International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Mobile Cloud Computing: Study on Trials and Matters

Mahabub Umar Mohammed [1] , Nasiru Sani [2],

Robert Anthony Ponga Hindowa Magbity [3]

[1]Bsc. Information Technology, Collage of Engineering and Information Technology , NIMS University, Jaipur-Rajasthan, (India)

[2]Research Scholar in Health Information and Management System, Department of Public Health and Community Medicine, NIMS University, Jaipur-Rajasthan, (India)

[3]Msc. Information Technology, Collage of Engineering and Information Technology, NIMS University, Jaipur-Rajasthan, (India)

ABSTRACT

The use of internet has become widely needed in today's technological world considering the high use of mobile phones. Data storage, manipulation and access is essential to users of internet and with the arrival of cloud Computing been the kid of todays technological revolution the wide used of mobile phones has brought about this new technology which is Mobile Cloud Computing that supports the use of wireless networks refering to internet. MCC has become an important research area due to the quick evolution of the uses in Mobile Computing environments and increasing wireless networks. This technology unites the computational resources for the mobile clients, tenants or users, network operators and cloud computing providers. Despite the rapid increase in use of mobile computing, achieving its full potential is challenged by its battery life, insufficient storage, frequent disconnections, low bandwidth and security. This paper explores the mobile cloud computing challenges and problems from various angles and provides solutions.

This paper is systematized as follows: the subsequent section discusses MCC in detail which includes evolution of MCC, comparison of MCC and cloud computing, generalized MCC architecture, cloud computing services and models and then applications of MCC. In the third section, advantages, challenges and open issues of MCC are considered.

Keywords: Cloud Computing(CC), Mobile Computing (MC), Quality of Service (QoS), Mobile Cloud Computing (MCC), Cloudlet and Clone Clouds, Cloud Computing and Sky Computing.

Objectives: This study was intended to review mobile cloud computing: A Study on Trials and Matters

Methodology: This study was done using a systematic review; the literatures were searched on mobile cloud computing: A Study on Trials and Matters with the help of libraries, books, conference proceedings, data bank, and also search engines available at Google, Google scholar. In our searches, we employed the following Keywords and their combinations: Mobile cloud computing, Trials and Matters , Computing System in the searching areas of title, keywords, abstract, and full text. Technical reports were excluded since we focus on research papers.

International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Google Scholar reviewed was done. The available evidences indicated that patient's information support for effective health care service delivery on the systematic reviewed carry out.

I. INTRODUCTION

Mobile Cloud Computing unites the benefits of mobile computing with the applications of cloud computing and accordingly expands the area of MCC uses. The goal of MCC is to ingest Cloud Computing techniques and methods for data storage and data processing on Mobile devices, and therefore decrease the boundaries. MCC is a innovation of Cloud Computing and Mobile Computing is grows with the support of mobile networks which connected with internet.

There are sum of classifications available for MCC in the research literature. According to N. Fernando et al., Mobile Cloud Computing allows to run an application on a remote server while the mobile device acts as a tinny client connecting through to the remote server machine through 3G/4G or Wi-Fi . Additional explanation from Marinelli is to create mobile peer-to-peer network using the shared sources of the numerous mobile devices in the inherent area.

The objective of Cloud Computing is to decrease the expenditure for technological infrastructure, worldwide working environment, good resource utilization, flexibility, backup and recovery.

The objective of Mobile Cloud Computing is to deliver mobile users with enriched resources for instance prolonged battery life, computation time, communication etc. In future, both the technologies have unique objectives and challenges.

II. INNOVATION OF MOBILE CLOUD COMPUTING

Mobile Cloud Computing has advanced through whole of stages which include Grid, Cluster, Utility, Cloud and Mobile Cloud Computing. The evolution of Cloud Computing is shown in Fig. 1. These are the technologies that provided a lot for the growth of MCC to increasing as a new technology in wireless communication period.

