Chapter VIII

Multiagent Systems and Web Services in Enterprise Environments

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Abstract

In this chapter, we discuss the general aspects related to the utilization of MultiAgent systems in Enterprise environments with special emphasis on the integration architectures enabled by Web service technologies. Also, we present a decoupled architectural approach that allows software agents to interoperate with enterprise systems using Web services. The proposed solution leverages existing technologies and standards in order to reduce the time-to-market and increase the adoption of agent-based applications. Finally, we show some case studies of knowledge-oriented Web services that have been designed following the discussed approach and outline some current research and business concerns for the field.
Introduction

Software agents (Jennings & Wooldridge, 1996) and Web services (W3C, 2003b) have become key research areas for a growing number of organizations and they are expected to bring a new generation of complex distributed software systems (Jennings, 2000). Even if Agent technology is finding its way little by little into the mainstream, Web services have been adopted much more widely and rapidly (Barry, 2003).

Several authors have pointed out some overlapping areas between Agents and Web services semantic capabilities (Hunhs, 2002; Preece & Decker, 2002). However, issues regarding how they may be competing or complementary technologies remain open (Petrie, 1996). Because of that, research involving Agents and Web services is mainly focused on building improved semantics (Hendler, 2001; Dickinson & Wooldridge, 2003), communication languages and interaction protocols (Labrou et al., 1999).

We assume that in order to impact real-world organizations, a greater emphasis should be made on interoperability between agent-based applications and enterprise information systems. Moreover, we believe that the adoption of agent technologies will grow by leveraging existing industry standards and technologies. Therefore, the problem we address is an instance of “the legacy software integration problem” (Genesereth & Ketchpel, 1994; Nwana & Ndumu, 1999).

In this chapter, we present a decoupled architectural approach and design principles, called “embedded web services architecture” (EWSA), that allows agent-based applications to be integrated into enterprise application environments (Peng et al., 1998) using Web services, thus allowing them to interoperate with robust conventional systems such as:

- Web-applications, portals and content management systems (CMS)
- Enterprise resource planning (ERP)
- Manufacturing execution systems (MES)
- Workflow engines and business process management systems (BPMS)

This integration allows agents to publish XML (W3C, 2000) Web services (W3C, 2003b) or standard HTML providing thus a convenient interface for other distributed components. The Web service architecture is widely understood as “a software system” designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (specifically WSDL (W3C, 2001)). Other systems interact with the Web service in a manner prescribed by its description using SOAP-messages (W3C, 2003a), typically con-
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