Integrating Heterogeneous Grid Computing Environments

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Abstract: Grid computing provides integration of different environments, creating a unified system, where organizations can share, manage and access different resources regardless of where they are located. However, the lack of integration among different grid computing systems limits the total exploitation of resources. This work investigates and develops an interface for the integration of two heterogeneous grid computing environments: Globus and InteGrade. Such integration transparently increases computational power. Users will be able to submit jobs through both grid environments and applications will be executed in either Globus or InteGrade grids, or even in both.

Introduction

Grid computing (Foster 2001) systems are open-compute grids and are becoming widely used. Users can run a single application that employs distributed resources, with a single click, on the highest performing computing resources. High performance grids have been defined as a grid computing architecture application that: (1) allows users to transparently access remote resources; and (2) supports the management of computational resources in a distributed environment. Grids have also become an infrastructure for the integration of systems on a service-oriented basis (hence, grid). Several grid frameworks have been defined and some of them are Globus (Globus 2006) and InteGrade (Integrade 2006; Mausolf 2005). These frameworks are designed to manage resources, which are located in different regions, and make them available to end-users, allowing them to perform high performance computing on demand without worrying about changes in source code and ways of allocating computational resources.

Although advanced technology that computes the current Internet allows sharing and exchange of information between computers, they do not allow an appropriate approach for shared and transparent use of resources that are distributed in the sense of access to local or remote supercomputers. In this scenario, it is common to find three main types of resources usage: (1) an intranet environment, which is more suitable for high performance computing tasks; (2) a Grid environment, where users can access resources distributed in different regions; and (3) a Grid environment, which combines both environments and is more suitable for high performance computing tasks. High performance computing environments that require the management of computational resources must be considered distributed grids (Shahabi and Feng 2004). The Globus Toolkit (Globus 2006) is a set of tools and libraries to support the grid architecture and applications. It is a project developed by the National Laboratory for Grid Computing (NLANR) and by the University of California, Santa Barbara. The main services of the infrastructure are: (1) the Global Resource Allocation Manager (GRAM); (2) the Grid Security Infrastructure (GSI); (3) the Globus Toolkit (Globus 2006); and (4) the Web Services. Global Toolkit (Foster 2001) is a grid middleware developed by The University of São Paulo to allow the integration of different grid computing environments. Such integration transparently increases computational power. Users will be able to submit jobs through both grid environments and applications will be executed in either Globus or InteGrade grids, or even in both.

Grid Computing Environments

One of the main characteristics of a grid is that it is identical with the computational environments that participate. The Grid-IT is capable of interacting with other systems. This integration is a challenge if we consider that different grids are controlled by different independent organizations. However, the solutions for the integration of computational resources that need to be integrated in order to fully utilize the resources of the distributed environment.

Grids Globus

InteGrade

InteGrade (Finger 2003) is a grid middleware developed by The University of São Paulo to allow the integration of different grid computing environments, creating a unified system, where organizations can share, manage and access different resources regardless of where they are located. This work aims to develop an interface to integrate heterogeneous grids, using as a case study Globus and InteGrade middleware solutions. This integration is an ongoing effort to build a platform for distributed collaboration on top of Grid-based services. This platform is built around general principles and network management solutions that provide grid computing services (i.e. compute power, data, information, programs, etc.) and in dynamic education. The goal is to build a test bed for community-specific applications, enabling new interdisciplinary applications. In this work, we use the MDS and GSI components through the interaction with Globus, allowing it to use new grid resources.

Incorporating Heterogeneous Grid Computing Environments

Our main motivation for this work, we can mention the need to create and develop a high performance grid computing environment that can be used to develop new research projects. The main goal of this work was to develop an interface to integrate heterogeneous grids, using as a case study Globus and InteGrade middleware solutions. This integration is an ongoing effort to build a platform for distributed collaboration on top of Grid-based services. This platform is built around general principles and network management solutions that provide grid computing services (i.e. compute power, data, information, programs, etc.) and in dynamic education. The goal is to build a test bed for community-specific applications, enabling new interdisciplinary applications.

Final Remarks

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