Chapter XXI

Implementation Options for Virtual Organizations: A Peer to Peer (P2P) Approach

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ABSTRACT

This chapter explores the challenges of constructing a distributed e-business architecture based on the concept of request-based virtual organization (RBVO). The RBVO is a value network, dynamically formed upon demand to meet identified business opportunities. The work within the framework of the European Union-sponsored LAURA project is presented, as its aim is to facilitate interregional zones of adaptive electronic commerce using, where applicable, the potential of the ebXML architecture. The LAURA realization framework outlined here addressed the structural concepts of an RBVO, based on the typical business requirements of small and medium-sized enterprises (SMEs). The architecture proposed in our work incorporates an innovative approach to discovery and matchmaking of business partners and services that includes usage of peer-to-peer (P2P) technology. The increasing maturity of P2P-based solutions allow, where applicable, for their implementation in the business-to-business (B2B) area. The P2P concept is discussed in comparison to a more traditional client–server approach in this chapter.

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INTRODUCTION

IT architectures may determine how organisational structures can evolve in response to flexible and adaptable technologies. However, implementing a virtual organization (VO) model is not a straightforward task in practice for a number of reasons. Innovative organisational models, business scenarios, and underlying technical complexity demand that architects of such systems need to make trade-offs to ensure both the business and technical viability of the solutions. This chapter investigates the use of certain architectures and technologies to implement a highly dynamic type of VO. We first define the concept of request-based virtual organization (RBVO) and its differentiators, which influence architectural requirements of the solution together with the end-user and business requirements. Architectural alternatives are then discussed with a comparison of implementation options for different aspects of partner collaboration.

Three areas of particular importance were singled out for end-to-end business collaboration; discovery and matchmaking of the business partners, secure and reliable business data transmission, and business process specification and enactment. The discovery and matchmaking aspect of the overall B2B problem becomes especially important in the SME e-business context, mainly due to the potential for a great number of collaborative participants, the diversity of their capabilities, and the lack of standardization for product and service description, as well as the absence of mechanisms to harmonize the latter. Traditionally, these problems have been addressed using a B2B marketplace approach (Butler Group, 2000), where an intermediate entity dictates particular marketplace policies, provides infrastructure, and ensures the virtual presence of the participants in the community. The static nature of these virtual formations does not fully address the continuously growing demand to locate products, services, and business partners, regardless of their physical location and affiliation to an intermediary entity. As a result, the whole set of potential business partners is fragmented into “islands,” and the potential added value of virtual enterprises is not maximized.

In order to fully reveal the potential of RBVOs as highly dynamic virtual business formations, an innovative approach is taken that is based on natural trading behavior patterns, expressing direct interaction between partners. Recent developments in the peer-to-peer (P2P) computing field allow this pattern to be implemented. This approach results in a more flexible topology for virtual formations and bridges the gap between the isolated islands, thus forming a B2B grid that widens the possibilities for collaboration and increases their availability to business partners. The chapter concludes with a discussion of a practical P2P approach to implementation.

The content of this chapter is partly shaped and influenced by a project sponsored by The European Commission Information Society Technologies (IST) Programme that is part of the Fifth Framework Programme for Research, Technological Development and Demonstration Activities. This project, known as LAURA (2003), aims to create an e-business infrastructure targeted at the business requirements of SMEs in four European countries (Bulgaria, Germany, Greece, and the United Kingdom). It introduces an innovative approach, “any actor to any actor” Internet-based seamless electronic commerce platform in which all request-based business entities can act as a one-channel virtual enterprise.

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