

# Chapter XVI

## Using VO Concept for Managing Dynamic Security Associations

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### **ABSTRACT**

*This chapter discusses how the virtual organisation (VO) concept can be used for managing dynamic security associations in collaborative applications and for complex resource provisioning as possible components of the agent-based virtual enterprises. The chapter provides an overview of the current practice in VO management at the organizational level and its support at the security middleware level. It identifies open issues and basic requirements to the VO security functionality and services and suggests possible directions of further research and development, in particular, VO management concept, VO security services operation, and basic VO operational models. The author hopes that understanding the VO concept and current practice in Grid of using VO for managing security associations will help developers effectively use Grid technologies and middleware for building distributed security infrastructure for virtual enterprises.*

### **INTRODUCTION**

Business and production/enterprise virtualization is a vital need and a condition for competitiveness in modern world. The advantages of the virtual enterprises (VE) include (Alexakis, Koelmel, & Heep, 2004): increased flexibility, broader scope of products, participation in wider nomenclature of orders, access to external knowledge and involv-

ing remote experts and specialists, cost reduction and flexible planning, international presence and faster partners search.

Using multi-agent systems (MAS) for VE was always a topic for industry oriented and scientific research. This allowed a few MAS platforms to be developed that are capable to model some of prospective VE processes and infrastructural components. But until now, MAS remain rather

narrowly focussed and close technologies using specific operational environment. MAS security model remains client-server based that maintains security context between communicating hosts/systems, in contrary to service-oriented and document-based security model used in grid and Web services that can provide end-to-end security and better mobility.

At the same time, needs of the highly technological industry were strong driving force for rapid developments of the collaborative technologies that intended to solve the same problem of the high-tech workforce mobility, unique equipment and expertise access and sharing. Traditional collaborative technologies are developing in the direction of adopting more dynamics and architectural openness to reduce implementation and deployment time. Grid and Web services provide a good platform for interoperability and also standard framework for security middleware infrastructure.

Multi-agent systems are seen as a natural way to develop in the direction of autonomous intellectual systems that can be easily integrated into the VE environment.

However, such important components of the distributed collaborative infrastructure, such as security association management, still remain unsolved for the dynamic virtualized environment. Currently, even companies widely using virtual laboratories (VL) as a collaborative environment between cooperative members still rely on the traditional enterprise identity management systems.

Virtual organizations (VO) as a concept was initially introduced and currently being developed in the grid community. It is evolving currently from the specifically project oriented to more general mean for managing dynamic security associations of users and resources. There are few works focused on the VO conceptual (Demchenko, 2004; Demchenko, Gommans, de Laat, Steenbakkens, Ciaschini, & Venturi, 2006) and technology issues (Ciaschini, 2006). Most of the

VO related developments are originated from the large grid infrastructure projects where the VO membership attributes are used for the VO related authorization. In general, grid applications provide quite a strong experience and a good example of how the VO can be used in (worldwide) distributed collaborative infrastructure. VO management support is a component of the grid infrastructure and currently available in the grid middleware. But actually the VO concept and real practice remains unknown and quite new outside of the grid community.

On other hand, there are few works that are evaluating current VE experience and looking into using the VO concept for building highly dynamic VE infrastructure and environment (Marik & Pechoucek, 2004; Marik & Pechoucek, 2004a).

The goal of this work is to provide extended information about current state of art and current practice in using the VO in grid based applications. This should provide an initial reference basis for considering VO use in VE and MAS applications. The chapter itself intends to contribute to further development of the VO conceptual model and its application to typical collaborative applications and complex resource provisioning in open service oriented environment.

The proposed approach and solutions are based on current experience in the two major grid infrastructure projects Enabling Grid for E-science (EGEE) (EGEE, 2006). The analysis and proposed conceptual model can also be used for other use cases that require creation of dynamic security association or interorganizational trust management and may also provide a basis for further development of the VO management services and tools. Implementation suggestions are given for complex resource provisioning (CRP) and open collaborative environment (OCE) (Demchenko, Gommans, de Laat, Oudenaarde, Tokmakoff, & Snijders, 2005) and potentially can be used for virtual enterprise that are built using grid and Web services.

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