee, 2002; Leymann & Roller, 2000). One of the main challenges in today’s WFMSs is to provide tools to support organizations to coordinate and automate the flow of work activities between people and groups within an organization and to streamline and manage business processes that depend on both information systems and human resources.

Workflow systems have gone through three stages over the last decade. First, homegrown workflow systems were monolithic in the sense that all control flows and data flows were hard-coded into applications, thus they are difficult to maintain and evolve. The second generation of workflow systems was driven by imaging/document management systems or desktop object managements. The workflow components of these products tend to be tightly coupled with the production systems. Typical examples are smart form systems (e.g., expense report handling) and case folder systems (e.g., insurance claims handling). The third generation workflow systems have an open infrastructure, a generic workflow engine, a database or repository for sharing information, and use middleware technology for distributed object management. Several research projects are contributing toward building the third generation workflow systems (Mohan, 1994; Sheth, 1995; Sheth et al., 1996). For a survey of some of the workflow automation software products and prototypes, see Georgakopoulos, Hornick, and Sheth (1995) and Aalst and Hee (2002).

Recently, workflow automation has been approached in the light of Web services and related technology. According to Alonso, Casati, Kuno, and
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