Towards an Efficient Management of Mobile Cloud Computing Services based on Multi Agent Systems

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ABSTRACT

Today, there is an increase of using mobile smart devices. These devices can have an effective access to information and benefit of many applications in the Cloud. Cloud Computing (CC) exploits its full potential with many difficulties due to its inherent problems such as resource scarcity, intermittent network connectivity, and mobility. Mobile Cloud Computing (MCC) can treat these problems by executing mobile applications on external resource providers to the mobile device for high-performance and scalability of mobile applications. This paper discusses the authors' approach on mobile cloud computing environment. This analysis permits to select the most appropriate service satisfied SLA while reducing energy consumption and increasing its availability in the Cloud without deteriorating performance and energy consumption. For that, the authors proposed a dynamic, efficient and equilibrated model based on multi-agent system and Top-K technology.

Keywords: Agents, Availability, Cloud Computing, Energy, Mobility, Scalability, SLA

1. INTRODUCTION

Today, the use of the mobile devices (smartphones, tablets, laptops, robots, etc.) is becoming an essential part of the human life. Cloud Computing offers certain advantages by allowing the clients to use *-as a service paradigm to offer cloud services on demand; infrastructures (e.g. servers, networks and storages), platforms (e.g. services of middleware and operating systems), and software (e.g. the programs of applications) provided by the authors of the Cloud (e.g. Google (Google, 2012), Amazon (Amazon, 2012), Microsoft (Microsoft, 2012), Salesforce (Sales, 2012), etc.) with high quality of services such as a minimum execution cost.

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The creation of mobile applications solves the problems of different mobile operating systems which can be executed on Cloud from any operating system requiring only a web interface. Because the application runs on Cloud, it means that the power of treatment is moved outside the mobile device and the computing is completely supported by the Cloud (Satyanarayanan, 2010), this allows reducing the energy consumption by mobile devices and economize significantly the battery life of these devices. It gives birth to the new expression called Mobile Cloud Computing (MCC) allowing to share resources and applications via a mobile channel.

There are several challenges in the process of the use of cloud computing services. We can mention: limited resources, bandwidth and latency, security and cost. However, the mobile devices are confronted to many challenges: the high availability of resources even in the presence of failures, intermittent connectivity because of the mobility of users and services and the autonomy of the battery which remains one of the main preoccupation of these mobile devices.

In this article, we suggest for problems-solving an architecture of Cloud Computing in a mobile environment for discovering of the most appropriate service whereby any mobile devices can access to any service, anywhere, and any time (Anybody, Any-where, Any-time) with the aim of addressing three challenges of MCC: i) Permanent availability even in the presence of failures; ii) Energy conservation; iii) Respecting the the SLA1.

This paper is structured as follows: in Section 2, we introduce the general concept of Mobile Cloud Computing and its functioning. A review of some existing approaches is presented in Section 3. Section 4 explains an exhaustive study of our approach. A comparative study of related work of MCC and the proposed approach will be discussed in Section 5. Finally the conclusion and highlight directions for future work will be presented in the last section.

2. MOBILE CLOUD COMPUTING

This section presents some definitions of mobile cloud computing from a synthesis of definitions collected form scientific literature as well as paradigm’s functioning.

2.1. Description

There are various existing definitions of MCC: Commonly, the term mobile cloud computing means to run an application such as Google’s Gmail2 for Mobile on a remote resource rich server (in this case, Google servers) while the mobile device acts like a thin client connecting over to the remote server through 3G. Some other examples of this type are Facebook’s location aware services, Twitter for mobile, mobile weather widgets etc.

MCC forum defined MCC as follows(MCCForum, 2012) ”Mobile Cloud Computing at its simplest, refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just smartphone users but a much broader range of mobile subscribers “.

Aepona (Aepona, 2010) describes the concept of MCC as a new paradigm for mobile applications whereby the data processing and storage are moved from the mobile device to powerful and centralized computing platforms located in clouds. These centralized applications are then accessed over the wireless connection based on a thin native client or from mobile devices that possess a web browser.

Alternatively, MCC can be defined as a combination of mobile web and cloud computing (Christensen, 2009), (Liu et al., 2011), which is the most popular tool for mobile users in order to access applications and services on the Internet. The MCC provides to mobile users data
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