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UTM Grid Portal: A Web-enabled Environment to Support e-Learning in Higher Education

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Abstract— **Nowadays, the web-technologies and Internet have become usual and are rapidly decreasing in cost t ch an area that technologies such as Enterprise Portals and Application Servers are swift becoming commodities and products of tomorrow. Any information access enabled by Web and communication – from Education to E-Governance, Portals of Enterprise or for Healthcare, a d all that one can imagine - is swift becoming all pervasive to such an area that approximately everybody in the earth is contributing something in it or affected by it. The UTM Grid Portal is a project exclusively concentrated on the Higher Education sector to set in place efficient IT methodol es and infrastructure as well as in that way of improving standards and quality of e-learning instructed in all the departments, institutions, research centers among the ntire campuses of UTM. The online supported programmes planned to be put in place over the Grid enabled knowl dge base system, and associated benefits of experience and expertise to flow from where it is needed – especially for collaborative authoring activities. This paper will explain how the users, learners, researchers will be benefited by such grid portal supported e-learning system and why it is efficient than the other existing e-learning systems. The core objective of this study is to ensure maximizing the quality of efforts by all students and learners concerned and the quality of instructions provided to and facilitates produce excellence teachers, thus elevate the standard of education all t ether.**

Keywords-grid portal; collaborative authoring activities; e-learning; education; content sharing

I. INTRODUCTION

UTM Grid Project will ensure the deployment of necessary IT facilitated Educational infrastructure and the necessary backbone network connectivity and server systems across the faculties, laboratories and research institutions involved. Central to the architecture are t layers of systems and services. The first is the mechanical part of networking the faculties, and laboratories, deploying appliance servers and access systems. The second is technologically and in the management sense a more challenging one. This is to provide for each subj ct or course a learning management system environment that provides every teacher and student a web-enabled course specific area of information and interaction environme that is well gifted with rich courseware with relevant instruction design and teacher's mentoring support. This environment supports multiple independent course specific collaborative content, information and knowledge networks across distributed servers over the Internet and parallel computing system enhances the job performance .

Several kinds of approaches have proposed [3] [4] [5] by various researchers for authoring activities environments. Among them B. Ferrero et al. [1] have described KADDET which is a cognitive diagnostic environment designed to assess the conceptual and procedural learning activities of students.

To fulfill graduation requirements, it is common practice in the Malaysian universities that majoring in Mathematics are required to work on a two semesters' project during their final year. By involving in the research projects, the students are trained on how to earn about a new math topic or to study more in-depth a topic that they are already familiar. Web based Education through grid portal technology is becoming a major recent trend [2]. The computational platform is supported by low cost shared and distributed memory in solving the grand challenge applications. Individual work is essential in any learning course but, student should learn the collaborative behavior as well. Student contributions e important in group efforts. Group work on designing a authoring a courseware is not a simple task. One of the major problems in work group is unequal distribution o task (among student in a group) and compensation (performance evaluation in the form of grades). The WBE in parallel computing are designed to provide students an efficient authoring environment to overcome the unequa distribution of tasks and performance evaluations in g oup efforts. That means they will have the opportunity to searching, uploading, visualizing output and file savi g by the help of online collaborative efforts through grid portal technology.

In the paper the architecture of UTM grid portal is presented in the next section. Web service performance evaluations are illustrated in section 3 and section 4 describes a discussion about the benefits and efficien of web enabled grid and section 5 will conclude the paper.

