

## Integrated Modeling of Distributed Software Systems and Workflow Applications

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The design of distributed software systems on the one hand and of workflow management applications on the other hand share a variety of common issues, for instance the modeling of activities, control flow, data flow, and resources. Despite this fact, there appears to be little interaction between the research communities involved. This Minitrack tries to remedy this situation by providing a forum for the discussion of novel approaches to model workflow-aware distributed software systems as well as the design and introduction of workflow management applications, which make use of techniques and tools used in distributed software systems design.

The recent growth in deployment of complex distributed applications has created the need for integrating distributed systems requirements into design techniques. Explicit or potential concurrency, the need for synchronization, resource usage, allocation, and distribution have to be modeled adequately in order to meet these requirements. On the other hand, workflow technology and real-life workflow applications are highly relevant for the software engineering community, since workflow management has created languages, techniques, and tools to model, simulate, monitor, and control the execution of business processes in complex technical and organizational environments.

The Minitrack program consists of six papers, which are organized in two sessions. The papers cover important issues ranging from the analysis of workflow specifications to case studies in applying distributed workflow techniques to specific application areas.

In the first session, different issues related to the specification of workflows and their analysis are discussed. The paper of Lin, Zhao, Li and Chen investigates synchronization properties and deadlocks in workflow graphs. A new graph reduction technique is proposed that reduces only structural correct graphs and hence reveals errors in the specification if the reduction does not succeed. Inoue and Iwaihara discuss a method to handle the unknowns and dy-

namics of systems during the design and implementation process. The method assumes a communicative process as the driving force during the realisation of a system and supports processes, which are not completely known at design time. Their prototypical M-Trans system is based on a notion of consistency between so-called templates and their implementation. Kwak and Han put their focus on the specific problems due to interorganizational workflow systems. Especially, the heterogeneity of the involved workflow management systems raises some important questions when discussed in a dynamic context, i.e., without specifying all details of possible interconnected systems a priori. A framework that is able to handle these problems is presented and evaluated in the context of the parts inventory management process of a motor company.

In the second session, comparison of recent work and the integration of methods from different areas are a common characteristic of the presented papers. Breton and Beziniv describe two recent standard proposals from the WfMC and the OMG for workflow management and compare them on the basis of their meta-model regarding workflow dynamics. The paper provides an in-depth state-of-the-art report with a focus on dynamic aspects. The paper by Bastos and Ruiz discusses an extension of activity diagrams taken from the Unified Modeling Language (UML) to model workflows. It shows the close relationship between issues in engineering complex distributed software systems and workflow systems. Zhao uses a case study from the area of document flow to investigate the relationships between issues from knowledge management, knowledge distribution and coordinated document flow. Their combined use leads to a promising concept of organizational knowledge networks, which is presented with its theoretical background, i.e., knowledge association algebra.

The work presented shows that techniques and lessons learned from the different areas are of mutual benefit, but serious problems have been identified, too. Among them

are the consistent incorporation of all aspects relevant to workflow and practically usable methods to combine the dynamic aspects of workflows with the well-known static structure when modeling for a distributed context.