

# Chapter 6

## Information Sharing and Communications with Mobile Cloud Technology: Applications and Challenges

**Shantanu Pal**

*The University of St. Andrews, UK*

### **ABSTRACT**

*The use of mobile devices (e.g., smartphones, tablet computers, and PDAs) has steadily increased in recent years. At the same time the cloud-based applications have greatly enhanced the computing capabilities to these mobile devices. Therefore, the emergence of mobile-cloud technology is promising for offloading computations to the cloud. In this chapter we explore the state-of-the-art research in mobile-cloud technology and discuss the integration of the mobile devices and cloud-based applications. We begin by describing the mobile-cloud architecture and its functional components. Next, we explore the applications (e.g., education, healthcare, disaster management, etc.) and related challenges (e.g., bandwidth utilization, latency, connectivity, etc.) with the mobile-cloud technology. Finally, we outline the issues associated to these applications that need to be improved upon for delivering a more scalable and resource-enhanced mobile-cloud technology to the users.*

### **INTRODUCTION**

Nowadays smart mobile devices (e.g., smartphones, tablet computers and PDAs) have become more popular. These devices are not limited anymore to just sending a text or making a phone call. They have become more powerful in order to execute computing resources (e.g., processing and storage) (Han, et al., 2015). With this explosive growth in the use of mobile devices and the use of accessible cloud-based applications at a user's will, helps to provide a more convenient way of offloading computations through

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the resource-constrained mobile devices. Thus, the emergence of mobile-cloud technology (Giurgiu, et al., 2009) delivers a new platform by combining the mobile devices and cloud-based applications together, whereby improving the devices processing power and storage capacity.

Mobile-cloud technology is the abstraction of the cloud-based application that enables ubiquitous, convenient and on-demand network access to the services by the user's mobile devices through wireless networks. Moreover, the use of cloud-based applications enables the execution of rich mobile computations to these devices with a better user experience that improves the constraints related to bandwidth utilization, latency related issues or the battery power for the devices (Fernando, et al., 2013).

The term 'cloud' refers to a distributed resource pool which enables networks, servers or storage to access configurable hosted services over the Internet in a 'pay-as-you-go' manner (Armbrust, et al., 2009). This kind of service is rapidly provisioned and needs minimal management efforts to gain access by the users. Moreover, the use of cloud-based applications improves the reliability and accessibility of data through the mobile devices. Therefore, mobile-cloud technology enables users an efficient use of networks with unified elastic resources of various applications aimed at storage, processing power and extensive functionality (e.g., the low cost of applications) of the devices.

In this chapter, we explore the various applications of mobile-cloud technology in different sectors. The scope of this chapter is to outline a set of mobile-cloud based applications which includes online learning applications, mobile healthcare, automated traffic management systems etc., and then we further outline the challenges e.g., bandwidth, latency, connectivity etc. related to these applications. In addition, we discuss the possible countermeasures to address these challenges. The major contributions of this chapter are as follows:

- A comprehensive analysis of the applications scenarios with this state-of-the-art research in mobile-cloud technology.
- A detailed discussion of the existing challenges that are related to these applications with the intent to bring attention to motivate further research for a more scalable and resource-enhanced mobile-cloud technology.
- An overview of the recent research advances with the possible countermeasures to identify these challenges that need to be improved upon for a better mobile-cloud application for the users in the future.

The rest of this chapter is organized as follows. Section 'BACKGROUND' describes the background of both, this research and mobile-cloud architecture and its functional components. In Section 'APPLICATIONS AND CHALLENGES', we explore the state-of-the-art applications and related challenges and issues related to mobile-cloud technology followed by the comprehensive summary of the applications, techniques, challenges and possible countermeasures (in Section 'SUMMARY'). Finally, we present our concluding remarks in Section 'CONCLUSION'.

## **BACKGROUND**

Mobile-cloud technology primarily focuses on the user's mobile devices to access cloud-based services through wireless network communications (Qi & Gani, 2012). This is achieved when mobile applications are deployed (i.e., mobile offloading) to the cloud servers or cloud-based applications run inside

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