

WCETR 2011

A dependable and economic service for long-life e-learning applications in grid environments

Bahman arasteh^{a*}, Manuchehr ZadahmadJafarlou.^b, Mohammadbagher Karimi^a

^aDepartment of Computer, Tabriz Branch, Islamic Azad University, Tabriz, Iran

^bDepartment of Computer, Ilkhchi Branch, Islamic Azad University, Ilkhchi, Iran

Abstract

Developing highly available, reliable, scalable and mobile educational systems are so difficult or impossible in the client-server and web service architectures. On the other hand, a grid environment is such a large distributed system that it supports large numbers of distributed resources sharing. The grid environment can be used as a good platform for the long-life, online and mobile educational applications which need high availability, reliability and scalability. The possibility of failure occurrence on the educational resources during a running educational application on the grid environment is not negligible. This paper proposes a dependable and economic learning service in grid systems. The other focus in this paper is to minimize educational resource consumption and consequently decrease the cost of requested learning services by the learners in the economic grid. A hybrid and dynamic resource management method is used to improve the availability, reliability, scalability and stability of learning service with low resource consumption. An analytical approach, Markov model, is used to show the availability, reliability, stability improvement in the proposed method.

© 2011 Published by Elsevier Ltd. Open access under [CC BY-NC-ND license](#).

Keyword: Grid Environment; E-learning Service; Dependability; Resource Consumption;

1. Introduction

These days the e-learning has become significant tool for modern educations without time and place restriction that is enabled by means of computer technologies like distributed technologies and web based application over the network. Many schools, universities and educational systems are using e-learning as their common training method [Tucker, 2002]. The e-learning resources are geographically distributed and system-dependent and thus cannot share and combine dependably and economically with other heterogeneous resources. Hence, the dependability and cost are the significant points in the e-learning and distance education systems. On the other the grid computing is an efficient distributed system with the large number of geographically distributed and heterogeneous resources which provides inexpensive access to various remote resources. It is a suitable framework for executing many applications like long mission oriented and distance learning applications [Foster,2002], [Globus website] and [Gannon, 2002]. The grid computing systems can be used to develop an efficient and economical e-learning platform. Service oriented concepts in the grid computing systems are the new platform-independent technique with open standards

* Bahman arasteh. Tel.: +984113318684

E-mail address: b_arasteh@iaut.ac.ir.

and protocols which have advantage over the web services [Gannon, 2002], [Chervenak, 2000] but some features of grid computing such as heterogeneity of remote resources, network details and geographical distribution can cause many transient and permanent faults. Therefore, failure occurrence in each component of grid environment is a rule not an exception. The resource in this paper refers to the educational resources. Hence, dependability and its related criteria such as availability, reliability, scalability and stability of educational resources must be considered in the grid resource management systems. The grid resource management is a complex process because the needed resources in the e-learning over the grid are dynamic, distributed and can enter and leave the grid at any time. The other significant feature from the learner's point of view is to minimize the cost of requested e-learning services. Delivering requested services by minimum number of resources leads to reduce the cost of services. Therefore, to attain a dependable and economic e-learning service the mentioned features must be considered.

2. Related Works

Dependability and cost of e-learning services are the significant drawback in the peer-to-peer, client-server and web service architecture [Pankratius, 2003], [Booth, 2003]. On the other hand, the grid services gather heterogeneous, dynamic and geographically distributed resources and achieve comprehensive and meaningful sharing of grid resources. Hence, it is a good choice to provide and share the distributed educational resources in the remote and e-learning applications. Some of the previously published researches like [Brusilovsky,2002], [Fuji,2002] proposed reusable distributed learning activities based on the CORBA technique. Several works have exploited the grid service technologies to attain dependable and economic e-learning systems [Pankratius, 2003], [Sun Microsystems, 2002]. Some of other works have proposed a framework based on Globus to develop a grid environment for e-Learning [Reklaitis, 2002], [Reklaitis, 2003] and [Towards, 2003]. This work proposes a resource management method to attain a dependable and economic learning service in grid systems. The other focus is to minimize educational resource consumption and consequently decrease the cost of requested learning services. The proposed hybrid and dynamic resource management method leads to improve the availability, reliability, scalability and stability of learning service with low resource consumption.

3. Background and system Architecture

This work exploits the grid service technologies to gather the distributed educational resources. A Grid can be defined as a layer of networked services that allow users access to a distributed collection of computing, data, communication and application resources from any location. The service oriented and grid based e-learning platform includes three components: Grid Infrastructure, learning management system (LMS) and user interface system.

3.1. Grid Infrastructure and Globus Toolkit

Service oriented concepts in the grid computing as a platform-independent technique are used in the e-learning systems. Grid infrastructure offers Grid services for computational and collaboration tasks needed by Learning process and the needed resources are managed and shared as a Virtual (VO) Organization by means of Grid publish-discovery mechanisms. The grid infrastructure consists of layered software components deployed in different nodes. In order to develop an e-learning system over the grid computing this work focuses on Globus Toolkit which is an open-architecture and software libraries that support Grid applications. The toolkit includes software for resource management, communication, security and reliability. Grid resource allocation management (GRAM), Monitoring and Discovery System (MDS) and Grid Security Infrastructure (GSI) are the main components of Globus toolkit. GRAM is responsible for managing local resources and comprises a set of Web services to locate, submit, monitor, and cancel jobs on Grid computing resources. The MDS is the information services component of the Globus toolkit and provides information about the available resources on the Grid and their status. GSI is a set of tools, libraries and protocols used in Globus to allow users and applications to securely access resources. Management of needed educational resources is one of the grid middleware roles which has significant impact on the dependability of delivered services. The discovery, selection and scheduling of needed resources in the e-learning applications are the main functions of resource management service. Figure1 shows an overview of e-learning architecture and the resource management component with respect Globus [Gannon, 2002]

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات