Chapter 14
A Multi Agent/HLA Platform for Enterprises Interoperability (Short–Lived Ontology Based)

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ABSTRACT

This chapter aims at proposing an implementation of the federation interoperability concept for information exchange between networked enterprises. This implementation makes use of Multi Agent / HLA paradigm and the emerging concept of Short-Lived Ontology. The authors give first, a review of ongoing researches on Enterprise Interoperability. Then, they recall on Artificial Agent Concept and HLA Standard that appear to be adequate to support simulation and execution of the studied concept. Indeed, on the one hand Agent dialogue fits the concept of information exchange in a federated enterprise interoperability approach, on the other hand the HLA standard, initially designed for military M&S purpose, can be transposed for enterprise interoperability at the implementation level, reusing the years of experiences in distributed systems. From these postulates, we propose the first Agent/HLA Short-Lived Ontology based framework to implement distributed enterprise models from the conceptual level of federated enterprise interoperability approach.

INTRODUCTION

In the globalised economic context, the competitiveness of an enterprise depends not only on its internal productivity and performance, but also on its skill to collaborate with others. This necessity led to the development of a new concept called interoperability that allows improving collaborations between enterprises. No doubt, in such context where more and more networked enterprises are developed; enterprise interoperability is seen as a more suitable solution to total enterprise integration. Since the beginning of 2000, several European research projects have been launched to develop enterprise interoperability ((IDEAS, 2002), ATHENA (Berre, 2007), (INTEROP, 2005)). Three main research themes or domains that address interoperability issues were identified, namely: (1) Enterprise Modeling (EM) dealing with the representation of the internetworked organization to establish interoperability requirements; (2) Architecture & Platform (A&P) defining the implementation solution to achieve interoperability; (3) Ontologies (ON) addressing semantics necessary to assure interoperability (IDEAS, 2002).

This chapter proposes a new contribution to implement Enterprise Interoperability solution for Information Technology (IT) architectures and platforms; it is based on an original ontological concept. In the first part, we present the various approaches of interoperability and the current consideration of interoperability stated as conclusion of the Interop Network of Excellence (FP6, 508011) (Chen *et al.*, 2007). Then, we recall the concepts of software Agent and the High Level Architecture (HLA) (IEEE, 2000), i.e. a standard for distributed simulation.

Next, from our experience, we propose to investigate three aspects of interoperability. The first concerns time management in Enterprise Interoperability; the dynamic aspect has to be tackled with sound techniques for correct causal behavior. The second aspect concerns the definition of Enterprise Ontologies; federated approach in interoperability requires a new definition of high-level standard (i.e. Ontology) for exchanged data. The last aspect concerns the privacy of data. Indeed, enterprises must manage confidentiality of data shared between entities; levels of rights on enterprise data must be defined.

Computer science Ontologies, Artificial Agent language, and Object/Interaction in HLA can give keys to two first considerations. As well, the experience coming from Information Systems (IS) and M&S programming can be studied to keep data safe to address third point. From these postulates, we specify a platform implementation using HLA and Software Agents' autonomous dialogue concepts, for data exchange interoperability among distributed federated enterprises.

BASIC CONCEPT OF INTEROPERABILITY

Enterprise Interoperability refers to the ability of interactions between enterprise systems. The interoperability is considered as significant if the interactions can take place at least at the three different levels: data, services and process, with a semantics defined in a given business context (IDEAS, 2002).

Interoperability extends beyond the boundaries of any single system, and involves at least two entities. Consequently establishing interoperability means to relate two systems together and remove incompatibilities. Incompatibility is the fundamental concept of interoperability. It is the obstacle to establish seamless interoperation. The concept 'incompatibility' has a broad sense and is not only limited to 'technical' aspect as usually considered in software engineering, but also 'information' and 'organization', and concerns all levels of the enterprise (Chen *et al.*, 2007).

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