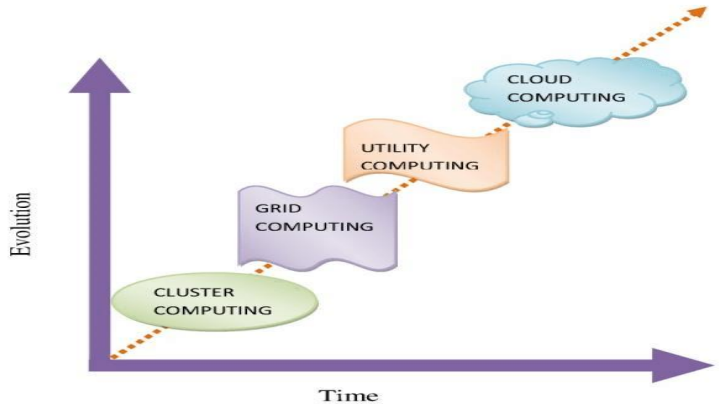

Figure 1 Evolution of Cloud Computing

❖Grid Computing**:** Refers to distributed computing in which a group of computers from multiple locations are connected with each other to achieve common objective. These computer resources are heterogeneous and geographically dispersed. Grid Computing breaks complex task into smaller pieces. These smaller pieces are distributed to CPUs that reside within the grid.

❖Clusters Computing: This is referring as group of linked together of computers that's called cluster. So the group of computers works watchfully together so that in many ways these computers making a single computer cluster.

Utility Computing: is a vision of computing that defines a service provisioning model for compute services in which sources such as storage, compute power, applications, and infrastructure are packaged and offered on pay-per use basis. The idea of providing computing as a utility like water, natural gas, power, and telephone connection has a long history but has become a reality today with the initiation of cloud computing. Among the earliest for runners of this vision we can include the American scientist John Mc Carthy, who in a speech for the Massachusetts Institute of Technology (MIT) centennnialin 1961, observed:

If computers of the kind I have advocated become the computers of the future, then computing may someday organized as a public utility, just as the telephones system is a public utility. The computer utility could become the basic of a new and important industry.

2.1 Concerning to this model

the owner of providers are the one who opereates and manages the computing and storage infrastructure. The Client, tenant or the subcriber can enable to access it whenever is required on a rental or as usual times.

2.2 Cloud Computing

It's an internet based computing to store data and access data in a shared manner. It's a metaphor of the internet.

2.3 Mobile Cloud Computing

In this technology mobile apps are developed, operated and hosted using cloud computing technology. Developers can build platform independent apps for mobiles.

2.4 Mobile Cloud Computing Architecture

There are different MCC architectures based on their context and application. A general MCC architecture is shown in Fig. 2. MCC architecture is composed of Mobile Users, Mobile Operators, Internet Service Providers (ISP) and Cloud Service Providers. Mobile devices can access cloud facilities and services through internet using two techniques, i.e. through mobile networks or using access points. Devices in mobile networks are connected via any medium can establish the connections and functional interfaces between network and mobile devices. Mobile users‟ requests are passed to the computers in the mobile network. So, the purpose of mobile network is to provide authentication, authorization and accounting (AAA) services to mobile users. Then the validated mobile user‟ s requests are delivered to the corresponding cloud services through internet providers. A cloud service includes utility computing, virtualization and service-oriented architecture like web, application and database server.

