Chapter 7.26
Semantic Web Services and Mobile Agents Integration for Efficient Mobile Services

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ABSTRACT

The requirement for ubiquitous service access in wireless environments presents a great challenge in light of well-known problems like high error rate and frequent disconnections. In order to satisfy this requirement, we propose the integration of two modern service technologies: Web Services and Mobile Agents. This integration allows wireless users to access and invoke semantically enriched Web Services without the need for simultaneous, online presence of the service requestor. Moreover, in order to improve the capabilities of Service registries, we exploit the advantages offered by the Semantic Web framework. Specifically, we use enhanced registries enriched with semantic information that provide semantic matching to service queries and published service descriptions.

Finally, we discuss the implementation of the proposed framework and present our performance assessment findings.

INTRODUCTION

Efficient execution of wireless applications is of paramount importance due to the highly dynamic wireless network conditions. Link outages occur in a near-stochastic pattern, thus, rendering the execution of applications quite tedious and uncertain. Research on mobile computing has for a long time focused on this specific aspect of wireless application engineering (Pour, 2006). In this article, we adopt the mobile agent paradigm in order to overcome the difficulties discussed above. Surely, this is not the first time that mobile agents are proposed as the vehicle for the implementation of wireless/mobile applications. Their autonomic nature and wide spectrum of characteristics render the specific technological platform a great enabler for the emerging ubiquitous computing paradigm.

Mobile computing is not the only development that significantly impacts the computer industry nowadays. Service-oriented architectures (SOA) are gradually changing the contemporary structure of the Internet and become a key facilitator for electronic commerce applications and related application domains. We try to incorporate both the discussed technologies into our wireless/mobile computing framework. Mobile agents are dispatched by mobile terminals in order to efficiently and safely satisfy the specific computing needs of their nomadic owner. After securing the autonomicity characteristic in order to progress the required task without the need for the mobile terminal to be constantly online, we try to minimize the service-related tasks. Our prime concern lies on the exact identification of the services to be executed at the demand of the user and minimize potential waste of time on unwanted invocations. The accuracy of the service inquiry mechanism has to be improved to really boost the mobile agent and service-oriented architecture. To expedite the service querying procedure and simplify the querying semantics, we employ a semantically enriched service registry. A precise definition of the user's requirement is mapped to existing services through a semantically enriched registrar.

In this article, we introduce a novel framework for dynamic discovery and integration of semantically enriched Web Services (WS) with Mobile Agents (MA). The proposed framework is mostly intended for wireless environments where users access Semantic Web Services (SWS) in the fixed network (the terms Web Service (WS) and Semantic Web Service (SWS) are used interchangeably within this article). This framework enhances the fixed network with the intelligence needed to dispatch the service requests of the wireless user in an efficient, reliable and transparent manner. The proposed approach enables users to execute multiple services with minimum interaction, without the requirement of being online during their entire session. Additionally, the proposed framework provides better fixed network utilization since unnecessary communication overhead is avoided and reliable delivery of the service results is provided.

The rest of this article is structured as follows. In section 2, we provide some background knowledge about the implemented technologies, whereas section 3, we discuss relevant prior work. In section 4, we present an overview of the proposed architecture. Section 5 studies the performance of the proposed framework and presents the results. Finally, section 6 concludes the article.

BACKGROUND KNOWLEDGE

In this section, we briefly describe the two technologies that are integrated in our proposed framework, namely Web Services and Mobile Agents.

Related Content

Advanced Resource Discovery Protocol for Semantic-Enabled M-Commerce
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