Mobile Cloud Computing and its Challenges: A Review

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***Abstract*—** Mobile phone is widely used in today's life. The term smartphone is the multipurpose device and it is mostly used for making phone call and writing text messages. But mobile is also have some limitations in the area of battery life, thermal heating and computational capabilities. It could be said that cloud computing is just another buzzword, a way to sell already existing technology. This paper give a brief introduction about different perspective of mobile cloud computing.

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Keywords-.*Smartphone, mobile phone, cloud computing*

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I. INTRODUCTION

Mobile Cloud Computing (MCC) is the composition of cloud computing, where the shared resources can be accessed by the mobile users. The shared features are provided by the third party companies or organizations. For example word processor for cloud is available for mobile devices. Even you can easily share your files or documents via Google Drive on mobile system. A number of apps are available provides access of cloud hardware devices such as cloud printing etc. A basic cloud based functions provided by apps are shown in the figure below.

Figure 1. Multimedia and other cloud features provided by apps for cloud access

Cloud computing or cloud storage also known as shared computing is a kind of Internet-based computing, where shared resources, data and information are provided to computers and other devices on-demand [10]. Cloud storage means storing data centralized in any online medium. So that the same data can be used by multiple users.

It is said to be just another attempt to market and pack existing technology in a new way (Krishnan, 2010). There is also a lot of confusion on what the term actually means or includes (Rittinghouse & Ransome, 2010; Armbrust et al, 2009) which is not surprising when the term covers a remarkably wide area. However, the critique is mainly directed towards to the term itself and many claims that the idea of cloud computing is here to stay, that there is great potential in the technology (Chow, Golle, Jakobsson, Masuoka, Molina, Shi & Staddon, 2009; Krishnan, 2010; Reese 2009; Rittinghouse & Ransome, 2010).

Now a day's mobile phones can handle most of the work of personal computer or laptops. For example handeling mail is very easy. Sharing of data is faster than other available mediums. Mobile phones are the best multimedia devices, You can play multiplayer games. Cloud computing has been suggested to improve mobile phones in various ways, but most of the common areas are future hardware upgrade, battery life extension and computational offloading (Kumar & Lu, 2010) [9].

II. BACKGROUND

As an enhancement and development of Cloud Computing and Mobile Computing, Mobile Cloud Computing, as a new technique, has been introduced since 2009.

‘‘Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centres that provide those services’’ [11].

A cluster of computer hardware and software that offer the services to the general public (probably for a price) makes up a ‘public cloud’. Computing is therefore offered as a utility much like electricity, water, gas etc. where you only pay per use. For example, Amazon’s Elastic cloud, Microsoft’s Azure platform, Google’s App Engine and Salesforce are some public clouds that are available today. However, cloud computing does not include ‘private clouds’ which refer to data centers internal to an organization. Therefore, cloud computing can be defined as the aggregation of computing as a utility and software as a service [12].

Commonly, the term mobile cloud computing means to run an application such as Google’s Gmail for Mobile on a remote resource rich server. Another approach is to consider other mobile devices themselves too as resource providers of the cloud making up a mobile peer-to-peer network [12].

III. THE ESSENTIAL CHARACTERISTICS OF CLOUD COMPUTING

There are many benefits having Cloud storage for businesses and end users. This cloud storage can be categorized as public cloud, private cloud or hybrid infrastructure. Three of the main benefits of cloud computing includes:

- Dynamic Network Structure: Companies can scale up as computing needs increase and then scale down again as demands decrease.
- Pay per use: Computing resources are measured at a granular level, allowing users to pay only for the resources and workloads they use.
- Self-service provisioning: End users can spin up computing resources for almost any type of workload on-demand.

IV. CHALLENGES IN MOBILE CLOUD COMPUTING

The main purpose of Mobile Cloud Computing (MCC) is to provide fast service in last time without using any hardware or any special infrastructure. So the it is very difficult to focus on a single application fulfilling requirements of multiple user. Another concern is modifying of shared data. If data or file is modified by another user then it will be very difficult to findout the changes. Also external threats can also very harmful for such kind of infrastructure.

