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# Future Mobile Cloud Computing of Next Generation Computing

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**Abstract—** This Mobile device has become essential part of human life. Apart from call and receive functions, user can access many function in his/her mobile. A user wants everything on his/her mobile device for the ease of work. Some people use tablets instead of laptop or desktop. In this paper, insights into Mobile Cloud Computing (MCC) are presented. First overview of cloud computing system is discussed. Then after architecture of MCC is presented. Some applications based on MCC are also discussed and paper is concluded by exploring the problems and solutions of these in MCC.

**Keywords:** ***Cloud Computing, Software as a Service (SaaS), Platform as a Service(PaaS), Infrastructure as a Service (IaaS), Mobile Cloud***



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## I. INTRODUCTION

The invention of Internet has affected the way of searching the information by a human. Today abundance of information is available to the user from the Internet through single click of mouse. In the earlier days, the software was utilized and sold as package and user was happy about this mode of usage. As the usage of Internet increased, the software companies have provided us the way to consume software on pay per usage basic. This is known software as a service (SaaS) [2], which is part of Cloud Computing [1], [12]. In the following section, overview of Cloud Computing is discussed. In section 3, architecture of Mobile Cloud Computing and issues related to it are presented. The paper is concluded with the conclusion section by suggesting the future development in the area of mobile based cloud computing.

## II. RELATED WORKS

Cloud computing is a style of computing where elastically scalable IT-enabled capabilities are delivered "as a service" to external customers using Internet technologies. These days Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) [2],[3] has also become popular where the entire infrastructure can be consumed as service. As focus of this paper is SaaS, further information regarding IaaS is not presented in this paper. There are major players of SaaS such as Google, Amazon, Microsoft [3] etc available in market today. Companies like Accenture also presented the research in [1] regarding certain aspects of cloud computing. Google drive is getting more popular recently as user can use it with ease. Primary requirement of SaaS is Internet connectivity. The architecture of cloud computing system is presented in Fig.1. A cloud computing system generally contains characteristics such as on demand self-service, ubiquitous

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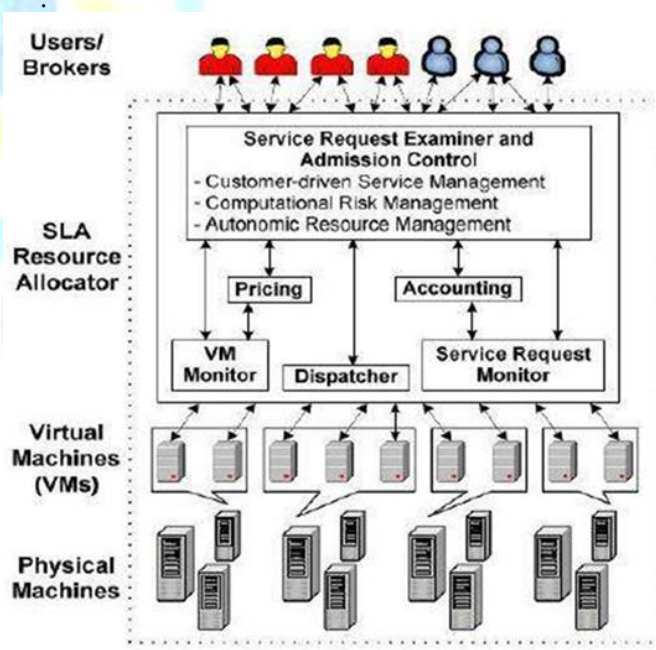


Fig.1. Cloud computing architecture as per [2]

public cloud, hybrid cloud and community cloud [2]. Private cloud: private cloud is also known as internal cloud, which is generally owned by institute or organization. For example an organization having the blade server where all the departmental services are located at this server. Public cloud: public cloud is sold to public having mega

infrastructure such as Amazon cloud service. Hybrid cloud: It is a mixture of any of available clouds. Community cloud: It is a cloud for specific community such as cloud based Learning Management System, which is proposed in our previous work [4], for academic institutes. As the advancement in mobile devices, companies now shift their focus to provide cloud based services on mobile device which is popularly known as Mobile Cloud Computing (MCC)[5],[6]. In the following section, MCC is explored in details.

## III. MOBILE CLOUD COMPUTING

In present days, use of smart phones, PDAs is common for all kind of people ranging from a small kid to old age person. This is possible because of the availability high quality mobile devices are available at cheap price. Throughout this literature mobile device, smart phone or PDAs are used interchangeably. The progression in telecom industry led to provide Internet access is easily in these devices at cheap prices. Most of the people prefer to control everything via their mobile devices to ease their work. This situation created enough space to develop cloud computing system based on the mobile devices, which is also known as Mobile Cloud Computing (MCC). As per the definition from CISCO [7] MCC is mobile services and apps delivered from a centralized (and perhaps virtualized) data centre to a mobile device such as a

