Chapter XIII

Service Computing for Design and Reconfiguration of Integrated E-Supply Chains

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Abstract

This chapter proposes a three-level decision-support system (DSS) for integrated e-supply-chains (IESCs) network design and reconfiguration based on data and information that can be obtained via Internet- and Web-based computing tools. The IESC is described as a set of consecutive stages connected by communication and transportation links, and the design and reconfiguration aim of the DSS consists of selecting the partners of the stages on the basis of transportation connections and...
information flows. More precisely, the first DSS level evaluates the performance of all the IESC candidates and singles out the best ones. The second DSS level solves a multicriteria integer linear optimization problem to configure the network. Finally, the third DSS level is devoted to evaluating and validating the solution proposed in the first two modules. The chapter proposes the use of some optimization techniques to synthesize the first two levels and illustrates the decision process by way of a case study.

Introduction

The discipline of service computing covers the science and technology of bridging the gap between business services and information-technology services (Institute of Electrical and Electronics Engineer [IEEE], 2004). Among others, it encompasses a new innovative area: business-process integration and management, also known as enterprise service computing. Enterprise service computing focuses on issues, modeling, methodologies, and the enabling of computing technologies in support of integrated and collaborative enterprise applications. The main task of enterprise service computing is to reengineer operations and integrate international logistics and information technologies in the production process to improve efficiency and minimize risk and cost. This has given rise to the formation of integrated e-supply-chain (IESC) networks, defined as a collection of independent companies possessing complementary skills and integrated with streamlined material, information, and financial flow (Luo, Zhou, & Caudill, 2001; Viswanadham & Gaonkar, 2003). Service computing and Internet- and Web-based electronic marketplaces can provide an inexpensive, secure, and pervasive medium for information transfer between business units in IESC (Gaonkar & Viswanadham, 2001; Luo et al.; Tayur, Ganeshan, & Magazine, 1999). Indeed, by taking advantage of these novel opportunities, companies are able to make smart decisions based on voluminous data flows. Hence, the research community envisages the need of IESC decision support in many areas (Keskinocak, Goodwin, Wu, Akkiraju, & Murthy, 2001). As a result, decision-support systems (DSSs) can be designed to provide effective analysis and comprehension of complex supply chains (SCs). Although several conceptual models for IESC are proposed and discussed in the related literature, research efforts are lagging behind in the development of formal decision models for IESC design (Talluri & Baker, 2002). A systematic way to capture all aspects of SC processes is proposed by Chopra and Meindl (2001) and Biswas and Narahari (2004). This guideline is based on the three levels of the decision hierarchy: the strategic, tactical, and operational ones. Strategic level planning involves SC design, which determines the location, size, and optimal number of suppliers, plants, and
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