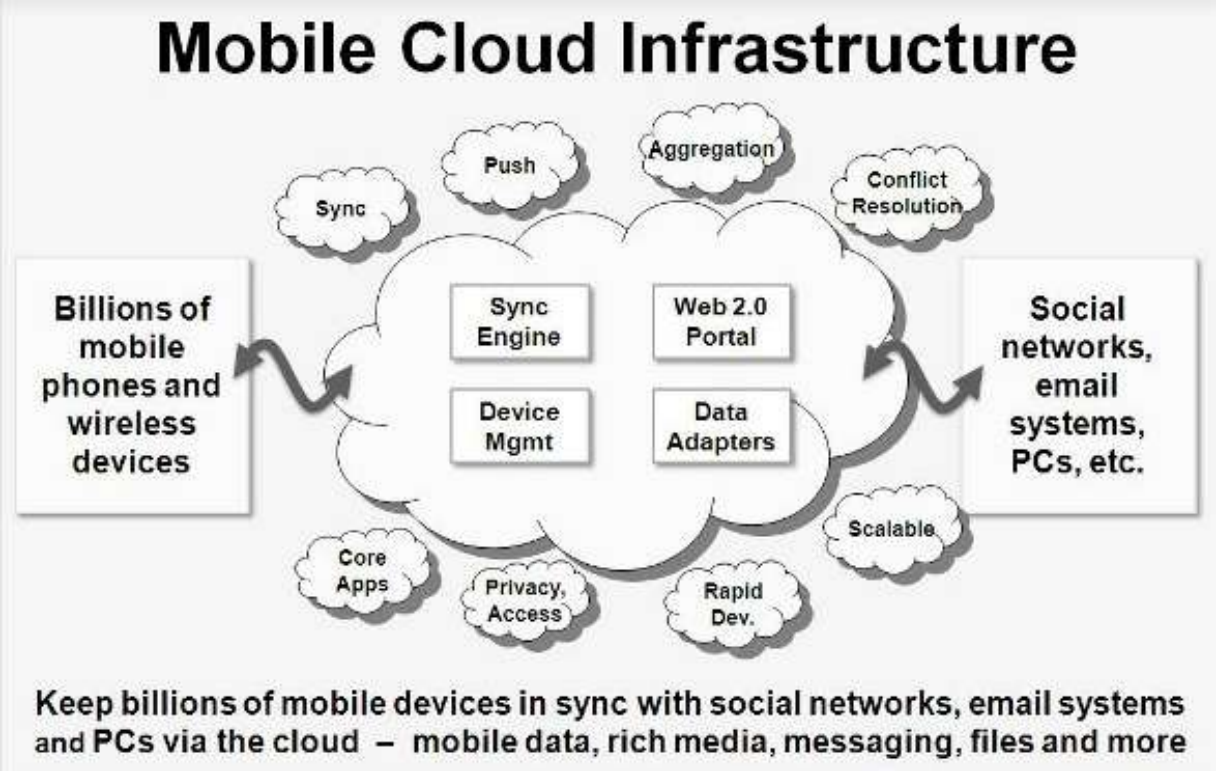

Figure 2: An basic Mobile Cloud Computing Model with key applications

Another limitation of such mobile cloud computing is you should have such device which supports cloud computing. Presently it is not compulsory that all devices will support cloud computing. Also the quality of service depends on the wireless network bandwidth.

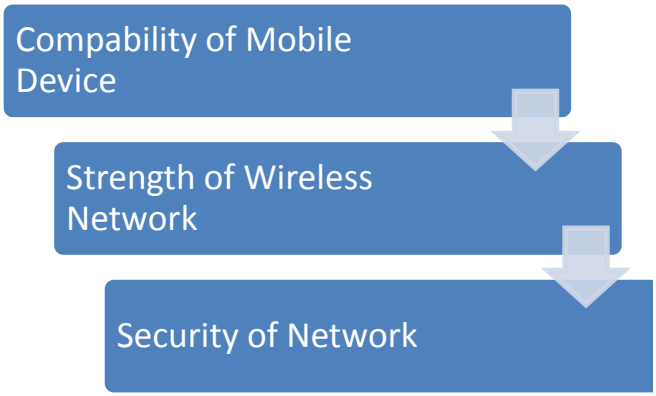

Figure 3: Major Limitations of mobile devices.

As given in figure apart from compability issue, there is an another issue is security of the network. If an threat attacks in the network then it will be a serious issue for concern.

Some challenges which occur in mobile cloud computing are given below in table [13]:

S.No.	Challenges	Description
1.	Resource poverty of Mobile Devices	Mobile devices have limited processing power, less memory, less storage capacity, and less bandwidth as compared to fix desktop pc.
2.	Seamless Connectivity	It is required to set the wi-fi connection for mobile cloud computing
3.	Reducing network Latency	The processing time in mobile cloud computing include the time at data centre, processing time on network, and data transportation time.
4.	Malicious Attacks	There are many attacks like Denial of Service (DoS) attacks, Side Channel attacks, Authentication attacks, Man-in-the-middle cryptographic attacks.
5.	Bandwidth	Generally this techniques required high bandwidth
6.	Energy Constraint	Mobile devices has limited battery life
7.	Network Monitoring	It is necessary to monitor the network performance continuously to avoid the problem of network failure.
8.	Security and Privacy	Since cloud computing basically deals with data storage and its processing so security of that data is very important. There are various policies and schemes (such as Fair Information Practice Principles (FIPP)) being proposed which require rigorous controls and procedures to protect the privacy of individuals.
9.	Cloud Policies for Mobile Users	There are certain cloud policies are set for using the cloud it is also applicable for mobile users who uses the mobile cloud.
10	Incident Response	Every cloud provider organization must plan and develop some measures that can be implemented as a quick response and recovery from data spill, misinformation and rumour, or from any malicious attack.
11	Various Network Access Schemes	In mobile world there are heterogeneous access scenario with different access technologies like WiMAX, WLAN, 3G, GPRS and many more. due to availability of different network it need seamless connection scheme when device move from one access to another access point [13].
12	Cloud Application Flexibility	An application is going to be supported by certain mobile cloud infrastructure or not, can easily be judged on the basis of its requirements against the cloud infrastructure characteristics along the device, network bandwidth and latency vectors [13].

V. CONCLUSION

Mobile cloud computing (MCC) at its simplest, refers to an infrastructure third party applications provides storage and data processing facility with mobile or other devices such as laptop tablet phones etc. The third party cloud computing applications also provides centralized storage so that the mobile device will not take load to save files in its own storage.

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