

# Basic Overview of Mobile Cloud Computing

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**Abstract** - Mobile Cloud Computing (MCC) is a combination of Cloud computing and mobile networks. It is a technique or model in which mobile applications are built, powered and hosted using cloud computing technology. The capabilities of mobile devices have been improving quickly than computers. Many researchers focus on the area of mobile computing and cloud computing. The mobile computing means to access shared data or infrastructure through portable devices like PDA, smart phone, tablet and so on. Independently from physical location and cloud computing means a virtual computing, distributed computing or resources sharing. Mobile uses the cloud for both application development as well as hosting. The most of application in mobile is cloud based application i.e. IE, social networking apps like facebook apps, that accessible through cloud (internet). It provides the user to interface the data and services on the cloud platform .The mobile computing needed to be limited energy than regular cloud computing.

**Keyword**- Mobile Cloud Computing, mobile services, open issues.

## INTRODUCTION

Day by day mobile device like Smartphone's, tablets pcs are increasingly becoming a part of human life. As more efficient tools not bounded on time and place. Today's fastest world for mobile computing technological innovations are occurring at an accelerated rate. The basic concept of mobile cloud computing is the advantage of cloud computing is available for mobile user and provide additional functionality to the cloud. Mobile cloud computing will help to overcome the limitations of mobile devices in particular of the processing power and data storage. It will help to extend the battery life, storage and bandwidth. for communication like mobility and security.

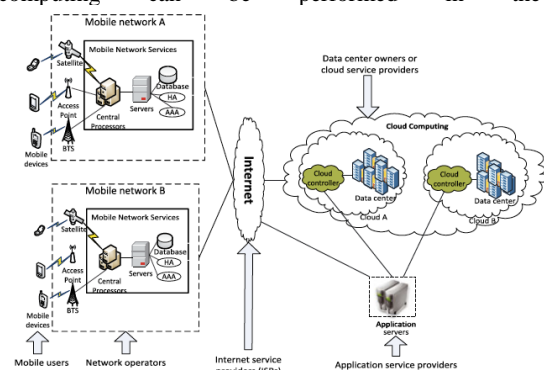
With a western centric view of the world ,it can sometimes be hard to remember that not everyone owns a Smartphone's .There are still a large number of markets worldwide where the dominant phone is a features phone while it is true that Smartphone will grow in percentage and features phones will become more sophisticated in time these lower end phones are not going away anytime soon. And its their very existence which will help drive the mobile cloud computing trend.

This paper present a survey of mobile cloud computing. This paper represent a survey on mobile cloud computing. section II provide a overview of mobile cloud computing including definition architecture and benefits. section III discusses challenges and their solution of mobile cloud computing. section IV shows the current use of application. section V describe the computational offloading and there types. section VI present several open issues in mobile cloud computing. Finally we summarized and conclude.

### [I] Architecture of MCC

Mobile cloud Computing is define as *“Mobile Cloud Computing at its simplest, refers to an infrastructure where both the data storage and the data processing happen outside of the*

*mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just Smartphone users but a much broader range of mobile subscribers”*. Mobile cloud computing is the combination of cloud computing and mobile computing and wireless network to bring rich computational resources to mobile users, network operators as well as cloud computing provider. Cloud computing offers advantages to users by allowing them to use infrastructure, platforms and software by cloud providers at low cost and elastically in an on-demand fashion. Mobile cloud computing provides mobile users with data storage and processing services in clouds, obviating the need to have a powerful device configuration (e.g. CPU speed, memory capacity etc), as all resource-intensive computing can be performed in the cloud.



Fig

shows Architecture of mobile cloud computing

The above figure shows the general architecture of mobile cloud computing. mobile devices are connected to the mobile network via base station (eg base transceiver station (BTS), Access point, or satellite) that establish and control the connection and functional interface between the network and mobile devices. Mobile user request and information eg. id and location and transmitted to the central processors that are connected to server providing mobile network services. here mobile network operator can provide services to mobile user for authentication authorization and

accounting based on the home agent and subscriber data store in database.

