Chapter VII

Advanced Middleware for eScience Applied to Environmental Integrated Systems

Catherine Houstis, Institute of Computer Science, FORTH, Greece

Spyros Lalis, Institute of Computer Science, FORTH, Greece

Emmanuel Vavalis, Institute of Computer Science, FORTH, Greece

Marios Pitikakis, Institute of Computer Science, FORTH, Greece

George V. Vasilakis, Institute of Computer Science, FORTH, Greece

Abstract

An advanced eScience middleware system is designed and implemented (the middleware has been developed within the ARION project, IST-2000-25289, funded by EU 5th Framework Programme) to support search and retrieval of scientific information. It is capable of integrating collections of scientific datasets, including simulation models and associated tools for statistical analysis and dataset visualization. These collections represent

application software in several scientific domains, they reside in geographically disperse organizations and constitute the system content. It also actively supports on-demand scientific data processing workflows. The system design makes use of two recently advancing technologies, the Semantic Web and the Grid, as well as state of the art distributed systems' technology. The systems' demonstration scenarios involve mainly environmental applications.

Introduction

Not so many years ago researchers relied solely on themselves to go through with their everyday activities or to achieve an important breakthrough in their discipline; and the only collaboration that used to exist was within institutional boundaries. Recently, however, more and more communication technologies are meeting widespread acceptance, enabling research as well as industrial communities to closely collaborate and share resources through a secure and scalable network infrastructure. These technologies come to realize a long awaited vision, introducing ways of sharing knowledge and of collaboration within distributed communities previously unheard of.

At the heart of this drive for ubiquitous collaboration lies the eScience initiative. There are two closely related technology trends that seem to be driving forward and promoting this initiative: the Semantic Web (W3C Semantic Web) and the Grid (Foster et al., 2001, 2002; Foster & Kesselman, 1998). Both these technologies are undergoing continuous development and have reached an acceptable level of maturity.

The ambition interwoven with the Semantic Web is of an environment where software agents are able to dynamically discover, interrogate and interoperate with resources, building and disbanding virtual problem solving environments, discovering new facts, and performing sophisticated tasks on behalf of humans (Hendler, 2001). On the other hand, the essence of the Grid is the power provided by large-scale integration of resources. The scale and automation of the Grid necessitates the universally accessible platform that allows data to be shared and processed by automated tools as well as by people. These last two sentences make apparent the close relationship between these two technologies and how each stands to benefit from the other.

It only makes sense, therefore, for middleware platforms involved in/dealing with information integration and management, sharing of resources and advanced collaboration to pay due attention to and embrace the afore mentioned technologies. As our approach towards eScience, we propose ARION as the middleware

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