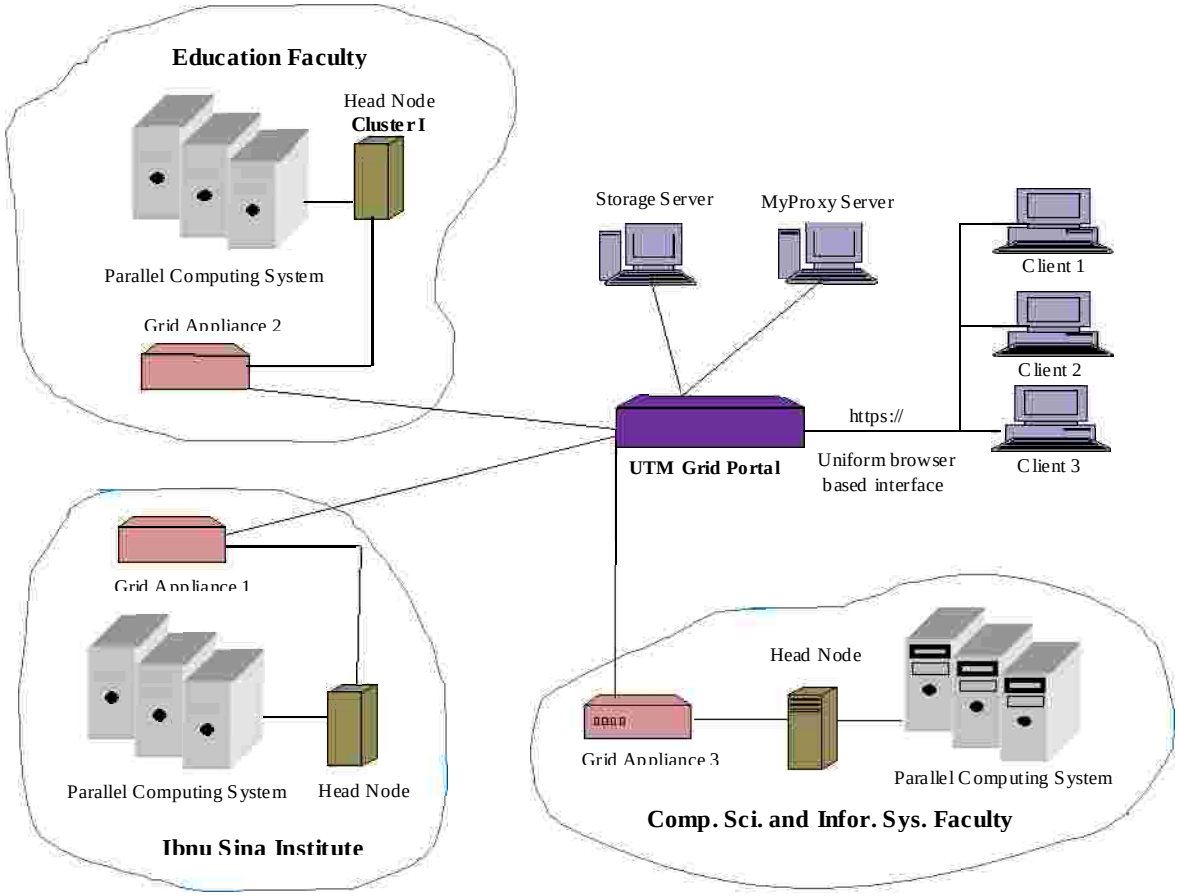


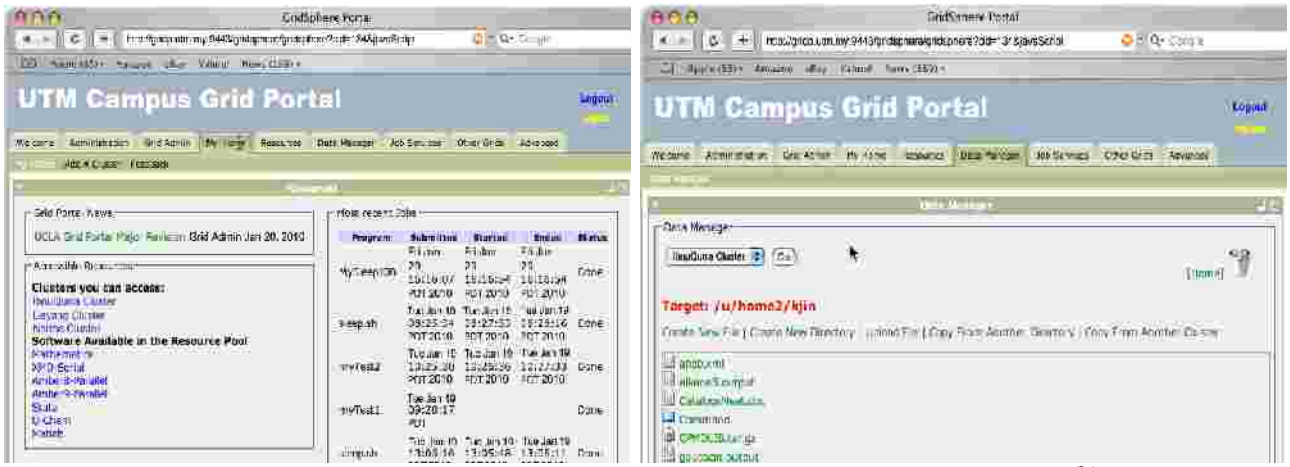
Fig. 1 : Infrastructure of UTM grid portal technology

II. GRID PORTAL ARCHITECTURE

A Grid is a collection of independently owned and administered resources which have been joined together by a software and hardware infrastructure that interacts with the resources and the users of the resources to provide coordinated dynamic resource sharing in a dependable and consistent way according to policies that have been agreed to by all parties. Because of the large number of resources available on a Grid at any given time, an individual researcher can always be provided with the best resources available at that point of time for his her needs, and overall, resource utilization can be distributed for maximum efficiency.

