

## MOBILE CLOUD COMPUTING – PROTECTION ISSUES

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### ABSTRACT

Mobile cloud computing can improve user experiences by executing applications on resource providers and exchange data on mobile devices. Mobile Cloud Computing (MCC) is a revolutionary application in the mobile computing world. This paper presents the concept of mobile cloud computing besides recommending a new term called M-cloud that is yet to be further explored. The various modules of this paper consist of MCC applications, major concerns and security concerns with related preventive measures.

*Keywords: MCC, applications, Security*

### 1.0 INTRODUCTION

Mobile Cloud Computing (MCC) is the process which integrates mobile computing and cloud computing, which has become one of the major themes in mobile computing. It is a combination of mobile computing, mobile internet and cloud computing. Therefore, mobile cloud computing can also be called as cloud computing using mobile internet. Mobile Cloud Computing is able to make an arrangement where both the data storage and data processing transpire outside of the mobile device. Cloud computing arises when tasks and data are kept on the Internet rather than on individual devices, providing on-demand access. In mobile cloud computing, the former mobile device-based intensive computing, data storage and bulk information control have been relocated to 'cloud' and thus the requirements of mobile devices in computing capability and resources have been compressed. Mobile cloud applications transfer the computing control and data storage ability from mobile phones and place it into the cloud, transporting applications through mobile computing which is not only made for Smartphone users but a much broader range of mobile subscribers.

### 2.0 CLOUD COMPUTING SERVICE MODELS

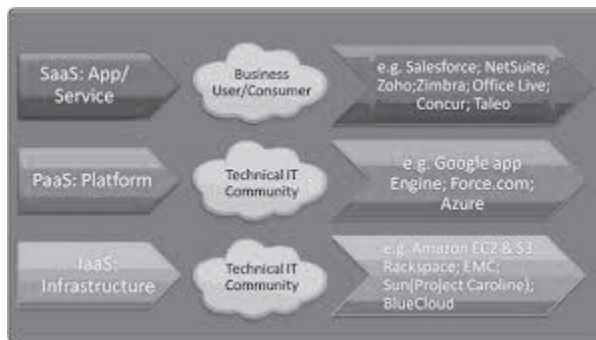
M.Rajendra Prasad et al (2012) states that Cloud computing can be viewed as a collection of services, often described as a stack of services built on top of one another. The three distinct models within Cloud Computing are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

SaaS is defined as software that is deployed over the internet. With SaaS, a provider licenses an application to customers either as a service on demand, through a subscription, in a "pay-

as-you-go” model, or (increasingly) at no charge when there is opportunity to generate revenue from streams other than the user, such as from advertisements". SaaS applications are designed for end-users, delivered over the web.

PaaS can be defined as a computing platform for the creation of software, delivered over the web, and consists of a set of tools and services designed to make coding and deploying web applications quick and efficient.

IaaS refers to the method of delivering Cloud Computing infrastructure; servers; storage; network or operating systems as an on-demand service. The user does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components.

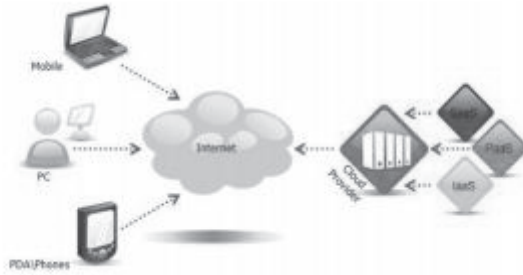


**Fig 1: Cloud Computing Service Model**

### 3.0 MOBILE CLOUD COMPUTING ARCHITECTURE

Jasleen et. al (2013) studied the Mobile cloud computing (*MCC*) platform at its simplest form and refers to it as an infrastructure where both data storage and data processing takes place outside of the mobile device.

Mobile cloud applications change the computing ability and data storage away from mobile devices and into powerful and centralized computing platforms located in clouds, which are then accessed over wireless connections based on a thin native client.



**Fig 2: Mobile Cloud Computing Architecture**

#### 4.0 MOBILE COMPUTING APPLICATIONS.

According to Pooja N. Dharmale et. al. (2015) some of the applications of mobile cloud computing are Google's Gmail drive, Maps and Navigation systems for Mobile devices, I-cloud from Apple Moto Blur from Motorola (with a special feature called remote wipe) and Amazon's new "cloud accelerated" Web browser Silk. Amazon's Silk is a "split browser whose software resides both on Kindle Fire and EC2". The applications reinforced by mobile cloud computing include mobile commerce, mobile learning, mobile healthcare and other common areas. Mobile applications have created an extensive share in the global mobile market. Various mobile applications have engaged the recompenses of Mobile Cloud Computing. The following are few of the inferences:

**M-Commerce:** Mobile commerce (m-commerce) facilitates the buying and selling of products using mobile devices. These commerce applications are normally used to achieve some tasks that necessitate mobility (e.g., mobile transactions and payments, mobile messaging, and mobile ticketing). The m-commerce applications face various complications (e.g., low network bandwidth, high complexity of mobile device configurations, and security). Subsequently, m-commerce applications have been integrated into the cloud computing environment to solve the earlier mentioned issues.

