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Facilitating cross-organisational workflows with a workflow view approach

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Abstract

Interconnecting business processes across systems and organisations is considered to provide significant benefits, such as greater process transparency, higher degrees of integration, facilitation of communication, and consequently higher throughput in a given time interval. However, to achieve these benefits requires tackling constraints. In the context of this paper these are privacy-requirements of the involved workflows and their mutual dependencies. Workflow views are a promising conceptual approach to address the issue of privacy; however this approach requires addressing the issue of interdependencies between workflow view and adjacent private workflow. In this paper we focus on three aspects concerning the support for execution of cross-organisational workflows that have been modelled with a workflow view approach: (i) communication between the entities of a view-based workflow model, (ii) their impact on an extended workflow engine, and (iii) the design of a cross-organisational workflow architecture (CWA). We consider communication aspects in terms of state dependencies and control flow dependencies. We propose to tightly couple private workflow and workflow view with state dependencies, whilst to loosely couple workflow views with control flow dependencies. We introduce a Petri-Net-based state transition approach that binds states of private workflow tasks to their adjacent workflow view-task. On the basis of these communication aspects we develop a CWA for view-based cross-organisational workflow execution. Its concepts are valid for mediated and unmediated interactions and express no choice of a particular technology. The concepts are demonstrated by a scenario, run by two extended workflow management systems.

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1. Introduction and problem description

1.1. Motivation

We observe that the notion of Business Process Management (BPM) is receiving increasing attention from analysts, customers, and solution providers. BPM is considered to provide comprehensive answers to the problem of application component, application, system, and business integration by providing higher-level constructs that are able to reflect contexts, involved entities, and their dependencies. Particular in the context of cross-organisational interactions (a.k.a. Business-to-Business), we observe that a particular context requires the involved partners to adapt for the purpose of the interaction. This adaptation can, however, not necessarily be reflected in the partners' private (internal) business processes without inflicting their ability to interact with other partners in a different context. Imagine an automotive supplier that is providing parts to two different car manufacturers that prescribe a particular sequence of interaction. This means that process-oriented abstractions need to be modelled and tightly bound to their corresponding private business process. Furthermore, these have to be executed in equilibrium such that internal actions that affect the interaction with other partners are communicated, and that the coordination between the partners effects their private workflows, i.e., that they synchronise with each other.

Workflow views are considered a promising conceptual approach to selectively hide details of private workflows, whilst providing a process-oriented interface to facilitate the state-oriented communication between trading partners. However, with the introduction of workflow views we need to address the issue on how a workflow engine could support them and how this would affect the design of an underlying architecture that would facilitate the cross-workflow-system communication. Workflow interoperability standards, such as BPEL4WS [17], and WSCI [13] provide important constructs to model interactions of web services. However, they neither address a model-oriented relationship between private workflows and their publicly visible abstractions nor do they model the interaction between abstract processes. It is further not the focus of these specification to propose how such a model could be supported by a runtime engine. In this paper we therefore consider a workflow management system (WfMS) and conceptualise a supporting architecture that enables execution of private workflows in a cross-organisational context without compromising the privacy and contingency of private workflows, which reflect best business practice, and provide a scalable visibility to structural information of private workflows to trading partners.

This paper is organised as follows: in Section 1 we motivate our work, clarify our understanding on cross-organisational workflow, elaborate on related work, and introduce a distributed workflow model. In Section 2 we consider architectural aspects, a scenario, and unmediated and mediated interactions. In Section 3 we particularly focus on an approach to tightly bind a private workflow to its corresponding abstract workflow and investigate how this approach behaves during execution time. In Section 4 we discuss a supporting cross-organisational workflow architecture and introduce its constituent entities. Section 5 presents an extended workflow management system for cross-organisational workflows, called Nehemiah. We conclude and mention future work in Section 6.

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