

# BPEL'n'Aspects&Compensation: Adapted Service Orchestration Logic and Its Compensation Using Aspects

Mirko Sonntag and Dimka Karastoyanova

Institute of Architecture of Application Systems, University of Stuttgart  
Universitaetsstrasse 38  
70569 Stuttgart, Germany  
{sonntag, karastoyanova}@iaas.uni-stuttgart.de

**Abstract.** One of the main weaknesses of workflow management systems is their inflexibility regarding process changes. To address this drawback in our work on the BPEL'n'Aspects approach we developed a standards-based mechanism to adapt the control flow of BPEL processes [1]. It uses AOP techniques to non-intrusively weave Web service invocations in terms of aspects into BPEL processes. Aspects can be inserted before, instead or after BPEL elements and that way adaptation of running processes is enabled. In this work we want to present a novel extension of the BPEL'n'Aspects prototype that deals with the compensation of weaved-in aspects in a straight-forward manner. The extension enormously improves the applicability of the approach in real-world scenarios: processes in production need the means to compensate behavior that was inserted into the process in the course of adaptation steps. The ability to compensate weaved-in aspects distinguishes our approach from other existing concepts that introduce AOP techniques to business processes.

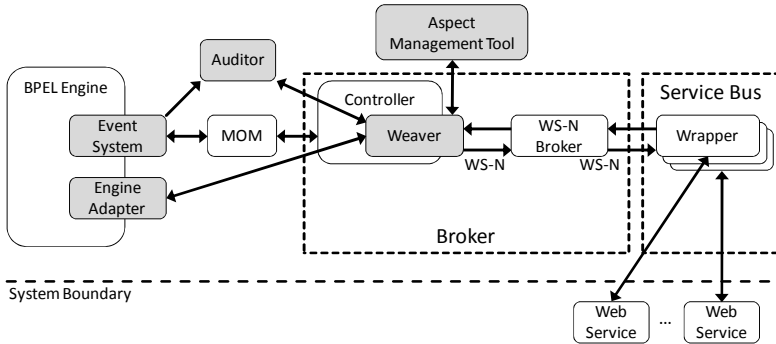
**Keywords:** Service orchestration, BPEL, compensation, aspect-orientation, adaptability.

## 1 System Overview

The BPEL'n'Aspects system consists of four components (see Fig. 1) described in the following: A *BPEL engine* with an extension event system to publish a set of events (e.g. navigation events). Process instance data such as variable instances can be accessed through an engine adapter. A *broker* conducts the actual weaving of aspects into processes. After deployment of an aspect it subscribes to the engine's event system and waits for an event that signals the correct position of the aspect (as given in the aspect definition). Execution of an advice of an aspect (i.e. invocation of a service) is done by the *service bus*. It consists of several wrappers that act as gateways to invoke services. This design decouples the broker from the service invocations. The results of these invocations are routed to the broker that propagates them back to the engine. The user can create, edit, delete, deploy and undeploy aspects with the help of the *aspect management tool*.

In order to account for compensation of weaved-in aspects, we extended the existing prototype as follows: (1) the aspect management tool now allows to attach compensation

aspects to aspects to be executed during compensation of the associated scope; (2) engine events that signal states of compensation handlers (ready, executing, finished) can be generated; (3) the engine adapter now provides functionality to dynamically register events that block process instance execution. This is needed to weave in compensation aspects; (4) the new auditor component stores the audit trail of processes (especially execution timestamps of activities and weaved-in aspects, and variable snapshots); (5) the weaver is capable of registering compensation aspects.



**Fig. 1.** Overview of the BPEL'n'Aspects system. Gray components were developed or adapted during this work.

## 2 Functions to Be Demonstrated

We demonstrate the extended BPEL'n'Aspects prototype with an example scenario of an online book store: (1) we show how users create aspects with the aspect management tool; (2) how a compensation aspect is attached to an aspect; (3) how aspects are deployed to the book store process model; (4) we prepare three different kinds of aspects that cover the most important use cases of our approach. For these three cases we show the deployment, normal execution with the changed process logic, and faulty execution with the compensation of the changed process logic.

**Acknowledgments.** The authors would like to thank the German Research Foundation (DFG) for financial support of the project within the Cluster of Excellence in Simulation Technology (EXC 310/1) at the University of Stuttgart.

## Reference

1. Karastoyanova, D., Leymann, F.: BPEL'n'Aspects: Adapting Service Orchestration Logic. In: Proceedings of the 7<sup>th</sup> International Conference on Web Services, ICWS 2009 (2009)