

# Chapter 92

## The State of the Art Forensic Techniques in Mobile Cloud Environment: A Survey, Challenges and Current Trends

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### ABSTRACT

*Smartphones have become popular in recent days due to the accessibility of a wide range of applications. These sophisticated applications demand more computing resources in a resource constraint smartphone. Cloud computing is the motivating factor for the progress of these applications. The emerging mobile cloud computing introduces a new architecture to offload smartphone and utilize cloud computing technology to solve resource requirements. The popularity of mobile cloud computing is an opportunity for misuse and unlawful activities. Therefore, it is a challenging platform for digital forensic investigations due to the non-availability of methodologies, tools and techniques. The aim of this work is to analyze the forensic tools and methodologies for crime investigation in a mobile cloud platform as it poses challenges in proving the evidence.*

### 1. INTRODUCTION TO MOBILE CLOUD COMPUTING

Mobile cloud environment utilizes unlimited resources offered by a cloud computing in a resource constraint mobile environment (Liu, Jain, Hu, Zhao, & Zhang, 2009). Mobile Cloud computing

is a combination of two new emerging information technology worlds. The motive of the mobile cloud computing concept is to make use of the computing power of the cloud environment and make it available to the mobile devices in order to solve the challenges in a mobile environment. In recently developed mobile cloud architecture,

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mobile devices can access cloud services either through ad-hoc mobile network or access points (Khan, Othman, Madani, & Khan, 2013). Smartphones are enhanced with powerful hardware in recent years. However, device energy, network connectivity, bandwidth utilization, and mobility are the major constraints for smartphones. The usage of Smartphones has since skyrocketed as it offers several attractive facilities such as surfing the Internet, checking e-mails, video-conferencing, accessing social websites, road navigation, and editing documents. Blackberry, iPhone, and Android Smartphones are most popular in the mobile market. Factors like device's weight, battery life, and heat dissipation limits the applications that can run on these Smartphones. However, the rapidly evolving technology of cloud computing could assist Smartphones to manage these critical factors, by running and storing applications in the cloud. Moreover, mobile cloud computing assists mobile devices to overcome the limitations in terms of data storage, bandwidth, heterogeneity, scalability, availability, reliability, and privacy (Dinh, Lee, Niyato, & Wang, 2013).

Cloud computing is a shared collection of configurable networked resources that can be re-configured in a short time with minimal effort. In the cloud environment, the cloud service providers maintain data centers worldwide (global cloud exchanges) to guarantee service availability and cost-effectiveness (Buyyaa, Yea, Venugopala, Broberg, & Brandic, 2009) and the cloud offers vast storage and facilities to its users. From the cloud user's point of view, it would be an attractive feature for a start-up organization and fabrication line in case of a hardware startup organization (Michael Armbrust, et al., 2009). An essential component of the cloud computing environment, characteristics, service and deploy models are described in (Lovell, 2011). Mobile devices are capable of performing a collection of functions that ranges from a simple voice call to the complex functions of a personal computer. The imperative characteristics of mobile phones include operating

systems, memory considerations, identity module characteristics, and communication protocols. A detailed description and architecture of all mobile device's OSs found in (Yates, 2010) (Casadei, Savoldi, & Gubian, 2006).

With the rise in demand, several threats grow continuously, and there are only limited security features currently available for the mobile device and the platform. Cyber criminals and illegal organizations are likely to take advantage of any emerging technology to commit crimes. Rapidly growing mobile cloud computing technology can be used to broadcast terrorist ideology, share information, and facilitate communication for attacking someone's digital information. Thus, the mobile cloud forensics play an important role in performing forensics in recently developed Smartphone applications that include bump payments, mobile credit billing, and location aware commerce. Mobile cloud forensics deals all illegal activities that utilize cloud to implement them. The mobile cloud forensics established that investigates integration of the virus into cloud applications, utilization of mobile cloud by terrorists, and illegal activities implemented in cloud storage applications such as Dropbox and SkyDrive. In recent days, forensic tools are capable of recovering a localized image in which the virtual machine images move from a cloud-computing platform to the local forensic environment for performing forensics in the virtualization platform.

### **1.1. Potential Applications of Mobile Cloud Computing**

Applications of mobile cloud are successful in five categories such as productivity, utilities, social networking, games and search (Research, 2009). The application in the productivity category is most successful among these categories that mainly focus on enterprise-based applications such as data sharing, customer relation management, scheduling, multi-tasking, and merchant services. Moreover, applications of mobile cloud comput-

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