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ABSTRACT

Open and Distance learning has been extensively researched in the past few years, yet the focus was more in its technological dimension. The plethora of advanced tools supporting e-learning and the difficulties in their adoption in real situations has only demonstrated that the primary need is a paradigm shift in the educational model. In this work, we argue that this paradigm shift can be efficiently supported by a new computing model: the Grid. Grid computing facilitates knowledge construction and reuse in highly dynamic, distributed e-learning environments. An initial design of an e-learning Grid is presented for an Open University environment where new e-learning models, such as constructivism, can be efficiently supported. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: Architectural Features; E-Learning; Grid; Internet Technologies

INTRODUCTION

Current teaching and learning practices are based on the information transfer paradigm: information is transferred from the teacher to the student. This enforces the student to consume information without being able to build knowledge. This static model of learning is supported by most state-of-the-art e-learning tools in the market today. Although the information transfer model is popular, because it is easily supported by Internet technologies, its educational effectiveness is seriously questioned (Xenos, 2002; 2003).

Many researchers propose a shift in the distance education paradigm focused on knowledge
construction which will enhance, not replace, the information transfer paradigm (Vrasidas, 2004, Carchiolo et al., 2007). Social learning, a major enabler of the knowledge construction paradigm is based on active collaboration among human peers and especially enhanced presence. In such a context, human learning is a social process where sharing and reusing knowledge and executing tasks in order to reach a common goal. In this article we argue that this new paradigm can be efficiently supported by a new computing concept: the Grid.

Grid Computing, or simply the Grid, is a new computing paradigm that enables access to distributed and heterogeneous computational resources (CPU cycles, storage, services, sensors, data) in a transparent, simple and on-demand way (Foster & Kesselman, 2004; Wells, 2008). The vision of the Grid resembles that of the Electric Grid where resources (electric power) are offered to the users: transparently (the user is not concerned on how and where the resources where produced or how they are distributed), simply (the user just needs to plug-in and use the resources) and on-demand (electric power is always available and enough and the user is charged on a pay-as-you-use basis). Thus, the vision of the Grid is to enable the provision of computational resources as commodities (Commodity Computing) (Stockinger, 2007). To enable this vision, several technologies have already been made available: coordination and virtualization of resources, management of heterogeneous resources, security, autonomy and lately, Grid services.

Recent advances in Grid frameworks enable its application to many areas, especially enterprise computing, e-Commerce and e-learning (Goyal & Lawande, 2007). The Grid is already emerging as a major enabler for networked organizations (Vanderhaeghen, 2007; Canavesio & Martinez, 2007). Although some of the enabling technologies are at a cusp in their development, the Grid has matured to its third generation of development adopting a service-oriented approach. A more holistic view of information infrastructures is supported and services are metadata enabled and ontologically principled (Singh & Huhms, 2005; Chen 2008). The next generation of Grid solutions facilitates the transformation of information into knowledge, by humans as well as – progressively – by software agents, providing the electronic underpinning for a global society in business, government, research, science and education. The Grid can be a major enabling technology for social learning, which in turn is a basic characteristic of the knowledge construction paradigm: active collaboration among human peers is supported by using different kinds of collaboration technologies and especially enhanced presence. Human learning is a social process using sharing and executing tasks in order to reach a common goal. In this context, it is hoped that next generation Grids will enable collaboration and effective knowledge sharing in large and highly dynamic e-learning environments. Several such examples have already begun to appear in the literature (Apon et al., 2004; Truong, 2004; Holliday et al., 2005; Meng et al., 2007; Gleeson & Pahl, 2007; Ho et al., 2004;). Some efforts worth noting are those of Shih et al. (2006) that use Grid services for distributed information retrieval of SCORM objects, Amoretti et al. (2005) use similar technology for multimedia streaming while Luo et al. (2006) provide on demand e-learning services.

This article presents the experience gained from the application of distance education technologies to the Hellenic Open University (HOU) and the effect of these technologies to the learning process, the learners and the tutors. Throughout the rest of the article the term ‘Learner’ will be used for anyone that learns something, formally or informally, either under a well-organized framework (i.e. school, university), or occasionally (i.e. in-house, while waiting for the bus, etc.). The term ‘Tutor’ is used to define the notion of tutoring in general and not a specific person (i.e. teacher, professor); in this context a tutor may also be a student offering an explanation to a fellow student. In addition to the presentation of the HOU experience, this work also discusses the problems created by the adoption of distance education...
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