Diploma/Master Thesis

Update and Change Propagation in Interconnected and Refined Workflow Models/
Aktualisierung und Änderungsweitergabe in verbundenen und verfeinerten Workflowmodellen

Beginning: immediately

Background
The SimTech Cluster of Excellence [1] studies multi-scale and multi-field simulation methods. These methods aim for combining different scales (e.g. cells, tissue, bone, skeleton) and different scientific fields (e.g., chemistry, biology, and physics) into one overall simulation. The Institute of Architecture of Application Systems (IAAS) has built a workflow management system that is tailored specifically for the requirements and needs of scientists [2]. The workflow system allows to model simulations as workflows in order to make them more flexible and improve automation. The workflows can be modeled, executed, adapted, monitored, and analyzed. The current system orchestrates different simulation components into one workflow using either only one scale or an approximation of all scientific fields/scales onto one scale.

In order to extend the system for handling the coupling of separate simulation workflows operating on different scales and scientific fields, we want to introduce the notion of choreographies to simulations. Choreographies are a concept of the business domain providing a global view on the interconnection of independent organizations communicating without a central coordinator. The business logic of each organization (also called choreography participants) is implemented/enacted by workflows. We use the choreography language BPEL4Chor [3], [4] to model choreographies of simulation workflows. For choreography modeling the ChorDesigner has been developed in the work of [5]. A BPEL4Chor choreography itself is not executable but can be transformed into the BPEL workflows that represent the participants in a choreography. Subsequently, the generated workflows are refined with concrete simulation steps.

Scientist want to model their simulations in a trial-and-error-manner, i.e., it must be possible to model a scientific problem only partially, start the execution and model again while taking into account intermediate results.
Tasks
In order to support the trial-and-error modeling style, the existing transformation from the choreography model to the enacting workflows has to be extended. Changes in the choreography model must be propagated to and incorporated into already existing and refined workflows. Additionally, transitive changes affecting further choreography participants should be considered.

In this work the following tasks have to be fulfilled:

- Literature analysis of the state-of-the-art with regard to changes and adaptation in choreography models and their propagation to the enacting workflows
- Concept for change propagation and update of existing workflow models
- Implementation of the concept
- Evaluation of the implemented concepts

Required previous knowledge and experiences:

- Java programming skills
- Workflows [6]
- WS-BPEL [7], [8]

The lectures "Services and Service Composition", "Business Process Management", and the listed literature are recommended for preparation. The student has to manage his schedule including the work packages and milestones by himself. A helpful guide for planning and writing a thesis can be found in [9] and [10]. The thesis can be written in English or German.

Literature
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