Green Web Services Integration and Workflow Execution within Next Generation CEMIS

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ABSTRACT

This article presents a detailed implementation of the Corporate Environmental Management Information Systems (CEMIS) Next Generation platform of the IT-for-Green research project. The provided services within this platform are grouped based on the module to which they belong. These services will be the main realization of the workflows activities of the system’s business processes. In the frame of this project, the Next Generation CEMIS will be developed, to integrate research concepts of current interest and investigate their feasibility through a prototypical implementation. In this paper the authors focus on two major components: the workflow engine implemented using State Chart XML (SCXML) and the Green Service Mall realized as a set of standardized Web Services.

Keywords: Corporate Environmental Management Information Systems (CEMIS), Green Service Mall, State Chart XML (SCXML), Web Services Workflows, Workflow Execution

INTRODUCTION

The demand for sustainable development requires that decision-makers in all organizational forms are able to take a multitude of heterogeneous data into account. Information systems in this domain are typically Corporate Environmental Management Information Systems (CEMIS) (Teuteberg & Marx Gómez, 2010a). Currently used CEMIS are not capable to cope with requirements resulting from the sustainability discussion, because they do not apply strategic decision support at earlier development stages (Junker, 2010) and are commonly used as end-of-pipe-solutions. Factors that influence the development of sustainable products, business processes or holistic models for cause-and-effect chains are still missing. A resource-friendly design of business processes and their energy- and material-efficient are controlling additional demands for sustainability-oriented organizational structures.

To face today’s problems, the European research and transfer network for environmental
management information systems (ERTEMIS) has been set up. This competence network initiated the “IT-for-Green: environment, energy and resource management with next generation CEMIS” project in 2011, with the objective to develop a CEMIS that covers the whole product lifecycle. The important components of this CEMIS are reflected in three modules, namely “Green IT”, “Green Logistics and Production” and “Sustainability Reporting and -dialogue” (Rapp, Solsbach, Mahmoud, Memari, & Bremer, 2011).

Additionally, a platform that integrates these modules together is designed to be open and extensible for new modules and services through a workflow-based and service-oriented approach. The paper is divided as follows: Section 1 presents a brief introduction to service-oriented architecture, sections 2 and 3 presents the methodological background and related work, and section 4 presents our next generation CEMIS in general. In section 5 we present the Green Service Mall as a core component, section 6 presents the workflow integration in detail and section 7 presents the execution of SCXML Workflows within the next generation CEMIS. To conclude, this paper sums up with a conclusion of what had been presented.

SERVICE-ORIENTED ARCHITECTURES

This section illustrates the main service orientation concept. The OASIS service-oriented architecture (SOA) Reference Model group defines SOA as follows: “SOA is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations” (MacKenzie, Laskey, McCabe, Brown, & Metz, 2006). Several technologies are used to realize SOA but Web Services are accorded the most common ones. A Web Service as defined by the W3C consortium is “a software system designed to support interoperable machine to machine interaction over a network” (Booth et al., 2004). In concept, there are three main components in SOA, namely:

- **Service Provider:** It creates a Web Service and possibly publishes its interface and access information to the service registry;
- **Service Registry:** Is responsible for making the access information of both Web Service interface and implementation available to any potential service requester, and categorizing the results in taxonomies. The Universal Description Discovery and Integration (UDDI), defines a way to publish and discover information about Web Services;
- **Service Consumer:** The service consumer (Web Service client) locates entries in the service registry using various find operations and then binds to the service provider in order to invoke one of its Web Services.

These three components constitute the traditional SOA concept (Mahmoud & Marx Gómez, 2008). The only issue is that a Web Service could give us anything and everything. Of course we will have the information we needed, but meanwhile, there will be a plenty of noisy information stored within the information system. Given the circumstances, most would agree that integrating all information conveyed by Web Services without first cleansing or filtering would be a very bad idea. Because if we do not feed our informative tools with right information, we won’t be able to discover trustful and accurate knowledge and to go further, this could be very dangerous if it gives us wrong or biased overview of the business we are analyzing. Besides, this can lead to a huge expansion of the data resources in terms of size. This abundance of information makes it crucial that we set some rules to identify whether the information we are using to help effective decision-making process is reliable or not.
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