International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

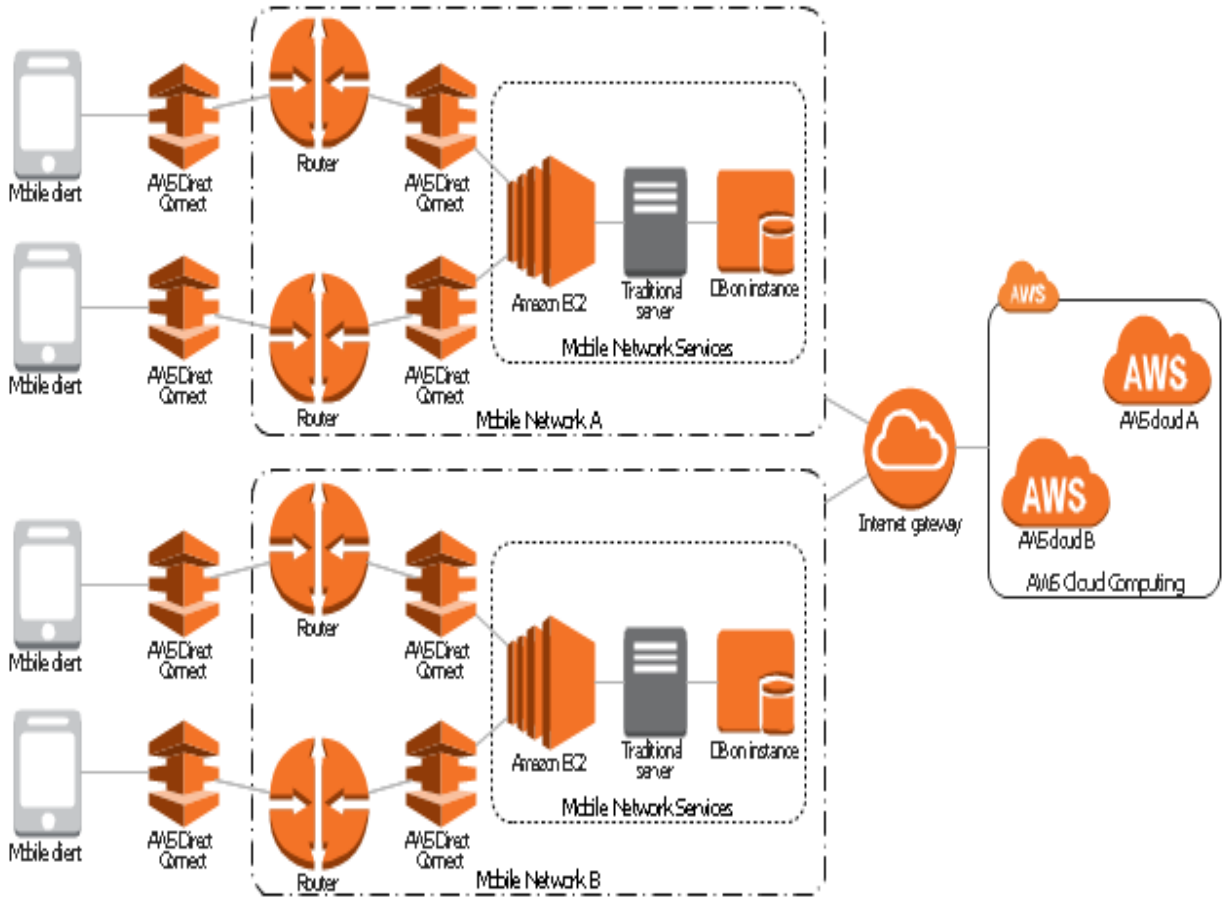

Figure 2. Mobile Cloud Computing Architecture

The advent of this technology is major data processing has been migrated to Cloud. The main objective of MCC is even low-cost mobile device or non-smartphones can also achieve mobile cloud computing. Web browser or desktop application receives the demands directed by mobile users. A management component allocates resources for the request. Monitoring and calculating functions ensure Quality-of-Service (QoS). A mobile network provider acts a middleware between mobile users and cloud. Mobile users direct their demands to the cloud through browser or an app.

III. CLOUD COMPUTING SERVICES AND MODELS

Distributed group of computing resources like servers, networks, storage and services use CC as a prototype for allowing ubiquitous, on-demand access that can be administered with less exertion or facility provider interaction. This cloud model is poised with five vital features, three service models, and four deployment models . The above definition can clearly tell about Cloud computing.

There are three rudimentary cloud services offered by the Data center / cloud providers. They are shown in Fig. 3 with sample services provided.