The proposed Grid portal is a web server as well as gateway by which users may access web services, manage data and compose workflows. The portal is used by the administrator to construct the service for others to u and by the users who wish to act together with the service by its automatically generated web interface. Our Grid portal technology offers a framework for supplying single-point access to Grid services, similarly a Web portal such as Yahoo or MSN comprehensive site information, indexes and web pages. A Grid service that is accessible within the portal. A distinctive feature of our grid portal is, a user navigates to the portal page, and afterward, the portal presents the appropriate applications that the user may interact with, derived from their identity and the authorization policies. Like this, a virtual organization may be formed. The Grid is a mixture of network infrastructure and software framework distributing computing services based on distributed hardware and software resources [8].

Users interact with the Grid Portal through an https connection from a web browser. The Grid Portal uses GridSphere to run the portal and Apache Tomcat to run the web-interface. UGP uses MySQL database for the database of information about users, clusters, applica ions and job status that it needs to run the Portal. The architecture also includes a MyProxy server to store u certificates, a storage server connected to the Grid P al to provide storage space for poolonly users, and a visualization server to drive the software that is optionally required to provide through-the-web data visualization services to users (see Fig. 1).



(a) (b)

Fig. 2: (a) Web portal interface for users showing all cluster lists along with list of applications, (b) Web portal interface for users showing contents for sharing

At the same time as the UGP architecture presents a uniform appearance to users, it provides for a Grid made up of diverse computing environments (hardware, operating systems, job schedulers) and autonomous administrative domains. UGP makes use entirely of open source software: Globus ToolKit, Tomcat, Java, Gridsphere and MySQL. UGP itself is also open source.

In grid portal service, we create schema Web Service Definition Language (WSDL) using tools such as Neatbean IDE, GlassFish as web engine, C compiler and Parallel Virtual Machine (PVM). After finish, clients an access web service portal from a server as called as distributed or grid Computing. Users can access web service portal from a server as called as distributed or grid. Grid portal supports a framework to provide a web service interface to the existing applications without having o write extra code or modify the existing web services.

III. WEB SERVICE PERFORMANCE

The process of visualization has becomes extremely fast, reliable and precise with high performance computing. The parallel performance makes the product really attractive because of its high speed, efficient, effectiveness and high temporal performance algorithm [6] [7]. In terms of numerical performance, the result are also precise, highly convergence, stable and accurate to the exact solution.

a) Low cost High Performance Computer (HPC): The operating system uses is open source. There is one of the most significant examples of free software in Linu Fedora and open source development, its underlying source code can be freely modified, used, and redistributed by anyone, so long as they fully comply with the GPL License. Linux is one of the most prominent examples of free software and open source development; its underlying source code can be freely modified, used, and redistributed by anyone, so long as they fully comply with the GPL License. The platform is capable in performing a complex computational to solve the real end-to-end solution run on high performance and high-productivity computing.

b) Robustness: The robustness of the software that well suits on any future upgrade distributed memory architecture. Productivity is understood to be a compo ite of system performance, portability, user friendly, administrative concerns and reduced the “expertise gap”.

c) Open source web based software: The open source product built on Linux platform in web-based format is really famous nowadays. This feature makes the software easy to be reach and access by user at any le el instead of providing latest information (see Table 1).

d) Feature of the software development: The visualization is presented in webPerl-CGI and PHP are emphasized to develop the software instead of MySQL database to store significant information. The productivity is understood to be a composite of system performance, system robustness, programmability, portability, and administrative concerns.

e) Real time solution: The mathematical modeling grants user the accurate prediction of engineering problems on a real time solution. This includes efficient visualization between mathematical simulation and exact solution of engineering problems.

Based on the Grid Portal with distributed parallel computer systems in University Technology Malaysia (see Fig. 2), we have been developing a numbers of software to assist users in numerical field and software engineer manufacturing industries.

TABLE 1: COMPARISON BETWEEN OPEN SOURCE AND PRICE BASED *SOFTWARE*

Open source (free)	Price based on version
Capture the smooth graph	Coarse graph
Highly convergent to exact solutions	Slowly convergent
Simulation based on web portal	Simulation is not provided
Server is provided	Server is not provided
High speed	Low speed
High performance of parallel computing	Low performance of sequential computing

IV. DISCUSSION

In pure collaborative authoring, each author takes over an authoring sub-task(s). When each author accomplishes the sub-task(s), the group goal is reached and collaborative mutual interdependent authoring is achieved.

