

# A Review on Mobile Cloud Computing

*Kusum Lata, Er. Sugandha Sharma*

Chandigarh University Institute of Engineering and Technology,  
 Gharuan Mohali Punjab  
[kusumdhiman212@gmail.com](mailto:kusumdhiman212@gmail.com)  
 Chandigarh University, Institute of Engineering and Technology,  
 Gharuan Mohali Punjab  
[sugandha.ss1@gmail.com](mailto:sugandha.ss1@gmail.com)

**Abstract:** Mobile Cloud computing is the ability of cloud computing services in the environment of mobile by providing different and optimal services for mobile users. Mobile Cloud Computing incorporates all elements of mobile networks and cloud computing. In MCC data and computing modules can be processed in the cloud and mobile device have no need to do configuration like memory capacity, CPU speed etc. However mobile device facing up many struggles in their resources like privacy, mobility and security. These challenges have large affect in the improvement of service qualities of MCC. In this paper, we discuss the review on MCC technologies and its architecture, characteristics, applications, advantages, limitations and offloading techniques of mobile cloud computing.

**Keywords:** about four key words separated by commas.

## 1. Introduction

Over the past few years, advances in field of network based computing and mobile cloud computing applications Mobile Cloud Computing (MCC) has been introduced as technology for Mobile services. Mobile Cloud Computing refers to an infrastructure or an environment where both data process and data storage happen outside of the mobile device. Mobile Cloud Computing is basically the combination of mobile computing and cloud computing that includes hardware, software and communication for performing different operations like accessing information, storing data and running different applications on mobile devices. The focus of Mobile Cloud Computing is to provide accurate, real time and valuable information to the user or client. The motive of Mobile Cloud Computing is to modify the execution of mobile phone's applications with a rich user experience and efficient results. It also provides business opportunities to both cloud providers and network operators. It is a kind of rich mobile cloud computing technology that unified resources of cloud computing and different network technologies with functionality like mobility that are used to serve mobile device from anywhere, anything with the use of Ethernet and internet with the heterogeneous environment and environment which have pay -as -you use principle in mobile cloud computing.

Due to the large and heavy applications in internet, Mobile Cloud Computing has become a very good research topic of industrial and scientific research. The Mobile Cloud Computing application is becoming more popular day by day. The different Mobile Cloud Computing applications have been developed and served to mobile user like Gmail, Google Maps and navigation system for mobile voice search and android based applications which are very beneficial for user in these days. The main motive behind Mobile Cloud Computing is to deliver services, processing and software and increase storage, automating system, reduce cost and de-coupling different service delivery from underlying technology and give the flexibility and mobility for different purposes.



**Figure 1:** Mobile Cloud Computing Environment

Mobile Cloud Computing applications move data storage and computing powers from mobile phones and into cloud environment. It is a kind of new paradigm for mobile applications where storage and data processing are moved from mobile device to centralized and powerful computing platform that is in cloud over internet. All these centralized applications are accessed by the help of wireless connection that is based on web browser, client of mobile devices. It is simply the combination of cloud computing and web which is beneficial for mobile user to access services and application on internet in these days.

## 2. Mobile Cloud Computing Architecture

The architecture of MCC is composed from internet services provider, cloud services provider, mobile operator and mobile users. The general architecture of Mobile Cloud Computing can be shown in figure 2.

