Utilizing Cloud Computing in Developing a Mobile Location-Aware Tourist Guide System

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ABSTRACT

Cloud Computing technologies support mobile applications and overcome the low computation resources and limited data storage by providing an on-demand access with pay-as-use rule to large number of computing resources. In this paper, the author describes the architecture of an electronic tourist guide system (Trip@Cloud) as mobile cloud computing application wherein the tourists can access cloudy information in ubiquitous and pervasive manner. The information needs not to be over the user’s mobile device, but it will be downloaded to user’s device according to user’s location and the Internet status connection. The interaction between the mobile device and the cloud is done when possible and transparently from the user. The existing architectures of partitioning the application between the device and the cloud depends deeply on the CPU workloads. The author’s application’s nature is different from these applications and this represents the main contribution. The idea is to download the data to the user’s device according to the current user location. Therefore the partitioning is done for the data to be sent to the mobile device. This idea is applied by developing a tourist guide application where the data to be installed is very huge and the mobile storage device is very limited.

Keywords: Cloud Computing, Data Partitioning, Location-Based Awareness, Mobile Computing, Smartphone, Tourist Guide Application

1. INTRODUCTION

Cloud computing technologies support mobile applications by overcoming the low computation resources and limited data storage. Processing data outside mobile devices and store data in the cloud bring mobile applications and mobile computing to not just Smartphone users but a much broader range of mobile subscribers (ABI Research, n.d.). Cloud computing is combined with mobile computing to produce the mobile cloud computing which support more types of services, high data computation and elastic use of resources at low cost for users and developers. Mobile cloud computing also offers all the benefits of cloud based computing.

Unlike traditional computers such as desktops and laptops, mobile devices have different capabilities in terms of computing power and applications they can support. In addition, the designed mobile applications are tailored to specific model and its capabilities.

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Each model runs different operating system, which make them incompatible. Thus mobile applications are designed to meet the requirements of a specific operating system. The user can not use an application until he has a specific model that run the desired application. Mobile cloud computing is appearing in the horizon to deal with the heterogeneity of mobile devices. The user can access all applications only if he can access web through his phone without taking into account the device-specific issues (Balan, Flinn, Satyanarayanan, Sinnamohideen, & Yang, 2002). Therefore, the development of mobile applications will be simplified and accelerated; the developers in another point of view will concentrate their efforts on application logic (Bellavista, Cai, & Magedanz, 2011).

Mobile cloud computing is most viewed as SaaS Cloud (Mobile cloud computing, 2011), which means that the mobile devices can access the cloud through web browser or thin client and the computation and data handling are usually performed in the cloud. In addition, running an application over the cloud will reduce the power consumption (Kumar & Lu, 2010). Cloud makes applications flexible, scalable and easy to build and maintain, the application can grow without regarding the underlying hardware and it can scale for any number of users.

Therefore, the technology trends in recent three years to build cloudy mobile applications to support more types of services, high data computation and elastic use of resources at low cost for users and developers (Mirusmonov, Kim, Cho, & Kim, 2012). According to ABI research (ABI Research, n.d.), the mobile applications are becoming increasingly available in the form of mobile cloud computing applications. The importance of MCC is coming from the ABI Research that mention in Bellavista, Cai, and Magedanz (2011): “by 2015, more than 240 million business customers will leveraging cloud computing services through the mobile devices, driving revenues of $5.2 billion whereas the number of mobile cloud computing subscribers in 2008 were 42.8 million”.

Therefore, we present in this paper an electronic tourist guide application as MCC application which use the cloud infrastructure to store data. This new application uses the most recent technologies in the IT world to keep pace with the modern technological age. The application is developed using Android programming languages. The paper presents the system architecture, implementation environment and the initial results of the system.

The existing electronic tourist guide applications are categorized according to Kenteris, Gavalas, and Economou (2006) into two categories:

1. **Pre-installed applications**: The application must be installed and run on the mobile device. They need some mobile resources such as storage and CPU computation power to install and run the application on the device. The tourist content is already defined and installed in the user device. The applications presented in Cyberguide (Abowd, Atkeson, Hong, Long, Kooper, & Pinkerton, 1997) and Mytilene E-guide (Kenteris, Gavalas, & Economou, 2009; Kenteris, Gavalas, & Economou, 2011; Kenteris, Gavalas, & Economou, 2006) are belonging to this category. These applications restrict the mobile devices to have a specific platform, they cannot be portable to other platform, the information is static and limited in size because of the limited mobile storage. In addition, periodical synchronization must be done between the client and the server;

2. **Web application**: A thin client such as a web browser is used to get the information from the server. This approach overcomes some disadvantages of the pre-installed applications because web applications can be accessed from any platform and they are accessible from anywhere but they need constant connectivity to the network. However, Web applications has also some disadvantages mentioned by Satyanarayanan in Satyanarayanan, Bahl, Caceres, and Davies (2009): “(1) too much introduced latency for real-time responsiveness, (2) no access to devices features such as camera
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