Exotica/FMDC: A Workflow Management System for Mobile and Disconnected Clients

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Abstract. Workflow Management Systems (WFMSs) automate the execution of business processes in environments encompassing large numbers of users distributed over a wide geographic area and using heterogeneous resources. Current implementations allow the definition and controlled execution of complex and long lived business processes as the basis for an enterprise-wide collaborative system but, in most cases, the autonomy of the users is greatly restricted due to architectural and design considerations. In particular, existing systems are built around a centralized server. As a result, users need to maintain an uninterrupted connection with the server to perform the different tasks assigned to them. This is a severe restriction, especially when considering the emergence of mobile computing, and the increase in use of laptops and small computers which are connected to the network only occasionally and which will, undoubtedly, be the tool of choice for many users. This paper addresses the problem of supporting disconnected workflow clients in large workflow management systems while still preserving the correctness of the overall execution and allowing coordinated interactions between the different users regardless of their location.

Keywords: Workflow, Disconnected Operation, Mobile Computing

1. Introduction

Workflow Management Systems, WFMSs, are seen as a key tool to improve the efficiency of an organization by automating the execution of its business processes. A WFMS supports the modeling, coordinated execution and monitoring of the activities that take place within an organization. It is up to the user to define such activities and organize them in the most efficient way using the tools provided by business process re-engineering [13], but once the activities and processes of interest have been defined, the workflow management system is
used to represent the business processes and to assign the staff and role hierarchies in the organization within which those business processes will be executed. During the execution of the business process, the workflow management system acts as a coordinator: the WFMS delivers the various tasks to each user, collects results, determines the next steps, controls the activities of each user, and detects when the process has successfully terminated. The patterns of collaboration among the users are predefined as dependencies between individual steps within a business process, with each step being assigned to potentially different users. Thus, the synergy between all the steps is provided by the designer of the business process. Note that full automation is not possible, since human intervention is necessary to solve many crucial steps and to determine what to do in case of errors and unpredictable events. However, the use of a workflow management system simplifies to a great extent the task of coordinating large numbers of users working in heterogeneous and distributed environments.

Many existing WFMSs are built based on a client-server architecture due to the simplicity of the design and the synchronization problems posed by other architectures [4, 3]. Such an approach has many advantages and it is useful in many organizations where the server is installed in some central computer and users access the system through terminals, PCs or workstations, installed in their offices. Most clerical work, form processing, accounting activities, and stock management, to name a few applications, is done this way. However, there are many other applications where this may not be the best approach.

Recently, disconnected operation has been identified as one of the main ways in which computers will be used in the future [17]. Taking advantage of the arrival of more reliable and powerful portable and home desktop computers, users within an organization can work independently of the main computer facilities: applications and data are loaded in the laptops or desktops by briefly connecting with a server, the connection is broken, and users work locally on those applications and data. After the work has been completed, which may be in a few hours or few days, users reconnect with the server and transfer the results of their work. Disconnected operation offers many obvious advantages but, in many ways, disconnected computing and workflow management systems have contradictory goals. A workflow management system is a tool for cooperation and collaborative work in which users work within a preestablished framework that guarantees progress towards a certain goal, the business process, of which the users may not be aware. This requires constant monitoring and checking of the users' activities. On the other hand, disconnected computing is geared towards supporting users who work in isolation from other users. There is not much room for collaboration in disconnected mode.

This paper addresses the problem of supporting disconnected clients in a large workflow management system. The goal is to give enough autonomy to the clients to allow them to perform work without having to be connected to the rest of the system and still maintain the overall correctness and consistency of the processes being executed. To bridge the gap between disconnection and coordination, we propose a compromise between both worlds. Users must "commit" themselves to perform certain tasks before disconnecting from the system. The workflow management system takes advantage of such commitment to assign tasks to users, allowing them to work on their own while ensuring overall correctness and constant progress towards the goal of the business process. The ideas described in this paper is one of the first studies on the impact of portable computers on collaborative workflow.