After that the subscriber request are delivered to a cloud through the internet. in the cloud controllers process the request to provide mobile user with corresponding cloud services these are developed with the concept of utility computing virtualization and services oriented. There is four layered architecture that is data centre layer, Infrastructure as a service(IaaS), Platform as a service(PaaS), Software as a service(SaaS). the user can use the services flexibly and efficiently.

### 1] Data centre Layer:

It provide the hardware and infrastructure facility for cloud. A number of servers are linked with high speed network, it provide service for customer.

### 2] Infrastructure as a Service (IaaS):

IaaS is top of the data centre layer. it enabled the provision of data, hardware, servers and networking components. Client can save the payment on which resources they really use example of IaaS are Amazon elastic cloud computing and simple storage service.

### 3] Platform as a Service (PaaS) :

PaaS provide an advanced integrated environment for building, testing and deploying custom applications example are google app engine, microsoft azure and amazon map reduce.

### 4] Software as a Service (SaaS):

The user can access an application and information remotely via internet and pay for this to user. SaaS supports a software distribution with specific requirement. Microsoft live mesh allow sharing files and folders across multiple devices simultaneously.

## 2.1] Benefits of Mobile Cloud Computing:

### 1] Extended Battery lifetime:

- Computation offloading migrates large computations and complex processing from resource limited devices to resourceful machine.
- Remote application executions can save energy significantly

### 2] Improving data storage capacity and processing power:

- Mobile Cloud Computing enables mobile users to store access large data on the cloud.
- The running cost for computation intensive application is reduce.
- The data is stored on the cloud not in mobile application.

### 3] Improving reliability and availability:

- Mobile Cloud Computing can be designed as a comprehensive data security model for both service providers and users. Protect copyrighted digital contents in clouds. Provide security services such as virus scanning, malicious code detection, authentication for mobile users.
- With data and services in the clouds, then are always(almost) available even when the users are moving.

## [III] CHALLENGES AND SOLUTIONS OF MOBILE CLOUD COMPUTING

The major challenge of mobile cloud computing comes from the characters of mobile devices and wireless networks, as well as their own restriction and limitation, and such challenge makes application designing, programming and deploying on mobile and distributed devices more complicated than on the fixed cloud devices Table 1 gives an overview of proposed challenges and some solutions of MCC

challenges	Solution
Limitation of mobile device	Virtualization & Image task migration
Quality of communication	Bandwidth upgrading, Data delivery time reducing
Division of application services	Elastic application division mechanism

### 1] Limitation of Mobile Device:

Battery is one of the main part of mobile device. Traditional approaches need to change the structure of mobile devices. the additional cost for the eng mobile users is not appealing in wireless network. The solution required for this is computation offloading technique means Immigrate the large computations and complex process from mobile devices to servers in cloud. This avoids taking a large application execution time on mobile device which result in large amount of power consumption.

### 2] Quality of communication:

In wired network use physical connection to ensure bandwidth consistency and the data time is constantly changing and the connection is discontinuous due to this the solution is that dynamically changing of application throughput, mobility of users and even weather lead to change in bandwidth & network overlay.

### 3] Division of application services:

User want to need the reliable backup for their information and lack of data security model for both service providers and user in existing mobile users. This reduces the chance of data and application lost on the mobile devices mobile cloud computing can be designed as a data security model for both service provider & user the cloud can remotely provide to mobile users with security such as virus scanning, malicious code detection and authentication.

## [IV] MOBILE CLOUD COMPUTING BASIC APPLICATION

### 1] Mobile Commerce:

Mobile commerce is a business model for commerce using mobile devices



There are some categories of m commerce Finance, advertising , Shopping

Application Classes	Type	Examples
Mobile financial applications	B2C, B2B	Banks, brokerage firms, mobile-user fees
Mobile advertising	B2C	Sending custom made advertisements according to users physical location

Mobile shopping	B2C, B2B	Locate/order certain products from a mobile terminal
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Mobile commerce is a business model for commerce using mobile devices. The m-commerce application generally fulfills some tasks that require mobility, such as mobile transaction payments, mobile messaging, and mobile ticketing. M-commerce applications can be classified into a few classes including finance, advertising, and shopping. It faces various challenges (low network bandwidth, high complexity of mobile device configurations & security). M-commerce is integrated into a cloud computing environment to address these issues.