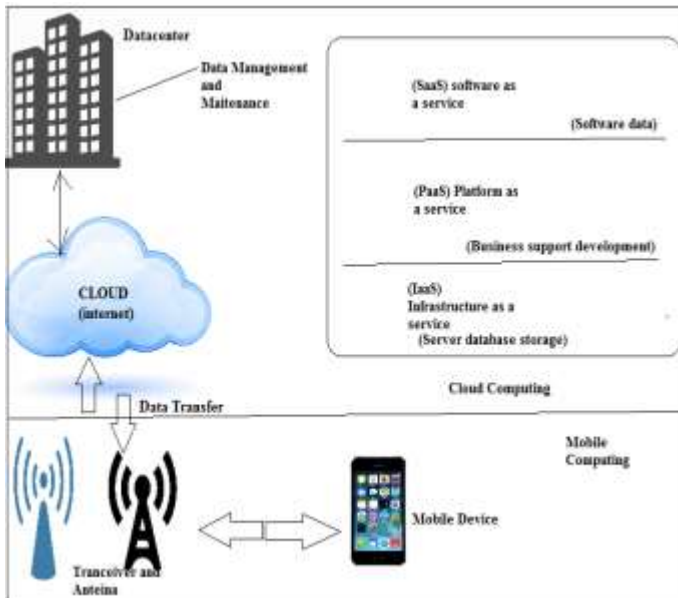


Figure 2: Architecture of Mobile Cloud Computing

The mobile devices like mobile phone, smart phones with mobile network with the help of access point /satellite and base station. The information is transferred and sends from mobile device and information is operated on CPU, database and server on mobile network provider side. After that subscriber is requested to the cloud with the help of internet and cloud process the request navigate to corresponding cloud services to provide mobile subscribers. This architecture provides advantages of cloud computing that are very beneficial for us. There are four deployment models that are identified in Mobile Cloud Computing Architecture that are explained as below:

### 2.1 Public Cloud

It provides on-demand services like business, government, organizational and academic. In Public Cloud, single administrator provides services to the multiple users. The only disadvantage of Public cloud is it is less secure in nature. This deployment mode represents the true cloud hosting. Services are rendered over a network that is open for users. The services are provided by vendors free of charge or based on pay per usage.

### 2.2 Private Cloud

The system and services is accessible only within an organization. The advantages of Private Cloud is high privacy, improve reliability, more security, cost and energy efficient in nature. This deployment model is owned by a single organization. Cloud infrastructure is operated for a single organization, managed internally and by third party. This deployment model is hosted internally and externally.

### 2.3 Hybrid Cloud

It generally includes the critical and non-critical activities of public and private cloud both. In hybrid cloud some network issues are faced. Hybrid cloud is also composition of public, private and community cloud. This deployment model is composition of two or more cloud that remains different identities but are bounded together and offering the benefits of multiple deployment models. This deployment model has

ability to manage, connect dedicated services with cloud resources.

### 2.4 Community Cloud

The system and services are accessible by a group of organizations in community cloud. In this deployment model organization with similar requirements share a cloud infrastructure. This model is helps to reduce costs as compared to the private cloud deployment model.

## 3. Applications of Mobile Cloud Computing

Mobile cloud computing has various number of applications in different field and a large range of mobile cloud computing applications have been introduced in present literature. These different applications are fall into different areas that include natural language processing, image processing, internet sharing, sensor data applications, multimedia search, querying and crowd computing. These applications are introduced as below:

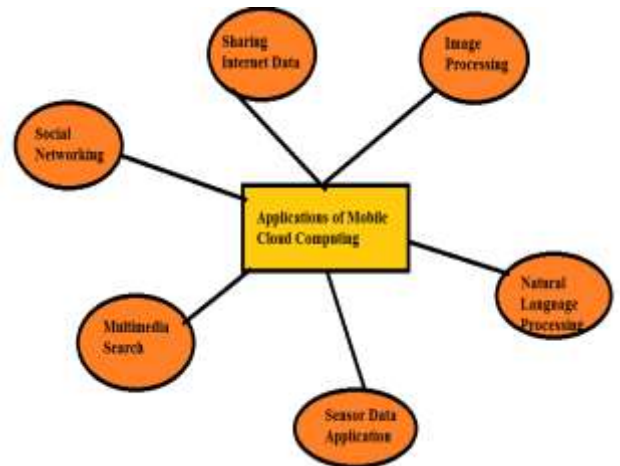


Figure 3: Applications of MCC

### 3.1 Sharing Internet Data

With the help of peer-to-peer connection and local network area data can be easily share among no of mobile devices that are near to each other. It is faster and cheap in cost also.

### 3.2 Image Processing

If the mobile user visit any place and he can't perceive the language of that place then he can take pictures of that place and using mobile cloud computing to understand the language of that place or any object.

### 3.3 Natural Language Processing

Language translation is also one possible application for mobile cloud computing.

### 3.4 Sensor Data Applications

Today every mobile phone is built with sensor data applications that are used to read data. Sensors like GPS, thermos sensor, light sensor, clock, compass and accelerometer are used in phone and associated with phones also for reading purposes.

### 3.5 Multimedia Search

Mobile phones also save and store different kinds of multimedia like photos, songs and videos.

### 3.6 Social Networking

Sharing user's information and contents is a very popular method or way to interact with friends on different social networking sites like Facebook.

## 4. Mobile Cloud Computing Characteristics

The major characteristics of mobile clouds computing are listed below:

### 4.1 Location Independence

Location independence is a good characteristics of mobile cloud computing. There is sense of different place and location independence where user generally has no knowledge and control over the exact location.

