Chapter 1.12
Pervasive Grid and its Applications

Ruay-Shiung Chang
National Dong Hwa University, Taiwan

Jih-Sheng Chang
National Dong Hwa University, Taiwan

ABSTRACT

With the advancements of computer system and communication technologies, Grid computing can be seen as the popular technology bringing about significant revolution for the next generation distributed computing application. As regards general users, a grid middleware is complex to setup and necessitates a steep learning curve. How to access to the grid system transparently from the point of view of users turns into a critical issue then. Therefore, various challenges may arise from the incomprehensive system design as coordinating existing computing resources for the sake of achieving pervasive grid environment. The authors are going to investigate into the current research works of pervasive grid as well as analyze the most important factors and components for constructing a pervasive grid system here. Finally, in order to facilitate the efficiency in respect of teaching and research within a campus, they would like to introduce their pervasive grid platform.

INTRODUCTION

The current scientific problems are becoming more and more complex for computers. As the aid of the advances in the computing power of hardware and the diversification of the Internet services, distributed computing applications are becoming more and more important and widespread. However, the past technologies such as cluster and parallel computing are insufficient to process the data-intensive or computing-intensive applications with the large amount of data file transmissions. In addition, from the perspective of the most users, a secure and powerful computing environment is beneficial for a tremendous amount of computing jobs and data-intensive

DOI: 10.4018/978-1-4666-0879-5.ch1.12

applications. Fortunately, a new technology called grid computing (Reed, 2003; Foster, 2002; Foster, 2001) has been developed to contribute to the powerful computing ability to support such distributed computing applications recently. Grid is a burgeoning technology with the capability of integrating a variety of computing resources as well as scheduling jobs from various sites, in order to supply a number of users with breakthrough computing power at low cost.

The most current grid system in operation is on the basis of middleware-based approach. A few grid middleware projects have been developed such as Globus, Legion, UNICORE, and SRB so far. However, as regards general users, a grid middleware is complex to setup and necessitates a steep learning curve. Take Globus as an example, which is now in widespread use for the deployment of grid middleware, only a command mode environment is provided for users. To cooperate with Globus very well must have strong knowledge in grid functions and system architecture. As far as a general user is concerned, it seems rather complex as manipulating grid middleware. Overhead of managing and maintaining a Grid middleware will limit the popularization for users. In addition, it is hard to integrate various computing resources such as mobile devices, handsets, laptops into ubiquitous computing platform due to the deficient system functionalities to underlying heterogeneous resources. How to access to the grid system transparently from the point of view of users turns into a critical issue then. On the other hand, as far as a programmer is concerned, a lack of programming modules may increase the complexity of system development for pervasive grid. Limited support for applications level components also restricts programmers to develop pervasive services.

Therefore, various challenges may arise from the incomprehensive system design as coordinating existing computing resources for the sake of achieving pervasive grid environment. We are going to investigate into the current research works of pervasive grid as well as analyze the most important factors and components for constructing a pervasive grid system here. In addition, in order to facilitate the efficiency in respect of teaching and research within a campus, we would like to introduce our pervasive grid platform to make resources available as conveniently as possible. The pervasive grid platform integrates all of the wired and mobile devices into a uniform resource on the grounds of the existing grid infrastructure. Resources can be accessed easily anytime and anywhere through the pervasive grid platform.

CURRENT AND FUTURE RESEARCH TRENDS

(Mario, 2003) brought up an architecture of pervasive grid with utilization of diverse grid technologies as indicated in Figure 1(a). For example, knowledge grid is able to extract interesting information from a huge amount of data source by means of the data mining technology. Semantic grid is an emerging technology, aiming for the translation of semantic job to corresponding grid job or command. The grid fabric provides various grid services, including data grid and information grid. Data grid intends to process data-intensive jobs by way of the powerful distributed storage system and data management technology in order to bring about superior performance with minimal job exection time. Information grid provides job broker with complete system information for job dispatch. The interconnection between diverse computing resources is achieved via P2P technology coupled with efficient management strategies, tending towards a more fullness architecture.

There had been several works (Arshad, 2006; Pradeep Padala, 2003; Vazhkudai, 2002) attempting to develop a high performance framework for grid-enabled operating system. A modular architecture called GridOS (Pradeep Padala, 2003) was proposed in order to provide a layered infrastructure. Four design principles are considered includ-