**M-Learning:** According to Jian Li et. al. (2010), X. Chen et. al. (2010) and H. Gao et. al. (2010) Mobile learning (m-learning) is an electronic learning (e-learning) and mobility service. However, traditional m-learning applications have limitations in terms of high cost of devices and network, low network transmission rate, and limited educational resources. Cloud based m-learning applications are introduced to solve these limitations, for example, utilizing a cloud with large storage capacity and powerful processing ability, provides learners with much richer services in terms of data (information) size, faster processing speed, and longer battery life.

**M-HealthCare:** According to D. Kopec et. al. (2003), MCC in medical applications is used to minimize the limitations of traditional medical treatment (e.g., small physical storage, security and privacy, and medical errors) [13]. Mobile healthcare (m healthcare) offers mobile users

with appropriate help to access resources easily. M-Healthcare provides healthcare organizations with diverse on-demand services on clouds compared to standalone applications on local servers.

**M-Banking:** M-Banking is the new development in traditional banking services, where users can utilize banking services provided to them through their mobile devices regardless of the location and time. Transactions can be done even through SMS or the mobile Internet if users are busy with their routine work. Moreover, they can also use special programs, called mobile applications, downloaded to their mobile device.

**M-Game:** Mobile game (m-game) is a prospective income generating market for service providers. M-game can completely offload game engines requiring large computing resources (e.g., graphic rendering) to the server in the cloud, and gamers only interact with the screen interface on their devices [14]. This demonstrates that offloading (multimedia code) can save energy for mobile devices, thereby increasing game playing time on mobile devices.

#### 4.1 BENEFITS OF MOBILE CLOUD COMPUTING

Mobile Cloud Computing can help to reduce the dispensation of power and data storage of mobile devices. It might also help to increase the battery life by affecting the performance of commutation-intensive applications ‘to the cloud’. Mobile Cloud Computing can improve the security level for mobile devices attained by a unified monitoring and maintenance of software. It’s a one-stop shopping option for users of mobile devices as Mobile Cloud Operators can act as virtual network operators, providing many types of e-services. A new technical function might be given by mobile clouds for storing data or running applications on clouds as an operative way to improve reliability.

#### 5.0 MOBILE CLOUD COMPUTING SECURITY

The key issues that most cloud providers are giving attention to is securing mobile cloud computing for users’ privacy and integrity of data or applications. Subsequently mobile cloud computing is a combination of mobile networks and cloud computing and thus, the security related issues are classified into two categories:

- **Mobile network user’s security**
- **Cloud security**

**Mobile network security:** Different mobile devices have a number of security threats such as malicious codes while some applications on cloud can cause privacy issues for mobile users. There are two main issues concerning the mobile users’ security.

**Mobile Application Security:** The easiest ways to check security problems is done by installing and running security software and antiviruses on mobile devices. But since mobile devices possess limited processing and power capabilities, protecting them from these threats could be more difficult compared to regular computers. Several techniques have been introduced for transferring threat detection and security mechanisms to the cloud. Before mobile users could use an application, it should go through some level of threat evaluation. All file activities that are done on mobile devices will be verified to discover if it is malicious

or not. Instead of running antivirus software or threat detection programs locally, mobile devices only perform lightweight activities such as execution traces transmitted to cloud security servers.

**Privacy:** Revealing your private information such as geographic location and users' important information like date of birth, credit card information etc. creates vulnerability for issues for users. For example, use of GPS on mobile devices. Threats of intimidations rising from revelation of private information could be reduced through selecting and analyzing the enterprise needs and ensuring only specified services acquired and moved to the cloud. The concept of privacy varies widely among (and sometimes within) countries and cultures. It is shaped by public expectations and legal interpretations, as such, a concise definition is elusive if not impossible. Privacy rights or obligations are related to the collection, use, disclosure, storage, and destruction of personal data (or Personally Identifiable Information—PII). At the end of the day, privacy is about the accountability of organizations to protect users' data, as well as being transparent to an organization's practice around personal information.

## 5.1 PREVENTIVE MEASURES

The following are the preventive measures to secure users' information on cloud:

**Integrity:** Every user must guarantee the integrity of their information stored on the cloud. Every access they make must be valid and verified. A different method in preserving veracity for one's information that is stored on the cloud is being proposed which ensures that unauthorized modification, destruction or creation of information does take place.

**Authentication:** Different authentication techniques have been accessible and projected using cloud computing to secure the data access suitable for mobile environments. Some use open standards and even provide the integration of various authentication methods.

**Legal provisions:** Distribution of pirated digital contents such as video, image, audio, and e-book, programs should be criticized. The solutions to protect these contents from illegal access are by applying encryption and decryption keys to enable access to these contents.

## 6.0 CONCLUSION

Mobile Cloud Computing provides an environment for applications, providing an easy way for smaller developers to secure their services. It also enables on-demand network access to a shared pool of configurable computing capabilities that can be rapidly provisioned and unconfined with minimal management effort or service provider interaction. Mobile cloud computing is one of the mobile technology trends for the future since it combines the advantages of both mobile computing and cloud computing, hence providing optimum services for mobile users. This paper has also discussed security issues concerning to mobile cloud computing. Securing mobile cloud computing users' privacy and integrity of data or applications is one of the key issues most cloud providers are taking care of which is divided into two categories: mobile network users' security; and mobile cloud security.

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