International Journal of Advance Research in Science and Engineering
Volume No.06, Special Issue No.(01), Nov 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

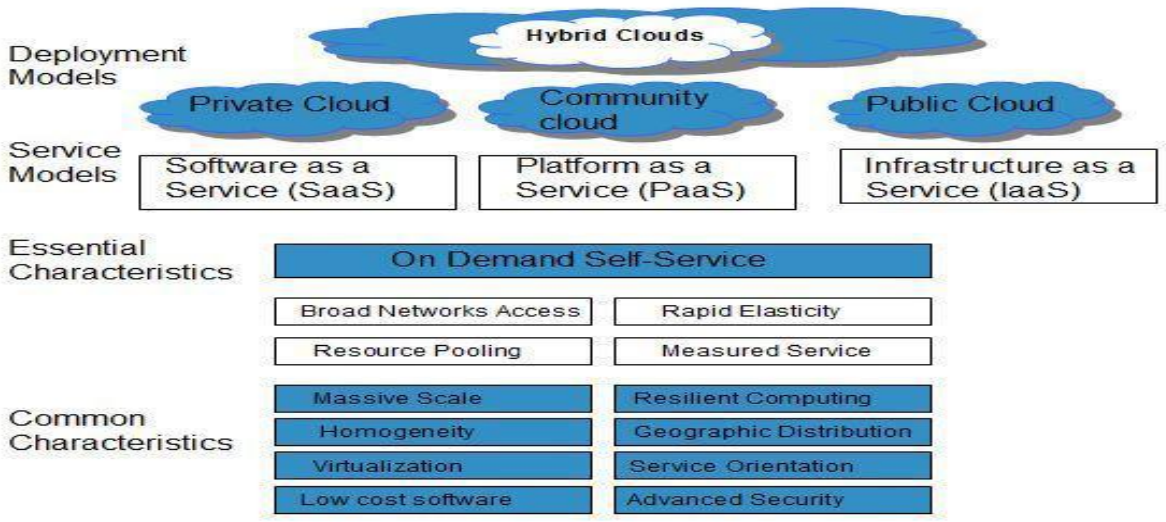

Figure 3. Above Cloud Computing Service models

3.1 Software as a Service (SaaS)

This model eases the clients to access the applications presented on the cloud. The users access these applications like e-mail, games, virtual desktop communication etc., using their own browsers.

3.2 Platform as a Service (PaaS)

The application development platform for the developers like Database Server, Web Browser and Development tools are offered by the Cloud Service Providers. Examples of PaaS are Amazon AWS, Red Hat‟ s etc.

3.3 Infrastructure as a Service (IaaS)

The cloud services like, hardware resources, storage and network infrastructure services are offered by the Cloud Service Providers. The virtualization is the base of this model. The characteristics and components of IaaS are utility computing service and billing model, automation of administrative tasks and desktop virtualization & Internet connectivity. Examples of IaaS are Amazon‟ s Elastic Cloud Computing (EC2), Amazon Web Services (AWS), Google Compute Engine (GCE) etc.

There are three basic types of cloud computing models currently in the market namely, Public cloud, Private cloud and Hybrid cloud.

IV. APPLICATIONS OF MOBILE CLOUD COMPUTING

The MCC providers take the advantage of the extravagant growth in mobile devices and cloud computing and providing many applications in MCC. The following are the few important applications which will be useful to the customers and society.

4.1 Mobile Commerce (M-Commerce): Is a business model for commercial applications using mobile devices. E.g.: mobile banking, mobile shopping, mobile ticketing etc.

4.2 Mobile Healthcare (M-Healthcare): is to reduce the risks and disadvantages of traditional medical treatment (e.g. limited storage, security/privacy issues, errors, etc.) M-healthcare provides mobile users with an easy access to databases (e.g. Health updates in medical records).

4.3 Aiding Technologies: Used to aid pedestrian crossing guide for blind and visually-impaired, sharing photos/videos, implementing safety and security for homes are major innovation of MCC.

4.4 Mobile Learning (M-Learning): Combines e-learning and mobility. Traditional m-learning has limitations on high cost of devices/network, low transmission rate and limited educational resources.

V. ADVANTAGES, CHALLENGES, AND ISSUES OF MOBILE CLOUD COMPUTING

5.1 Advantages of MCC

There are a number of advantages like mobility, portability and mobile communication (some are disadvantages due the nature of mobility) of using mobile devices for cloud computing due to the technological development like off-loading resource intensive applications to the cloud. The following are consider as important advantages:

5.2 Extended Battery Life:

Extending battery life is a big challenge for the mobile gadgets. There are several solutions have been developed to enhance CPU performance and to use disk and screen efficiently . These solutions needed to change the structure or a new hardware, this will increase the cost. Computation or data offloading: this will migrate the huge computations from mobiles to servers in the cloud. This avoids long execution time on mobile device thus saves amount of power and time consumption.

