ABSTRACT

Grid computing allows for the creation of e-infrastructures providing computational power and information storage capabilities needed both by present and future research centres around the world. Although the value of Grids is recognised by its early users, many companies, which would benefit from the adoption of this new paradigm, are still waiting claiming that Grid technologies are still not well-established and continuously evolving. A company usually takes a risk when it adopts a technology before its standardisation because if the technology subsequently demonstrates to diverge from (de-facto) standards then the investments can be partially lost and, additionally, switching to the new standard technology will probably be more expensive. In this chapter we present a couple of approaches which allow existing Grid infrastructures to evolve, by including newer Grid middleware, and consequently preserve the investment made on the infrastructure. The capability to evolve reduces current problems of Grid implementation (especially the lack of standards), so it makes Grid adoption by business companies and research centres painless.
AN INTRODUCTION ON RESOURCES EXCHANGE APPROACH

The global market requires an effort from companies and research centres to continuously improve the quality of products and services. This improvement is possible only through a huge research activity having the goal of investigating new products and production innovations. An important part of this research activity consists of design and simulation of new products and services performed by means of the most powerful computational tools that companies can afford.

Moreover, the global economy creates additional challenges for companies because they have to face the problem of operating around the world and around the clock (i.e., twenty-four hours a day, seven days a week). For that reason modern companies require systems able to handle the information flow among different locations and monitor the situation in real-time, in order to set up an efficient management process.

However, in modern business, setting up a powerful and efficient IT infrastructure requires a big investment for companies in terms of both money and people. In fact, in order to properly manage the workload produced by company activities a large powerful hardware equipment and complex software are necessary. This kind of IT solutions can speed up the company growth process very much as well as its incomes but very often they are composed by really expensive components to be continuously upgraded. Moreover truly qualified employees are mandatory to administrate and maintain such complex systems, requiring additional costs for company balance. That is the reason why a wrong choice in this field could turn in a huge loss for the company.

Therefore, an efficient IT infrastructure, scaling up and down to fit requirements deriving from company activities, and maintaining an affordable cost, plays a key role for the success of modern companies. In this context Grid computing (Foster & Kesselman, 2003) is nowadays emerging as the most promising technology because it grants IT infrastructures to provide the power and flexibility needed by companies.

The word Grid identifies an innovative computational approach, defined in the mid '90s, which enables geographically distributed communities, named Virtual Organisations (VOs), to dynamically share CPU power and storage with the aim of avoiding resources under exploitation and overload. Therefore, companies can access resources just when really needed, either by paying for the time they effectively use the resources or compensating that by allowing others to access their own resources when unused (or underused). The resources exchange approach allows for the building of huge IT infrastructures able to supply the CPU power and the storage capabilities needed by companies and requiring a very limited increment of IT costs.

Although Grid is commonly considered to be the best solution to implement a flexible IT infrastructure, many cultural and practical problems limit its usage up to now. The former are related to companies’ difficulties to adopt new technologies that deeply modify the infrastructures running the company business. The “scare” of new technologies grows for Grid since it requires sharing of IT infrastructure with further organisations and consequently putting it out of control. As an example, common users are often concerned about the confidentiality of data stored on remote resources. Actually, the Grid community is developing additional components in order to support the privacy of data allocated on shared resources (Scardaci & Scuderi, 2007) and grant a sufficient level of QoS - Quality of Service - on the resource usage so company can be confident that their needs will be properly satisfied. Other cultural problems, such as the general aim to apply as few changes as possible to business and production systems, must be considered.

The cultural problems could be overcome after the successful adoption of Grids from very impor-
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