### 4.2 Reliability

The use of multiple sites the reliability can also be improved which makes cloud computing more popular and worthy for disaster recovery of applications and business purposes.

### 4.3 Broad Network Access

User ability and capability are available over network that can be accessed with the mechanism which promote the use of heterogeneous platform such as laptops, phone etc.

### 4.4 Scalability of Infrastructure

In the server, which is physical the new nodes can be added and dropped from network with limited changes to infrastructure setup and software. Mobile cloud computing architecture is easily handled the demands and scale horizontally and vertically.

### 4.5 Flexibility/ Elasticity

Users can be easily access computing resources without human interaction.

## 5. Mobile Cloud Computing Advantages

There is different reason like communication, mobility and portability that provides the solutions for mobile cloud computing. The advantages of cloud and mobile computing are combined by mobile cloud computing which provides optimal services to users. These advantages are explained as below:

### 5.1 Improving Reliability

Storing information and data on cloud is very effective way to increase the reliability where the applications and data are backed up and stored on numbers of computers. Therefore, the chance of application and data lost on mobile phones is decreased and reliability is increased ultimately.

### 5.2 Extending Battery Lifetime

There are number of solutions have been purposed to improve the performance of CPU and organize the disk and screen in an effective manner to overcome and reduce the power consumption in mobile. To fulfil these solutions that are require changes in the structure of mobile devices and improve advance hardware results in increase of cost. But the changes are not compatible and feasible for all mobile devices. Therefore, to execute big computations and improve complex processing from limited resource device such as mobile phones

computation offloading mechanism is proposed. In mobile cloud computing it avoids long application execution time on mobile devices which may results in large amount of power consumptions.

### 5.3 Dynamic Provisioning

It is a flexible method for mobile user and service provider to run their applications without any advanced reservations of different resources. We can easily store data on cloud dynamically without storing in mobile devices.

### 5.4 Ease of Integration

Different kinds of services from different services provider can be integrated very easily with the help of cloud and internet to fulfil the user requirements.

### 5.5 Multi-tenancy

Internet Service Provider like data centre owner and network operator can easily share the resources and cost that provide variety of applications and for numbers of users.

### 5.6 Scalability

Internet services providers can be easily expanding and increase the application and services with or without small constraint on the resource usage.

## 6. Mobile Cloud Computing Limitations

The main motive behind the mobile cloud computing is to provide a rapid and convenient method for user to access and get data from cloud computing network. Number of limitations and challenges of mobile cloud computing are coming from characters of mobile device like smart phones and wireless network and their own restrictions and limitations. Limitations of mobile cloud computing is listed below:

### 6.1 Security and Privacy in Cloud

In mobile cloud computing privacy and security is the biggest issue. When we establishing a remote cloud base infrastructure certainly any organization will give away private information and data that is very confidential and sensitive. Then this data gives to the service provider of cloud to protect, manage and retain them. Therefore, user might feel uncomfortable to share their data with the third party.

### 6.2 Prone to Attack

Nothing on the internet is completely secured and protected. It is more vulnerable to external attack like hacking and threats to save and store information in the cloud.

### 6.3 Low Bandwidth

Since mobile network's resource is much smaller as compared to the traditional bandwidth which is the one of major issue in mobile cloud computing environment.

### 6.4 Dependency and Vendor Lock-In

The biggest disadvantage of mobile cloud computing is its dependency on the internet service provider.

### 6.5 Limited Control and Flexibility

All the services and applications of mobile cloud computing is run on third party virtual environment or run on remote, so user



have no and limited control over the functioning and execution of software and hardware.

## 7. Offloading Technique of Mobile Cloud Computing:

Offloading is defined as a concept which migrates or transfer resource- intensive computation part from mobile device to the cloud which has number of resources or on server. It enhances the performance of an application, execute application and reduce battery consumption that is difficult to execute on the mobile devices. Offloading is a type of network related application in which smart phones and mobile devices access cloud with the help and use of internet. The offloading is providing resources to the mobile and executes the mobile device applications on cloud side. This technique offloads the heavy computation part on the cloud side and store resources on the mobile on cloud. It is a solution to augment these system capabilities of mobile system by transferring to resourceful computer which is called server. It is different from traditional client-server architecture, where a thin client always transfers computation to server. Offloading may improve performance and save energy on mobile systems.