5.3 Data storage capacity

mobile devices have limited storage. To overcome this – MCC can be used store the large amount of data through wireless networks.

5.4 Increased reliability

MCC improves the reliability of stored data. Data stored and backed up on a number of components. MCC works as a data security model for both service providers and users.

5.5 On demand service provisioning

MCC promotes the provisioning of resources on-demand basis. This is the best way for both service mobile providers and users to run their applications without prior reservation.

5.6 Scalability

Mobile apps need to meet the uncertain user demands. Service provides can easily expand/add application with or without any constraint.

5.7 Multi-Tenancy

The valuable resources and application sharing to the multiple users by the service providers is major concern in MCC. So MCC facilitates mobile users to upload images easily to the clouds.

5.8 Integration of Services

The integration of multiple services from different service providers to meet the user's demand.

VI. CHALLENGES OF MCC

Even though MCC has many advantages, there are lot of challenges and issues in MCC due to the technological integration of cloud computing, mobile computing and wireless networks. The following are the important challenges in MCC:

6.1 Heterogeneity

Radio Access Technologies such as GPRS, 4G, 3G, WLAN, WiMax (Worldwide Interoperability for Microwave Access IEEE 802.16) are used simultaneously in MCC. MCC requires wireless connectivity in highly heterogeneous environment. It has some issues, MCC should provide all time available connectivity, on-demand scalability energy efficiency for users. Klein et al. proposed an architecture to provide an intelligent network access strategy to meet the application requirements for mobile users.

6.2 Service Availability

Service availability is one of the major issues in MCC. MCC requires an "always-on" connectivity. It is easy to implement "always-on connectivity" in cloud computing with wired networks as compared to MCC. Mobile users may face problems like traffic congestion, network failures, disconnection and out-of-range. Huerta et al. proposed a mechanism for the node discovery in the vicinity of the mobile users whose link with cloud disconnects. Mobile users can connect with cloud in ad-hoc manner by using connection of neighbouring nodes with cloud. The victim node (lost connection) maintains a list of stable neighbouring nodes and connects with cloud through these nodes. Zhang et al. proposed a Wi-Fi based multi-hop networking system called MoNet. Each node exchanges short control messages with neighbouring nodes. Node with shortest hop length and highest role level (disk space, bandwidth and power supply) are selected as the intermediate nodes to receive contents.

Challenges in Computing

6.3 Off-load Computation

Mobile off-loading computation admits to migrate resource-intensive computations from a mobile device to the cloud. It enhances the application performance, reduces battery power consumption, and executes applications for smartphones (which has less resources). Off-loading can be done under two environments. Static environment off-loading has less problems than dynamic off-loading. Due to the nature of dynamic, the resources, mobility and other parameters keep on changing in the dynamic off-loading which makes more complex and less efficient to implement. Kumar et al. presented that off-loading does not always prove efficient

for solving every type of problem. Cuervo et al. proposed a model called MAUI to make smartphones last longer with code offload.

6.4 Security

The next important computing issue is the security. The success of MCC is based on how user‟ s data and applications are protected from unauthorized user. There are two categories of security in MCC, security for mobile user and security for data and applications:

Mobile User Security – There are two distinct issues under the mobile user security. The very first one is numerous security threats, malwares and adware attack on mobile devices. The second one is installation of GPS in mobile devices leads to privacy issues. These two problems can be addressed by installing security, malware and adware alerts up to some extent. Privacy – Location Based Service (LBS) become a privacy issue in MCC when users share private information like location and other private information. Zhangwei et al. proposed a Location Trusted Server (LTS) approach to overcome this issue.

Data Security on Cloud – Mobile users store large amount of applications/data on the cloud and they should be cautious in dealing with the data. There are three issues with regards to data security. They are integrity, authentication and digital rights. Those are a number of solutions proposed by researchers to address the integrity issue. For authentication issue, there are a number of approaches proposed by researchers. Administering the digital rights is very important in this predominant period of progressing technologies. Zou et al. proposed “Phosphor”, a cloud based Digital Rights Management (DRM) method with sim card in mobile phone to improve the flexibility and reduce the vulnerability of its security at a low cost.

