Chapter 7
Agent–Based Resource Management for Mobile Cloud

Zhili Sun
University of Surrey, UK

Yanbo Zhou
University of Surrey, UK

Yichao Yang
University of Surrey, UK

Haitham Cruickshank
University of Surrey, UK

ABSTRACT

Mobile cloud computing is a new computing paradigm to integrate cloud computing technology into the mobile environment. It takes full advantages of cloud computing with great potential to transform a large part of the IT industry. The objectives of mobile cloud computing are to meet user demand, efficiently utilize a pool of resources, including mobile network, storage, and computation resources, and optimize energy on mobile devices. Here, the authors review the current mobile cloud computing technologies, highlight the main issues and challenges for the future development, and focus on resource management. Then, combining the current agent architectures and resource optimization strategies, they present an agent-based resource management to deal with multiple data and computation intensive applications of user demand. The chapter offers a promising solution of selecting the best service provider and efficiently utilizing mobile network resources given the user's request constraint.

INTRODUCTION

Mobile cloud computing (MCC) provides on-demand service to mobile users through different mobile cloud service providers (MCSP) (Wei-guang & Xiaolong, 2011). As increasing of user demand and mobile applications, MCC allows to integrate mobile network technology into the cloud computing. It takes advantages of typical cloud computing characteristics such as non-front investment, lower operating cost, highly scalable and easy access (Vaquero, Rodero-Merino, Caceres, & Lindner, January 2009). It also brings new types of services to mobile users and utilizes cloud computing to provide ubiquitous mobile service access. Cloud computing is a new computing paradigm that aims to provide reliable service and elastic scalable on demand of applications (Buyya, Yeo, & Venugopal, 2008). It has emerged

to utilize the Internet resources (e.g., computation, storage) conveniently and ubiquitously.

As cloud computing, MCC delivers new computing service to mobile users that including infrastructure-as-a-service (IaaS), platform-as-a-Service (PaaS), and software-as-a-Service (SaaS), in which users' applications are deployed and perform in the cloud(Vaquero, et al., January 2009). From the perspective of the cloud service providers, cloud computing is often viewed as a pool of resources in stationary machines for service delivery. These service providers manage a global network of datacenters, with each networked to combine the computing power of tens of thousands of commodity servers.

Cloud computing promises the availability of virtualized infinite resources. These elastic resources for mobile applications in a mobile environment, called mobile cloud computing (Gupta & Gupta, 2012). On the other hand, mobile computing technology played as an important role in the Internet. Today, mobile devices (e.g., tablet PC, Pad, smartphone, etc.), have become an essential part of human life. These devices need to be used "anywhere at anytime." In the mean times, we have also seen the rapid growth of mobile applications due to the mobile device popularity and ubiquity of mobile access. Many of mobile applications such as email, real-time multimedia, data and computation intensive applications can be performed on these mobile devices.

The mobile devices can sense the environment and e-health parameters to enhance the quality of life, remote monitor and gather relevant information. However, these devices still cannot execute multiple data and computing-intensive applications with large-scale data management and data mining. These applications often hit a performance wall because the mobile devices have limited storage, processing capability, scarce mobile network and energy resources comparing to a desktop PC. Unlimited resources offered by cloud computing

can help break through this wall and turn the problem into a vast opportunity for the growth of mobile computing. As increasing the number of mobile applications, it demands great resources and needs improving interactivity for better service provisioning. This underlines the importance of cloud computing for mobile services.

Mobile technology enters cloud computing domain by trying to access the shared pool of resources in data centres. Mobile technologies are drawing the attention to the clouds due to the demand of the applications requirement in terms of more computation capability, larger storage space and more processing power. By 2015, more than 240 million business customers will be leveraging cloud computing services through mobile devices according to the ABI Research (Narain), and the Juniper Research reports the market for cloud-based mobile applications is also expected to grow 88% annually by 2014 (Juniper Research). There are already some well-known cloud-based mobile applications; for example, Google's Gmail for iPhone (Google App Engine) and Cisco's WebEx on iPad. Cloud computing can broaden the range of applications available to mobile users beyond conventional office by supporting applications, such as 3D virtual environments, large storage capacity, or 3D medical imaging (Meir & Rubinsky, 2009). Mobile cloud provides new types of services and facilities for mobile users to gain full advantages of cloud computing.

A general view of mobile cloud computing scenario is shown in Figure 1. These applications are then accessed over the mobile network based on a thin native client or web browser on the mobile devices. In the other word, the mobile network and end-system resources can be allocated dynamically. Data and computation intensive mobileapplications benefiting from a mobile Cloud are related to various domains such as social networks, location based services, context-aware systems etc.

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