Chapter VI

Mobile Agents Meet Web Services

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Abstract

Web services standards provide the basis for interoperability, discovery and integration of distributed applications. Web services will enable mobile agents to better use and exploit Web accessible applications and resources. However, there is a lack of tools for integrating mobile agents and Web services. This chapter presents MoviLog, a novel programming language for enabling mobile agents to consume Web services. The most interesting aspect of the language is its reactive mobility by failure mechanism that allows programmers to develop mobile agents without explicitly providing code for handling mobility or Web services invocations.
Introduction

Many researchers envision the Web of the future as a global community where people and intelligent agents interact and collaborate (Hendler, 2001). Unfortunately, today’s Web has been designed for human interpretation and use (McIlraith et al., 2001), generally for reading and browsing HTML pages and online form filling. However, there is a need for automating the interoperability of B2B (business-to-business) and e-commerce applications. Until now, this interoperation has been handled by using programs that interact with Web accessible services to obtain and then parse HTML content for extracting data. This approach is very weak since it depends on the format of the HTML pages, and the interfaces for accessing services (e.g., CGI or RMI). In order to achieve a truly automatic interoperability between programs and Web accessible resources, new technologies aim at creating a Semantic Web (Berners-Lee et al., 2001), where information and services offered by any site are described in a nonambiguous and computer-understandable way.

In the scenario of the Web consisting of sites with highly dynamic content, mobile users, unreliable links and small portable devices such as personal digital assistants (PDAs) and cellular phones, mobile agents will play a fundamental role (Hendler, 2001). A mobile agent is a computer program that represents a user in a computer network and is able to migrate autonomously from site to site to perform task on behalf of the user (Tripathi et al., 2002). This feature is particularly interesting when an agent makes sporadic use of a valuable shared resource located at a remote site. In addition, efficiency can be improved by moving agents to a host to query large repositories and then return with the results, thus avoiding multiple interactions with the data over network links subjected to delays or interruptions of services.

Mobile agents exhibit a number of properties that make them suitable for exploiting the potential of the Web, because they add mobility—the capacity to migrate across sites of a network (Fuggetta et al., 1998)—to common capacities of ordinary intelligent agents such as reaction, perception, deliberation and autonomy. Some of the most significant advantages of mobile agents are their support for disconnected operations, heterogeneous systems integration, robustness and fault-tolerance (Lange & Oshima, 1999; Milojicic et al., 1999).

Despite the number of applications that can be benefited from the usage of mobile agents (Kotz & Gray, 1999), this technology has shown difficulties when used for interacting with Web content (Hendler, 2001). Agents’ inability to understand concepts required for invoking and using Web accessible services and resources requires the creation of a Semantic Web, where content is described according to precise semantics. In this sense, we claim that there is a need for a mobile agent development tool for solving these problems which preserve, at the same time, the key benefits of mobile agent technology.