6.5 Context Processing

Mobile devices gather social information of all contexts and gestures from their surroundings. Exponential growth of this information creates “several challenges” such as storing, managing and processing information. It is required to design energy efficient reliable robust platform for context storage. Lot of research work is happening in the context awareness to utilize the local contexts like data types, network status, user preferences, device environments etc. to improve the QoS. Samimi et al. developed a model called Mobile Service Cloud (MSC) which is an extension of the Service Cloud Paradigms developed by McKinley et al. Here, when a user requests for a service from the cloud, the request goes to the request gateway first, the gateway choose an appropriate primary proxy to meet the requirements and send the result to the user.

iii. Challenges in Applications

6.6 Interoperability

Mobile devices are installed with different operating systems. E.g.: IPhone, Android and BlackBerry. Sending and receiving information across the mobile phone with different OS is a major breakthrough.

Cloud Computing Adoptability

It‟ s not necessary that all cloud apps be supported by all mobile infrastructure providers. Different apps require different cloud infrastructure such as computation intensity, network bandwidth and latency.

6.7 Open Issues of MCC

This section presents many open issues in MCC and the future directions for research in MCC.

Bandwidth limitation is a major apprehension in MCC. The emerging technologies such as 4G network and Femtocell may transform and modernize the bandwidth enhancements. Bandwidth limitation is still a big concern because the rapid increase in number of mobile and cloud users. Bandwidth is scarce resource for wireless networks. 4G network is a technology that significantly increases bandwidth capacity for users. 4G supporting features are like, faster handoff services, broaden the mobile coverage area and exchanging video files among users. It has certain drawbacks, Lack of fairness regarding the distribution policy. Jung et al. developed a distribution policy when and how much portions of bandwidth are shared among users. Jin et al. proposed an approach to share the limited bandwidth between the mobile users who are from the same area and using the same content. Satyanarayanan et al. proposed a Cloudlet [30] concept which is used to improve the bandwidth and latency issue. The following two technologies help to enhance the bandwidth. The first one is used to increase the bandwidth and the second one is used to extend the coverage of mobile network.

4G Network It provides bandwidth up to 10 times faster than 3G network. It has some salient features like quick handoff and wide mobile coverage area. Rahman et al. give numerous issues related to network architecture, access control and quality of service of 4G network .

Femtocell It is a compact cellular base station used in small area developed by Boccuzzi et al. Concept of Femtocell is combined with CC – to implement a scalable, economical secure network for mobile users. On demand services will be provided to the users by adding / removing resources. Femtocell located in homes and offices of mobile users can connect through internet to cloud.

6.8 Quality of Service (QoS)

When mobile users access the servers located in the cloud they suffer from congestion. The reasons for congestion could be limited wireless bandwidth, network disconnection and attenuation. Cloudlet and Clone Cloud are the two techniques that help in reducing the network latency.

6.8.1 Cloudlets - It is a cluster of computers connected to the internet provides services to nearby mobile users. When mobile users don‟ t want to offload their requests to cloud due to high delay, low bandwidth, computation and storage cost. The Cloudlet provides the services in less time and cost. If no cloudlet is available in the vicinity, then services will be provided by the cloud. This methodology has some substantial issues such as distribution mechanism, storage and communication of information for each cloudlet such that overall cost of the system can be minimized. There are some other issues like trust and security (due to fake cloud).

6.8.2 Clone Clouds - Clone Cloud facilitates the fast execution of smart phone apps by using nearby computers The entire data and apps from smart phone are cloned onto the cloud. Some apps are executed by clones and sent back to smart phone. Multiple clones of same smart phone can be built to make it fast. It has some limitation like security vulnerabilities - all of the user‟ s private data could be cloned into a public server, Authentication Immunity against IP spoofing, ARP poisoning and DNS poisoning is a must when exchanging

data. On the other hand, data tampering, data loss and data theft are also serious concerns. Clone Cloud must prove it is a trust-worthy technology.

