Chapter 4

Harmonized and Reversible Development Framework for HLA based Interoperable Application

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ABSTRACT

This chapter aims at proposing an approach to implement a distributed Information System built on top of a federation of existing (reused) software components. This solution is taking as a core consideration the problem of interoperability of data exchanged between enterprises. The idea is to adapt and reuse experiences coming from the development of enterprises legacy Information Systems in order to create a HLA (High Level Architecture) based system of systems. In that perspective, this chapter proposes a new bi-directional development life cycle. MDA (Model Driven Architecture) and HLA FEDEP (Federation Development and Execution Process) are combined and harmonized to implement distributed Information Systems from enterprise models of existing system. Conversely, model reverse engineering techniques are used to help re-implement existing systems, in order to be interoperable without being fully reconstructed. Then, according to HLA 1516 evolved new features, this chapter proposes a solution based on an open source RTI, poRTIco, to implement Web enabled federates.

DOI: 10.4018/978-1-4666-0146-8.ch004
INTRODUCTION

Nowadays, enterprises collaborations become more and more interlaced as the globalised economic context. The competitiveness of enterprises depends not only any longer on its internal productivity and performance, but also on its ability to collaborate with others. This necessity leads to the development of a new concept called interoperability that aims at improving collaborations between enterprises. Therefore, more and more networked enterprises are developed, meanwhile for these structures, enterprise interoperability is considered as one of the most suitable solution to total enterprise integration.

Since the beginning of 2000, several European research projects have been launched to develop enterprise interoperability (IDEAS, ATHENA, and INTEROP). Three main research themes or domains that address interoperability issues were identified, namely: (1) Enterprise modeling (EM) dealing with the representation of the internet-worked organization to establish interoperability requirements; (2) Architecture & Platform (A&P) defining the implementation solution to achieve interoperability; (3) Ontologies (ON) addressing the semantics necessary to assure interoperability (IDEAS, 02).

This chapter will focus on the (2) issue and will propose a solution to implement federated solution in enterprise interoperability framework. In order to achieve that goal, we will contribute on a rapid and intelligent development of Distributed Enterprise Information Systems by proposing a harmonized and reversible development framework for HLA based interoperable application. HLA is the leading standard that fully supports interoperability for any information exchange between real-time simulations (like Live simulators), paced real-time systems (like Virtual simulators) and time-stepped and event-driven systems (like Constructive simulations). Compare to SOA, who also focus on distributed software systems, HLA is more simulation specific than SOA. In addition, HLA provides efficient data management (with data handling algorithms) and scalability for interactions and information exchange in a shared, complex state. It also provides unique time management capabilities for synchronizing the data exchange between systems using logical time. However, flexibility and compatibility provided by HLA are proposed at low level TCP/IP, they are not at the internet 2.0 web application level contrary to techniques such as to SOA. So HLA can benefit from SOA such as, the support for numerous newer and older languages and operating systems as well as the ease of deployment across wide area networks. Thus, the solution proposed in this chapter will comply with HLA evolved IEEE 1516TM-2010, which has been recently published in August, 2010 (IEEE 2010) to propose the update of HLA standard to web 2.0 requirements. Besides choosing HLA evolved, this solution also intends to harmonize MDA (Model Driven Architecture) and HLA development process to form an accelerated development life-cycle thanks to reuse of information and behavior of legacy systems. In detail, Model Reverse Engineering is used to discover the enterprises’ knowledge quickly, to reverse the legacy system of enterprises backwards to models, and concurrently to solve the interoperability problems without rebuilding the information systems from scratch (Jouault et al., 2009).

BACKGROUND

The enterprise interoperability framework has identified three barriers for enterprise interoperability, conceptual barrier, technological barrier, organizational barrier (Ullberg et al., 2007). Those barriers are problems that basically prevent interoperability. We propose a synthetic development life cycle to facilitate the development of the dynamic, secure and synchronized interoperable HLA based platform for enterprises with heterogeneous legacy IT system. The three crosses in