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Towards Developing Grid-based Portals for E-Commerce on-Demand Services on a Utility Computing Platform

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Abstract

Trends and current practices in the design and development of grid-enabled portals (GeP) reveal the need to identify and fulfill certain additional relevant requirements in order to build applicable and usable grid-enabled portals for evolving computing platforms such as the utility computing (UC). This paper reports an investigation of the minimum relevant additional requirements that must be fulfilled to attain effective GeP design for UC. A GeP prototype for the Grid-based Utility Infrastructure for Small, Micro, and Medium Enterprises (SMME) Enabling Technology (GUISET) initiative – a UC platform was developed, and an analytic evaluation experiment undertaken in the study to elicit these additional requirements using a set of benchmark requirements (standards) revealed that it fulfilled the minimum requirements to be suitable for UC context. The result of the study underlines the need for more controlled experiments in portal prototyping in order to foster the practice of GeP design for UC.

Keywords: Grid-enabled portal requirements; Grid-enabled portal development; Utility Computing.

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1. Introduction

The utility grid computing paradigm is a variation of the conventional grid computing model in which resources and services are provided and utilized solely on per user request basis (Rappa, 2004). It is essentially based on the pay-as-you-use service provisioning business model. In a typical grid environment, Grid-enabled portals (GeP) build upon the familiar Web portal model to offer virtual organizations (VO) or community of users a uniform access to computational resources and services (Akram et al., 2005; Russel et al., 2006). So far, the design of conventional grid-enabled portals has been largely influenced by traditional functional requirements of the grid platforms (Yanli et al., 2006). However, the peculiar characteristic of UC which implements a pay-as-you-use business model imposes new requirements that must be satisfied to realize usable GeP for UC (Foster and Kesselman, 1999; Eilam, 2003; Pagden, 2003; Phillip, 2004). Studies in design prototyping of GeP of UC platforms have been rarely reported in literature, which means there is a lack of sufficient formal guidelines for the design of GeP for UC. Hence, more experimentation is needed in order to determine the composition of an adequate guidelines for the design of GeP for UC, and by so doing foster the practice of design and development of GeP for UC.

This paper reports an investigation of the minimum relevant additional requirements that must be considered and fulfilled in order to attain effective design of usable GeP for UC. We have developed a prototype GeP for Grid-based Utility Infrastructure for SMME Enabling Technology (GUISET). GUISET is aimed at technologically enabling the business activities of Small, Micro and Medium Enterprises (SMME) by facilitating an affordable access to relevant technologies on a *pay-as-you go* basis. The GUISET portal is equipped with a set of features to address the identified relevant additional requirements for UC apart from the traditional functional requirements for grid portals. An analytic evaluation experiment was done using a set of benchmark requirements to determine if the minimum set of identified relevant requirements considered necessary for the design of usable GeP for UC platforms are fulfilled in the portal prototype. The result of the evaluation revealed that the designed GUISET portal prototype fulfilled the minimum requirements to be suitable for the utility computing context.

2. Background and Related Works

2.1. The GUISET Framework

The GUISET framework is conceptualized as a suite of service-oriented on-Demand Applications such as: e-Commerce, e-Tourism, e-Health, e-Business, e-Government. (Phillip, 2004; Adigun, 2005; Khosrow-Pour, 2006). It is depicted as a Mobile Grid-enabled Utility Computing Architecture aimed at helping under-resourced SMMEs reduce their operating overhead cost to the barest minimum by providing e-Commerce services and applications on-demand (Adigun, 2008). It is a three (3) layered architecture. It comprises of (i) Multimodal Interface layer (ii) Middleware layer and (iii) Grid Infrastructure layer. This is shown in Figure 1.

The Multi-modal interfaces layer houses the various application interfaces designed for accepting customer subscription. The interfaces run on a Grid client which can be a mobile device or laptop. Each client is a potential Grid service provider or resource. The services available are also advertised through these interfaces. This layer also provides a template for customer specification of service parameters. These templates are then passed to the utility broker for a SLA-driven validation of all completed templates. The Middleware Layer comprises the utility broker, enabling information bus for dynamic services selection. The utility broker component works with validated service specification templates. It initiates a negotiation process with customer until a mutual agreement is reached and a contract is established. It also invokes a subscription manager that enforces and manages updates to all existing contracts. The billing component of the broker