

Monitoring and Adaptation of Semantic Execution Environments

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Abstract

Current SOA-based systems are operating in a highly dynamic environments. While execution requirements, constraints, and preferences can change rapidly, the underlying infrastructure can affect service availability and influence quality of service. Furthermore, new services can emerge, existing services can undergo modification, and services can be retired. Since the SOA-based systems should be able to operate and evolve in such environments, the need to meet and resolve those challenges is stronger than ever. While Semantic Web Services (SWS) are laying down a foundation to automate typical service usage tasks, the needed level of autonomy can not be achieved without introducing appropriate monitoring and adaptation solutions. The purpose of monitoring is to enable observation of the relevant events and situations occurring during the system execution. Such events may cause changes that require updates to the system configuration and behavior. Adaptation, utilizing data from the monitoring process, enables the adjustment of the configuration and behavior of the system in order to align it with the new requirements and environmental demands.

A middleware solution capable of using the SWS descriptions in order to automate the service usage tasks is called Semantic Execution Environment. The aim of this work is to exploit and further extend this knowledge-rich environment in the context of the state-of-the-art monitoring techniques and adaptation strategies. Ontological representation of monitored events complements the formal characterization of the parts involved in the process (third-party services, middleware broker services and their orchestrations). This enables causal relationship and correlation detection, and application of powerful reasoning techniques for data analysis. The work explores the reuse of existing behavior specification mechanisms, such as Ontologized Abstract State Machines, to enable specification and implementation of adaptation strategies in the form of even-triggered reactivity. The overall approach aims at a novel and integrated solution for monitoring and adaptivity in a setting of SOA-based systems.