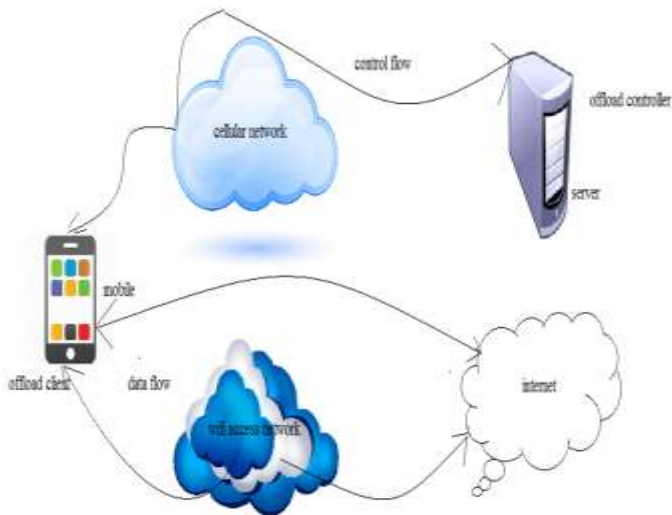


Figure 4: Offloading Technique in MCC

### 7.1 Partial or Static Offloading

In **static offloading** application is partitioned during development. In static environment, parameters such as data size and execution time which acts as deciding factor for offloading are known beforehand. However, it is difficult to know the correct execution time before the actual execution takes place and the inaccurate data can result into inefficient offloading result.: When only the intensive part or an application could be offloaded is called partial offloading. In this heavy task is computed and executed on android and virtual machines or clone cloud and another remaining task is executed on smart phone.

### 7.2 Complete or Dynamic Offloading

This technique is used to offload complete task and application to cloud for saving battery life of smart phone. In this technique, whole application is on cloud and cloud act as replica of smart phone. The infected files are cleaned at cloud side and cleaned files are on the smart phones. Dynamic network environment means changing connection status and

bandwidth that affect the process of offloading. By the term dynamic offloading we mean that the modules may be transferred for execution onto cloud when the application is running.

## 8. Conclusion

The main motive behind mobile cloud computing is to improve the mobile user by providing rich functionality, regardless of resource limitations of mobile devices. In future mobile cloud computing, could become the major model for mobile applications. In this paper, we present the introduction on mobile cloud computing and its architecture and advantages and limitations and characteristics and techniques also. In this paper, we have given an extensive review on mobile cloud computing. Therefore, highlighting the objective of mobile cloud computing, we have also described different definitions on mobile cloud computing in the literature. Our future work is to focus on how security and privacy issues can be improved on mobile cloud computing

## References

- [1] Harshitha. K. Raj "A Survey on Cloud Computing" in International Journal of Advanced Research in Computer Science and Software Engineering, issues July 2014.
- [2] Palvinder Singh, Er. Anurag Jain "Survey Paper on Cloud Computing" in International Journal of innovations in Engineering and Technology, issues April 2014.
- [3] Karthik Kumar Jibang, Liu Yung -Hsiang, Lu. Bharat Bhargava in Springer, issues April 2012.
- [4] Pragma Gupta, Sudha Gupta "Mobile Cloud Computing: The Future of Cloud" in International Journal of Advanced Research in Electrical, Electronic Instrumentation Engineering, issues September 2012.
- [5] Han Qi Abdullah Gani "Research on Mobile Cloud Computing: Review, Trend and Perspectives" in IEEE, issues April 2013.
- [6] Priyanka Asrani "Cloud Computing for Mobile Users: Can Offloading Computation Save Energy?" in IEEE, issues April 2010.
- [7] Ms. Snehal P. Warhekar, Prof. V.T. Gaikwad "Mobile Cloud Computing: Approaches and Issues" in International Journal of Emerging Trends and Technology in Computer Science, issues April 2014.
- [8] Karamjeet Kaur, Sugandha Sharma, Mayank Arora "Mobile Cloud Computing Techniques: A Review" in International Journal of Advanced Research in Computer Engineering and Technology, issues April 2014.
- [9] Palvinder Singh, Er. Anurag Jain "Survey Paper on Cloud Computing" in International Journal of Innovations in Engineering and Technology, issues April 2014.
- [10] Jasleen Kaur, MS. Anupma sehwat MS. Neha Bishnoi "Survey Paper on Basics of Cloud Computing and Data Security" in International Journal of Computer Science Trends and Technology, issues June 2014.

## Author Profile



Kusum Lata Student at Chandigarh University Institute of Engineering and Technology ME-CSE Department.



Sugandha Sharma Assistant Professor at Chandigarh University Institute of Engineering and Technology CSE Department.