In the wider spread cooperative authoring, authors just reuse each others materials, style, learning goal setts, dictionaries, linking and sequencing, etc. The primitive interaction activities among participants during both cooperative and collaborative authoring, from a macro granulation perspective, are as follows (listed in their order of priorities):

- Planning/Execution/Creation
- Coordination/Control
- Initiative/Supervision
- Observation/Suggesting
- Data/Idea sharing
- Dialogue (with Interaction)

This research will provide the following benefits to students and participating universities [9][10]:

- Facilitate and support work group students in their design and developing a courseware.
- The successful application of authoring activities environment through grid technology provides enhancements in work group performance, helps to lower cost, and encourages innovation.
- Learners and faculties can promote the exchange of ideas, information, knowledge, and joint research and development of Web-based teaching materials.
- Help member universities build a network of facilitators to support e-learners (forum with advanced Information and Communication Technology (ICT), i.e., with the use of massive parallel processors of globally distributed and yet interconnected mini-supercomputers through global neural computer network).

Researchers can partner with colleagues in more advanced faculties, and perform joint collaborative research and development with the use of the emerging global GRID computer networking technology.

V. CONCLUSION

While it will take time to incorporate all the above features, the project aims to start with the core components to be developed and deployed in a few key courses at undergraduate Engineering and Sciences education levels through Resource Centers to be set up in leading Institutions. It will assist reputable institu to offer distance learning programs and encourage collaboration between institutions of higher education to share and spread best practices in teaching, pedagogy and learning environment management.

There is a general perception that providing internet access to colleges will result in the delivery of better quality instruction to greater numbers of students. UTM Grid is a well thought-out framework taking into account inputs from numerous experts, concerned citizens and teachers. This project attempts to squarely take up the challenge of appropriate use of IT and Internet in Education using a knowledge enabling approach.

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REFERENCES

1. B. Ferrero, M. Martín, A. Alvarez, M. Urretavizcaya and I. Fernández-Castro, "Authoring and Diagnosis of Learning Activities with the KADDET Environment," Journal of Universal Computer Science, vol. 11 (9), pp. 1530-1542, 2005.
2. J. Tourino, MJ. Martin, l. Tarrio, and M. Arenaz, "A grid portal for an undergraduate parallel programming course," IEEE Transactions on Education, vol. 48, pp. 391-399, 2005.
3. Z.L. Ye, G.N. Qi, XJ. Gu, Z.G. Bao, and Y.D. Qian, "A cooperative process-management system based on the manufacturing grid," International Journal of Computer Integrated Manufacturing, vol. 20, pp. 244-253, 2007.
4. D. Soni, and J. Sharma, "Role of grid computing in Indian education," in Proc. of the 12th WSEAS International Conference on Applied Mathematics, Cairo, Egypt, pp. 417-423, 2007.
5. Chao-Tung Yang, and Hsin-Chuan Ho, "An e-Learning Platform Based on Grid Architecture," Journal of information science and engineering, vol. 21, pp. 911-928, 2005.
6. Xc Geist, A., Beguelin, A., Dongarra, J., Jiang, W., Manchek, R., and Sunderam, V., "PVM: Parallel Virtual Machine & User's Guide and Tutorial for Networked Parallel Computing," MIT Press, Cambridge, Mass, 1994.
7. Lewis,T.G. and EL-Rewini,H., "Distributed and Parallel Computing," Manning Publication, USA, 1998.
8. B. Wu, M. Dovey, M. Hong Ng, K. Tai1, S. Murdock, H. Fangohr, S. Johnston, P. Jeffreys, S. Cox, J. W. Essex and Mark S.P. Sansom, "A Web / Grid Portal Implementation of BioSimGrid: A Biomolecular Simulation Database," Journal of Digital Information Management, vol. 2, No. 2, pp. 74-78, 2004.
9. D. hjh. Tiawa A. hj. Hamid, M. R. Islam, N. Alias and A. Hafidz H. Omar, "An Efficient Authoring Activities Infrastructure Desig through Grid Portal Technology**",** in Proc. of The 7th WSEAS International Conference on ENGINEERING EDUCATION (EDUCATION'10), Corfu Island, Greece, pp. 146-151, July 22-24, 2010.
10. D. hjh. Tiawa A. hj. Hamid, M. R. Islam, and N. Alias, "A Distributed Learning & Teaching Environment across Institutions base on Advanced Grid Portal Technology", in Proc. of the 3rd Regional Conference on Engineering Education & Research in Higher Education (RCEERHEd 2010), Kuching, Sarawak, Malaysia, June 7-9, 2010. [In press].