Technical Architecture of Enabling Body of Knowledge System for Effective Learning and Information Dissemination

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ABSTRACT

In the current era of knowledge explosion, many fields are witnessing a tremendous amount of research and practice reported on a regular basis. How to help people effectively and efficiently study state-of-the-art knowledge in a specific field has become an urgent task yet highly challenging. On top of the Internet as an unstructured knowledge base, this paper reports the design and development of a Body of Knowledge portal (BoK), which can be used as a novel learning environment. Leveraging the key technologies of services computing (Web 2.0, Web services and Service-Oriented Architecture), a BoK provides a uniform gateway for researchers and practitioners to seamlessly study and organize knowledge from heterogeneous data sources. A service-oriented knowledge delivery mechanism is key to a BoK centered on configurable delivery protocols. As services computing having evolved as the foundational discipline supporting modern services industry, the authors used the field as an example to illustrate the technical architecture that enables the establishment of BoK in services computing. Information dissemination of BoK on mobile delivery platform is explored as well. Performance data analysis is also reported on the BoK infrastructure.

Keywords: Body of Knowledge Portal (BoK), Knowledge Sharing, Learning Management System, Service-Oriented Architecture, Web Services

INTRODUCTION

The Internet environment has triggered many disciplines and fields to emerge and evolve rapidly. For example, services computing has evolved in the last decade as the foundational discipline to study how to leverage IT and Internet computing technology to help people perform business services more efficiently and effectively (Zhang, Zhang et al. 2007). These new fields gain significant momentum and a tremendous amount of research and practice has been reported on a regular basis. How to deliver such exploded state-of-the-art knowledge to the...
community in a timely manner has become an urgent task yet highly challenging. This paper reports our design and development of a Body of Knowledge portal (BoK). One major goal of our BoK is to provide an effective online learning platform, as an instance of a constructivist learning environment (Wilson 1996), for facilitating community members in studying the latest knowledge and literature in a specific field. According to Wilson (1996), an effective learning environment should be “a place where people can draw upon resources to make sense out of things and construct meaningful solutions to problems.” Toward this ultimate aim, this paper reports our design and development of the BoK portal 2.0. Our contributions can be summarized in the following three main perspectives: (1) knowledge delivery protocol, (2) system and process, and (3) time and place.

From the knowledge delivery protocol perspective, we designed effective knowledge processing and transmission models. On top of the Internet as an unstructured knowledge base, our BoK provides a uniform gateway that organizes knowledge from heterogeneous data sources. Based on knowledge ontology and a hierarchical resource model, we built a uniform message-based knowledge delivery protocol to facilitate service resource sharing.

From the system and process perspective, we leverage the key enabling techniques in the field of services computing, i.e., Web 2.0, Web services, and service-oriented architecture (SOA), to design a novel architectural model of the environment, featured by its comprising components, interaction patterns between components, and control flow of the system. The BoK portal allows researchers and practitioners to seamlessly review and construct knowledge from heterogeneous data sources such as IEEE Computer Society digital library, IEEE Services Computing community database, related international conference websites and paper review systems, and community-based audio and video conference presentation resources.

From the time and place perspectives, we created an open learning environment where users can learn from anywhere and at anytime. The portal delivers the learning services via mobile channel (e.g., iPhone) in addition to desktop channel. Our iPhone-based service also serves as a learning game.

As an example, our BoK 2.0 was developed to serve for the field of services computing. In this project, we also studied and analyzed the performance and scalability of our BoK infrastructure, from the perspective of its capability of handling increasing complexity when integrating various data resources and delivering services through various channels. It should be noted that our technology to build the BoK learning environment for services computing is not limited to the field of services computing; rather, it can be applied to build knowledge bases and learning environments for other disciplines as well.

The remainder of the paper is organized as follows. After examining the motivation background of the project, we introduce the enabling technologies as the basis for building the BoK portal, present our knowledge delivery mechanisms, and present system process of the BoK design. Then, we introduce our iPhone-based knowledge delivery service as an example of mobile channel service delivery. Afterwards, we present our performance data analysis, and discuss related work. Finally, we draw conclusions.

**MOTIVATING CASE AND CHALLENGES**

Modern services industry poses a significant IT challenge as how to achieve higher reusability, scalability, interoperability, and cost efficiency. To address this issue, services computing has recently evolved as the foundational discipline to study how to leverage IT and computing technology to help people perform business services more efficiently and effectively (Zhang, Zhang et al. 2007). This is the reason why in the recent decade, services computing has gained significant momentum from both
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