6.8.3 Cost - MCC uses the services provided by both Mobile Service Provider (MSP) and Cloud Service Provider (CSP). Both have different policies for service management, customer management and payment method. This leads to an issue cost paid by the customer. The price of each application is divided among these three entities get satisfied with the distribution.

6.9 Network Performance - It can be increased by improving the link performance and optimizing the bandwidth usage. Cognitive Radio is an intelligent radio it can be programmed and configured dynamically. Its transceiver is designed to use the best wireless in its vicinity. Such a radio automatically detects available stations in wireless range, then accordingly diverge its transmission or reception. Integration of Cognitive radio into MCC solves the problem of spectrum scarcity overall cost of network. MCC mobile users should detect radio resources without interfering the MCC services.

6.10 Service Convergence - Cloud services should be differentiated according to the type, availability, cost and quality. A new technique is required that makes use of multiple cloud services where a single cloud cannot fulfil mobile user‟ s demands. Sky computing is the future of cloud computing where large distributed infrastructure can be created by using multiple CSPs‟ services.

VII. CONCLUSION

Mobile cloud computing is an initial and challenging technology that aims to expand the power of cloud computing to mobile users by delivering a all-in-one and rich functionality, regardless of the resources limitation of mobile devices. This paper provides a hardanalyst on mobile cloud computing. According to the statistics from forbes.com, cloud applications will be accounted for 90% of mobile data traffic in 2019. It will increase the revenue of MCC to more than 5.2 billion and the mobile cloud market will grow to over $46.90 billion by 2019. The benefits of MCC are: increased reach, reduced costs, reduced reliance on hardware and software equipment.

The future trends of MCC will be, acceleration in the “Consumerization” of IT through MCC - involve non-PCs in cloud network, MCC will Revolutionize How Work is Done - e.g. when MC entered cloud, one of the first app got highest demand is Email. When Mobile Cloud Computing can be done with less human computations, then it is considered as IoT (Internet of Things). MCC and IoT are two distinct technologies play a vital role in our day to day activities. IoT is the combination of many technologies like electronics, mechatronics, wireless sensors, wireless networks and internet. These technologies embed with “things”, whichenables users to amass and exchange data. This concept is referred as the Internet of Everything.

VII. RECOMMENDATIONS

In view of the above, the following recommendations are suggested for effective and efficient cloud computing.

1. There is need for trained and retrain of personnel for upgrading their skills on

Cloud computing, since it is a continuous program or a dynamic system.

2). There should be constant supply of light or solar system in Cloud computing

3) Government and concern authorities should embark on research and development of security measure of cloud database in order to avoid impersonation by unauthorized users.

REFERENCE

[1]M. Rahman and F. A. M. Mir, "Fourth Generation (4G) Mobile Networks - Features, Technologies & Issues," 6th IEEE International Conference on 3G and Beyond, pp. 1-5, November 2005.

[2]E. Jung, Y. Wang, I. Prilepov, F. Maker, X. Liu and V. Akella, "User-Profile-Driven-Collaborative Bandwidth Sharing on Mobile Phones," 1st ACM Workshop on Mobile Cloud Computing & Services: Social Networks and Beyond (MCS), ACM, June 2010.

[3]F. Niroshinie, W. L. Seng and R. Wenny, "Mobile Cloud Computing: A Survey," Future Generation Computer Systems, vol. 29, pp. 84-106, January 2013.

[4]M. George, X. M. Constandinos and P. Evangelos, "Resource Management of Mobile Cloud Computing Networks and Environments," IGI Publishing Hershey, PA, USA, March 2015.

[5]P. Mell and T. Grance, NIST Definition of Cloud Computing, Special publication from U.S. Department of Commerce, October 2011.

[6]Morgan Kaufmann is animprintofElsevier 225 WymanStreet,Waltham, Mastering Cloud Computing Foundations andApplications Programming MA02451,USA 2013

[7]E. Cuervo, A. Balasubramanian, D. K. Cho, A. Wolman, S. Saroiu, R. Chandra and P. Bahl, "MAUI: Making Smartphones Last Longer with Code offload," 8th International Conference on Mobile systems, applications, and services, pp. 49-62, June 2010.