## 2] Mobile Learning:



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 the large storage capacity and powerful processing ability, the applications provide learners with much richer services in terms of data (information) size, faster processing speed, and longer battery life.

## 3] Mobile Healthcare:



Mobile healthcare provides mobile users with convenient help to access resources (e.g. patient health records) easily and quickly. It offers hospital and healthcare organizations a variety of on-demand services on cloud rather than relying on standalone applications on local servers. Some schemes of m-commerce in healthcare include comprehensive health monitoring services, intelligent emergency management systems, health-aware mobile devices, pervasive access to healthcare information, pervasive lifestyle incentive management.

## 4] Mobile



## Gaming

Mobile game (m-game) is a potential market generating revenues for service providers. M-game can completely offload game engine requiring large computing resources (e.g., graphics

rendering) to the server in the cloud, and gamers only interact with the screen interface on their devices.

## [V] COMPUTATIONAL OFFLOADING

Computational offloading is a main feature of mobile cloud computing. It reduces energy consumption of mobile devices from client to cloud. They include efficient and dynamic offloading under environment changes. There are two types of offloading environments: static environment and dynamic environment.

### a) Offloading in the static environment :

A program partitioning based on estimation of energy consumption before execution. Optimal program partitioning for offloading is dynamically calculated based on the trade-off between the communication and computation costs at run time. A cost graph is constructed and a branch-and-bound algorithm is applied to minimize the total energy consumption of computation and the total data communication cost. Online statistics of the computation time are used to compute optimal timeout and if the computation is not finished within timeout, it is offloaded to the server. Saves up to 17% more energy than existing methods.

### b) Offloading in the dynamic environment:

For the dynamic environment, offloading encounters new problems such as changing connection status and bandwidth and data may not reach the end users. They consider three circumstances of executing an application to estimate the efficiency of offloading: performed locally (without offloading), performed in ideal offloading systems (without failures) performed with the presence of offloading and failure recoveries (re-offload after failure). Then these application partitions are packaged in mobile agents and sent over the network to the selected instances to start running, and the application task is completed with agent collaboration without further management by the mobile platform.

## [VI] OPEN ISSUES IN MOBILE CLOUD COMPUTING

There are several issues in mobile cloud computing where research to development of mobile cloud computing but this section will provide several open issues for future development point of view to the researchers for developing the mobile cloud computing.

### 1] Low Bandwidth:

The bandwidth limitation is a big issue because the number of mobile and cloud users is day by day increasing in very high speed so we considered that 4G network and femtocell are a very promising technology that overcome the limitation and bring a revolution in improving bandwidth.

### 2] Network Access Management:

Network management improves the link performance and bandwidth usage for mobile users. Cognitive radio as a solution to achieve the wireless access management in mobile communication environment.

### 3] Quality of Services:

The mobile users face many problems such as network disconnection, congestion due to limitation of wireless bandwidth and signal attenuation caused by mobile user, so quality of services is reduced significantly. To overcome this limitation in future directions two new researches are cloudlets and cloudlets is expected to reduce the network delay.

### 4] Standard Interface:

The interface between the mobile users and cloud are mostly based on the web interface. However first of all web interface is not specifically developed for mobile device and also not compatible with the device so web interface could be an

issue. To overcome this the promising technique is HTML5 address this issue. HTML5 WebSockets offer an interface and it will work more efficiently.

## [VII] CONCLUSION

Mobile Cloud Computing is one of the best mobile technology in the future for providing optimal services for mobile. According to recent study by ABI research, a New York based firm, more than 240 million business will use cloud services through mobile device by 2015. that traction will push the revenue of mobile cloud computing to \$5.2 billion. With this survey the paper present an overview of mobile cloud computing in this its definitions, architecture, and its benefits. challenges and there solutions is described MCC supported different type of application mention it clearly for wide range of mobile services. Finally several open issues were described as future use.

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