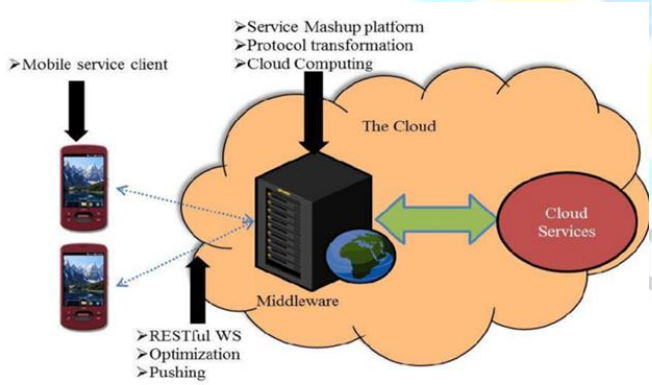


Fig.2. Mobile Cloud computing architecture [11]

It is not necessary to use desktop or laptop to use cloud services if MCC service is available on mobile devices. Today MCC is very useful to help people to share videos and photos various social networking websites such as Facebook and Twitter. The useful MCC application such as Melog [11] is very useful to share real experience at various places. Some MCC based services are useful to find route of desired location by using GPS and mobile device. As per [8] MCC can be helpful in different domains such as image processing, natural language processing, crowd computing- to find missing person, sharing GPS/ Internet data, sensor data, multimedia search and social networking. In Fig 2, architecture of MCC is presented. As per the architecture presented in fig 2, middleware such as Simple Object Access Protocol (SOAP) or Representational State Transfer (REST) web services can be useful to consume the service and then delivering the results to the mobile client. The steps are as follows: 1. The mobile client sends a HTTP GET request to the middleware. 2. The middleware with interaction with the web service. 3. Then middleware extracts the required service results from the original service result and prepares a new service results in particular format and returns this result to the mobile client. A middleware is requires as cloud services don't support mobile devices [10]. Based on this architecture many authors proposed systems based on MCC. The authors in [12] compared Amazon Elastic Cloud Computing (EC2) and Google Apps and provided the comparative study of different features to conclude which is better on which feature. The authors discussed different challenges to MCC such as low power of device, low band width, network access, security of data etc. In [13] J2ME based MCC is proposed. The authors develop this system to resolve problem of limited resources in the mobile device. Details regarding security set up were not reported in this paper. For secure data storage Zhibin Zhou and Dijiang Huang[14] proposed efficient model for MCC. The authors proposed novel Privacy Preserving Cipher Policy Attribute-Based Encryption (PP-CP-ABE) to protect users' data. This model is tailor made for the light weight devices to perform encryption and decryption. In [15], the features and infrastructure of mobile cloud computing are discussed. The paper analyzed the challenges of mobile cloud computing such as Limitations of mobile devices, Quality of

Virtualization and Image, Task migration, Bandwidth upgrading, Data delivery time reducing, Elastic application division mechanism to overcome these problems. Another re]search paper on MCC is proposed in [16], which focused on similar challenges and solutions in MCC. In [17], concepts such as Mobile Software as a Service, Mobile Infrastructure as a Service and Mobile Platform as a Services are introduced. The authors focused on mobile technology which is focused on pooling and sharing of resources in these devices.

## IV. METHODOLOGY

Mobile Cloud Computing will be on demand in the upcoming 10 years. As the use of mobile devices and MCC based services will increase, the user data must be secured especially in the public cloud as data is vulnerable in the large public infrastructure. This technology is yet at its young stage so issue like security is a major concern to address. In the literature presented in this paper only one paper [14] addressed and provided good solution to provide security in MCC. Many researcher are focusing on the developing various security algorithms to secure user data in MCC environment. So, in future there is wide scope to

develop such security system which can complement MCC. We conducted one survey among 80 students of CMPICA and obtained the graph shown in fig 3, to determine the popularity of MCC. Out to 80 students, 75 students agreed to have MCC for the LMS. It is evident that MCC may replace the desktop based system as well as it might replace the PC or Laptop with mobile device.

## V. CONCLUSION

Mobile Cloud Computing will be on demand in the upcoming 10 years. As the use of mobile devices and MCC based services will increase, the user data must be secured especially in the public cloud as data is vulnerable in the large public infrastructure. This technology is yet at its young stage so issue like security is a major concern to address. In the literature presented in this paper only one paper [14] addressed and provided good solution to provide security in MCC. Many researcher are focusing on the developing various security algorithms to secure user data in MCC environment. So, in future there is wide scope to develop such security system which can complement MCC. We conducted one survey among 80 students of CMPICA and obtained the graph shown in fig 3, to determine the popularity of MCC. Out to 80 students, 75 students agreed to have MCC for the LMS. It is evident that MCC may replace the desktop based system as well as it might replace the PC or Laptop with mobile device.

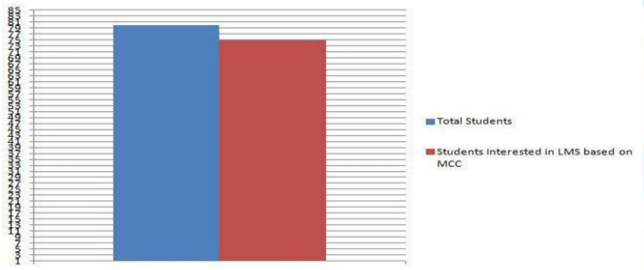


Fig.3. Graph containing number of students interested in MCC

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