



Chapter XIII

Managing Dynamic Virtual Enterprises Using FIPA Agents

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Virtual enterprises (VEs) enable the deployment of distributed business processes among different partners in order to shorten development and manufacturing cycles, reduce time to market and operational costs, increase customer satisfaction, and operate on global scale and reach. Dynamic virtual enterprises are an emerging category of VE where the different partners are being selected dynamically during business process execution based on market-driven criteria and negotiation. In this chapter, we present an agent-based platform for the management of dynamic VEs. The main contributions of this approach are the distributed, autonomous agent-based business process management, the XML-based business process definition language, the flexible ontologies, and the dynamic negotiation and selection of partners based on virtual marketplaces. The presented platform has been fully developed using emerging agent and Internet standards like FIPA, MASIF, and XML.

INTRODUCTION

In a global marketplace, companies are continuously seeking for new ways to address competitive pressure. Recognizing the need to shorten development and manufacturing cycles, reduce time to market and operational costs, increase customer satisfaction, operate on global scale and reach, and adapt rapidly to new market changes has historically led companies to automation, collaboration

and distribution (Applegate, Holsapple, Kalakota, Radermacher & Whinston, 1996; Malone & Rockhart, 1991; Ouzounis & Tschammer, 2001a). As a result, the information systems in many of today's mid- to large-size companies reflect tremendous diversity.

The original goals for virtual enterprise business systems were to enable deployment of distributed business processes among different partners, to increase the efficiency of existing provided services, to decrease the cost for these services, and to adapt to new market changes (Stricker, Kradolfer & Taylor, 2000). As companies introduced electronic business systems, they started to see new possibilities enabled by those systems. By more closely coordinating the work of suppliers and manufacturers, businesses see dramatic productivity and efficiency increases in manufacturing processes. As communication barriers and costs drop, businesses are able to engage in many more kinds of relationships. These new relationships open additional possibilities for distribution and supply partners, for participation in virtual trading communities or dynamic virtual organizations, and for extending classic value chains to value networks (Doz & Hamel 1998).

Virtual enterprises are not a new concept in management studies (Camarinha-Matos & Afsarmanesh 1999; Ouzounis & Tschammer, 1999). Some of the big manufacturing companies, and especially car manufacturers, already have business relationships with their suppliers and customers. These "virtual" business relationships enable the sharing of business processes and resources among them. However, the level of integration and the information and communication technologies (ICT) used for enabling virtual enterprise concepts is varying. Most of the activities are still performed manually, adhoc, and in a complex way, while the cost to implement and integrate these solutions and the time required to deploy them are high (Lin, 1996; Reichert, Hensing & Dadam, 1998).

The paradigm of virtual enterprise represents a prominent area of research and technological development for today's progressive industries. The research area is a growing and multidisciplinary one that still lacks a precise definition of the concepts and an agreement on the used terminology (Bolcer & Kaiser, 1999; Camarinha-Matos & Afsarmanesh, 1999). So far, there is no unified definition for this paradigm and a number of terms are even competing in the literature while referring to different aspects and scopes of virtual enterprise (Filos & Ouzounis, 2000). For instance, the NIIP project defines that "a VE is temporary consortium or alliance of companies formed to share costs and skills and exploit fast-changing market opportunities" (NIIP 1996). Byrne says that "a VE is a temporary network of independent companies—suppliers, customers, even rivals—linked by information technology to share costs, skills, and access to one another's hierarchy."

The wide variety of different networked organizations and the emergence of new production and provisioning paradigms have led to the generation of a number of related terms such as the extended enterprise, virtual organization, networked organization, supply chain management, or cluster of enterprises (Ouzounis &

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