

# Architecture and Integration of Prototype in SAKE

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**Abstract.** In this article we propose architecture and prototypes of the SAKE project. SAKE (Semantic Agile Knowledge-based E-government) is a STREP Project supported by the European Union starting March in 2006. The overall objective of SAKE is to specify, develop and deploy a holistic framework and supporting tools for an agile knowledge-based e-government that will be sufficiently flexible to adapt to changing and diverse environments and needs. We give a brief overview of the architecture and some details regarding prototype implementation of basic functionality and architecture.

## 1 Introduction

Existing approaches for knowledge management in e-government focus mainly on the efficient management of a particular, isolated knowledge resource and on supporting only message-based communication between public administrators. However, the demands for knowledge-based e-government are much higher [1]:

- First, the existing approaches do not take into account the increased granularity of informational resources and the manifold semantic
- Second, due to complexity of the decision making processes, effective knowledge management requires the creation of a supportive, collaborative culture while eliminating traditional rivalries.
- Third, the usage of existing knowledge resources is indeed a valid aspiration, but for realizing a learning e-government, the crucial is creation of *new* knowledge.
- Finally, ad hoc management of the changes in e-government systems might work in the short term, but to avoid unnecessary complexity and failures in the long run, management must be done in a systematic way.

Whole SAKE approach will provide tools and methodologies to address these problems. In this article we will concentrate on architecture of the system and the first prototype architecture and implementation.

## 2 Architecture of the SAKE system

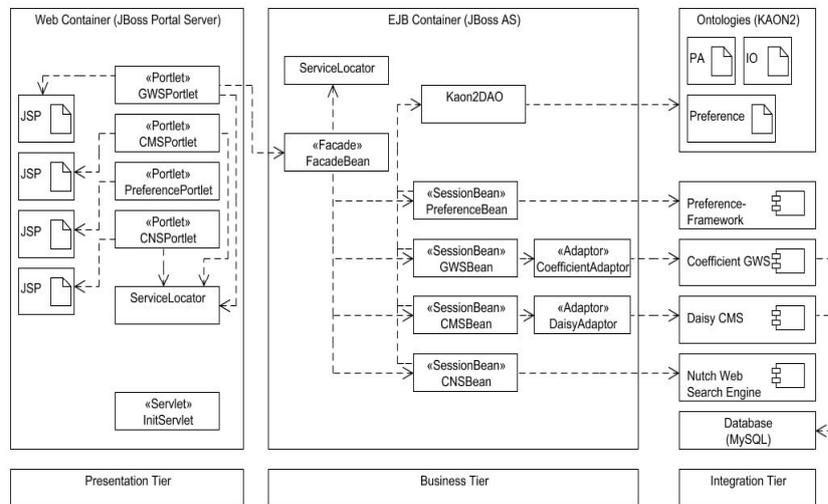
Project SAKE (Semantic Agile Knowledge-based E-government) is a STREP Project sponsored by the European Union starting March in 2006 with 11 involved partners from Greece, Germany, Slovakia, Hungary, and Poland. The overall objective of

SAKE is to specify, develop and deploy a holistic framework and supporting tools for an agile knowledge-based e-government that will be sufficiently flexible to adapt to changing and diverse environments and needs. Based on the analysis of the problems addressed in previous chapter and the needs for applying semantic technologies, we have identified these main SAKE's technological components [2]:

- *Semantic-based attention (change) management (AMS)* – ensures the high precision of the information delivered to a public administrator by formal and explicit modelling of the preferences of a public administrator regarding provided information; developing a preference editor that will enable description of the preferences of a knowledge worker; developing methods for applying preferences on delivered information (filtering); developing methods and tools for change notification in order to enable proactive delivery of the relevant information.
- *Semantic-based content management system (CMS)* – enables efficient provision of knowledge in the context of a public administrative process by: semi-automatic population of the Information ontology by using Text Mining methods (Ontology Learning); developing methods and tools for ontology-based tagging of: (i) the content of a knowledge item, (ii) usage of an item and (iii) the relations between particular items; developing methods and tools for realizing context-aware searching for virtual content; developing methods and tools for editorial process, to satisfy the knowledge items evaluation requirements.
- *Semantic-based Groupware system (GWS)* – supports more efficient knowledge sharing by developing: methods and tools for ontology-based tagging the interaction between public administrators; methods and tools for enabling building community of practice from interaction log and their specific vocabularies by social tagging; methods and tools for collaborative knowledge creation; methods and tools for pushing of knowledge and for searching for experts.
- SAKE will also develop a *conceptual framework* for a semantic-enabled agile knowledge-based e-government that will comprise an analysis of the knowledge infrastructure and knowledge sources in e-government; the SAKE Ontology will provide an overview model of all aspects relevant for achieving agile knowledge-based e-government and will serve as the backbone of the approach; the Domain ontology that models the terminology used in the e-government domain; the Information ontology that models the different kinds of information sources with their respective structures, access and format properties; the Process Ontology and Profile Ontology that model how an administrative process works and what is it about, respectively; semantic models of users (public administrators), their roles and skills (PA Ontology); a Quality model of the decision making process in the public administration (DMQual Ontology) and guidelines for estimating the quality of decision making processes, based on the user and quality model.

### 3 First version of prototype in SAKE

Figure 1 shows overall view of the implementation of the first prototype based on the Portlet technology [3].



**Fig. 1.** Overall technological view of the first prototype of the SAKE system

From the technological point of view, J2EE/EJB is used for the implementation of the business logic of the components, JBOSS is used as an Application Server, Portlets (JSR168) are used for the implementation of the User Interfaces provided by components (JBossPortal) and KAON2 API [4] (wrapped in an EJB) is used for Ontology Management and Reasoning. The system (three-tier) architecture consists of the following:

- *Web Container* – accommodates the JSPs (Java Server Pages) which contain the presentation markup and the portlets which allow access to the underlying Business Logic. The portlets access EJB business methods and prepare data for display in the JSP.
- *EJB Container* – handles the business logic, is based on the JBoss portal server and accommodates a set of EJBs (Enterprise Java Beans). The *CMSBean* and the *GWSBean* provide programmatic access to the functionality of the CMS (access, search, annotation of information resources) and the GWS (notification and search of active discussions). The functionality that is provided by these components is exposed to the SAKE platform through the *CMSBean* and the *GWSBean* respectively. Another session beans are related to Preference framework and Change Notification System, basic elements of the AMS.
- *(Ontology) Storage* – for each ontology composing the Common Knowledge Space (CKS), there is a *OntologyNameDAO* interface, which defines the public, fine-grained operations that are possible on this ontology (e.g. *addDocument()*, *removeDocument()*, *addEvent()*, *addEmail()*, ...). This interface supports accessing the ontologies via the KAON2 API. This is just a clear separation between the KAON2 specific code in order to minimize the dependencies to the KAON2 API. MySQL is used for the necessary persistent storage.

From the functional point of view core element of the business process management is newly introduced *Workflow management system (WfMS)*, which is fully

developed and implemented using jBPM [5]. All other subsystems (CMS, GWS, AMS, CKS) are tightly integrated using this workflow-based business management, which strongly support business context management and sharing of the actual context. All subsystems then semantically logged actions of the users and AMS analyse it and push new knowledge back to users.

Main aim of the next prototypes is to introduce and implement several semantic enhancements of the integrated architecture as well as improved integration itself, e.g. semantically-enhanced search in documents, annotation of the documents in CMS, and others. We are responsible mainly for the GWS component, our enhancements for the next prototype are:

- Extraction of potential experts as support for collaborative knowledge creation and building community of practices – based on the discussions analysis algorithm for ranking of users – ‘find experts’ functionality – aim is to provide information about communication skills of users). We will extend this approach using ‘argumentation ontology’ [6] and annotation of particular contributions – ‘voting’ regarding previous discussion contribution in structured (semantic) way – using concepts from argumentation ontology (positive vs. negative reactions).
- Semantically-enhanced searching in discussions.

## 4 Conclusion

In this article architecture of the SAKE project has been described. SAKE (Semantic Agile Knowledge-based E-government) is a STREP Project sponsored by the European Union starting March in 2006. The overall objective of SAKE is to specify, develop and deploy a holistic framework and supporting tools for an agile knowledge-based e-government that will be sufficiently flexible to adapt to changing and diverse environments and needs. We described simple overview of the architecture and some implementation details regarding prototypes in the project.

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