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## **Chapter IX**

# **A Survey of Distributed Information Management Approaches for Virtual Enterprise Infrastructures**

César Garita, Hamideh Afsarmanesh and L. O. Hertzberger  
University of Amsterdam, The Netherlands

The support of real collaborative virtual enterprise (VE) scenarios sets forward particularly interesting challenges in terms of distributed information management, regarding the proper sharing and exchange of information among preexisting autonomous enterprises. In order to address these challenges, it is necessary to achieve a comprehensive analysis of advanced information management approaches that can be applied in VE platforms. In this context, this chapter provides a representative survey of several VE-related information management standards, technologies, and existing approaches that can be applied to support future VE infrastructures.

## **INTRODUCTION**

The virtual enterprise (VE) concept can be defined in brief as an interoperable network of preexisting enterprises that collaborate by means of specific IT components towards the achievement of a common goal (Camarinha-Matos & Afsarmanesh, 1999). In principle, these enterprises can function together and be regarded as a single organization, for a determined period of time, until the common objective is achieved or until the enterprises decide to dissolve their cooperation. In most cases, the driving force for enterprises to join such collaborations derives from the

emergence of a business or market opportunity, whose fulfillment would not be feasible for a single enterprise under normal circumstances. The virtual enterprise goal becomes viable thanks to a global management of activities and coordination of a selected set of resources and services that are made available by individual members of the VE. The VE paradigm is nowadays an active research area, for which many existing technological approaches and tools are required to be applied. In recent years, several significant research efforts and initiatives addressing this field have materialized in the form of international and European research projects and conferences.

Furthermore, currently available information and communications technology (ICT) resources and tools, such as those offered by the Internet environment, enable enterprises to share information and strengthen their interactions with other companies representing partners, clients or suppliers in different collaboration scenarios. Nevertheless, most of the current ICT developments provide solutions to only certain specific technical problems that arise when supporting certain basic interactions among enterprises. There are still many obstacles and open issues that need to be properly addressed when supporting complex collaborations among enterprises involved in VEs. Here, one challenging case for virtual enterprise platforms is the proper sharing and exchange of information among preexisting heterogeneous and autonomous enterprises and their internal systems. In fact, without an adequate support framework for information management, it is impossible for enterprises to collaborate as a single virtual entity. Among the key problems faced in information management approaches supporting the VE domain we can mention:

- Lack of standard definitions of information models and access mechanisms.
- Support for sharing and exchange of distributed information, while maintaining the proper level of autonomy and security for each VE member.
- High degree of heterogeneity encountered at every VE node.
- Wide diversity of information technologies and tools.
- Adequate performance and scalability.

The design and implementation of an information management system aimed at supporting VE infrastructures must address these general challenges, as well as many other specific requirements related to the particular application domain under consideration.

In this context, one of the objectives of this chapter is to present an analysis of several information management techniques and VE support infrastructures that need to be considered when designing and developing an information management system for future virtual enterprise support platforms. Due to the diverse nature and complexity of the requirements described above, the intention of this analysis is to identify a set of potential technological solutions and reference infrastructures that are applicable for addressing the described information management needs. The presented work is also useful for enterprises that are considering to join virtual organizations, since it points out some crucial ICT administration issues that will be faced by these companies in the future.

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