Chapter IX
GRIDS in Community Settings

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ABSTRACT

The authors have been running the second decade since the time that pioneers in Grid started to work on a technology which seemed similar to its predecessors but in reality it was envisioned totally divergent from them. Many years later, the grid technology has gone through various development stages yielding common solution mechanisms for similar categories of problems across interdisciplinary fields. Several new concepts like the Virtual Organization and Semantic Grid have been perfected bringing closer the day when the scientific communities will collaborate as if all their members were at the same location, working with the same laboratory equipment and running the same algorithms. Many production-scale standard-based middlewares have been developed to an excellent degree and have already started to produce significant scalability gains, which in the past, were considered unthinkable.

INTRODUCTION

Grid computing means different things to different individuals. However, in the view of grid computing as an analogy to power grids (see Figure 1), computing becomes pervasive and individual users through their applications gain access to computing resources (processors, storage, data, applications, and so on) according to their needs irrespective their location as well as the underlying technologies, hardware, operating system, and so on (Fukui, et al., 2005).

Though this vision of grid computing can capture one's imagination and may indeed someday

become a reality, there are many technical, business, political, and social issues that need to be addressed. If we consider this vision as an ultimate goal, there are many smaller steps that need to be taken to achieve it. Therefore, grid computing can be seen as a journey along a path of integrating various technologies and solutions that move us closer to the final goal. Its key values are in the underlying distributed computing infrastructure technologies that are evolving in support of cross-organizational application and resource sharing and virtualization across technologies, platforms, and organizations.

This kind of virtualization is only achievable through the use of open standards. Open standards help ensure that applications can transparently take advantage of whatever appropriate resources can be made available to them. An environment that provides the ability to share and transparently access resources across a distributed and heterogeneous environment not only requires the technology to virtualize certain resources, but also technologies and standards in the areas of scheduling, security, accounting, systems management, and so on.

The first implementations of grid computing have tended to be internal to a particular company or organization. However, cross-organizational grids are also being implemented and will be an important part of computing and business optimization in the near future. As Internet connect speed increases though, the difference between having two PCs in the same office, the same building, the same city or the same country shrinks. By developing sophisticated middleware which makes sure that widely distributed resources are used effectively, Grid computing gives the user the impression of shrinking the distances further still. In addition, as the middleware gets more sophisticated, it can deal with the inevitable differences between the types of computers that are being used in a highly distributed system, which are harder to control than within one organization. Globus (http://www.globus.org/) is such a popular middleware package today, and it is essentially a software toolkit for making Grids. With such middleware, the aim is to couple a wide variety of machines together effectively, including supercomputers, storage systems, data sources and special classes of devices such as scientific instruments and visualization devices.

Grid computing involves an evolving set of open standards for Web services and interfaces that make services, or computing resources, available over the Internet. Very often grid technologies are used on homogeneous clusters, and they can add value on those clusters by assisting, for example, with scheduling or provisioning of

Figure 1. Grid computing vision