A Review on Mobile Cloud Computing (MCC) and Big Data Convergence

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Abstract - Mobile computing technology helps individuals to access data and information from anywhere through a variety of devices. The popularity of smartphones and tablet devices are growing immensely day by day. With this explosive growth in demand of mobile phone users, brings along various challenges. Cloud computing has gained significant attention in last few years and can be thought of as a total solution that delivers IT as a service. Cloud computing has been integrated with various fields in computing. One of them is Mobile computing and after integration it is called Mobile Cloud Computing (MCC). Some of the challenges of mobile devices like limited memory, processing power, battery life, etc. are resolved through MCC. Large volume of data over the cloud needs special processing which can't be handled with traditional ways, thus giving rise to the word Big Data. Big Data and cloud computing are paired with a primary focus on achieving solutions to various challenges of mobile technology. This paper presents how mobile cloud computing is gaining edge through Big Data and what are futuristic scope of Big Data and mobile cloud computing.

***Keywords - A* Cloud computing, Mobile Cloud Computing, Big Data.**

1. Introduction

Many portable devices such as smartphones, tablets, mobile phone and wearable computing devices have been emerging in market. With this rapid growth of mobile applications running on these devices, variety of data processed over the internet has exceeded the processing capacity of modern computer systems. Cloud computing is considered as one of the most significant swing in computation because of its various advantages such as virtualized resources, parallel processing, security and scalable data storage [1]. Mobile cloud computing is a combination of mobile computing and cloud computing. Mobile cloud computing (MCC) provides a new infrastructure in which data processing and data storage are done over the cloud instead of mobile device itself. Big data has attracted a lot of attention. More than 2.5 quintillion bytes of data are generated each day over internet through these various computing devices. Because of this large scale of data over the cloud, the processing and analysis of it requires a large computational infrastructure [2].

This paper first gives overview of mobile cloud computing along with its various advantages. In next section Big Data is discussed and then various advantages of integrating mobile cloud computing and Big Data is discussed.

2. Overview of Mobile Cloud Computing (MCC)

Cloud computing has been integrated with various fields in computing. One of them is Mobile computing and after integration it is called Mobile Cloud Computing (MCC).Cloud computing is capable of providing a virtualized environment in which software, storage, server and network all are provided as a service via internet. Mobile cloud computing is a combination of mobile computing and cloud computing.

Mobile computing includes various portable computing devices along with communication technologies allowing users to access internet and data on their devices from anywhere without needing a connection to a physical link. Mobile cloud computing (MCC) provides a new infrastructure in which data processing and data storage are done over the cloud instead of mobile device itself. The working of mobile cloud computing is shown in figure 1[3].
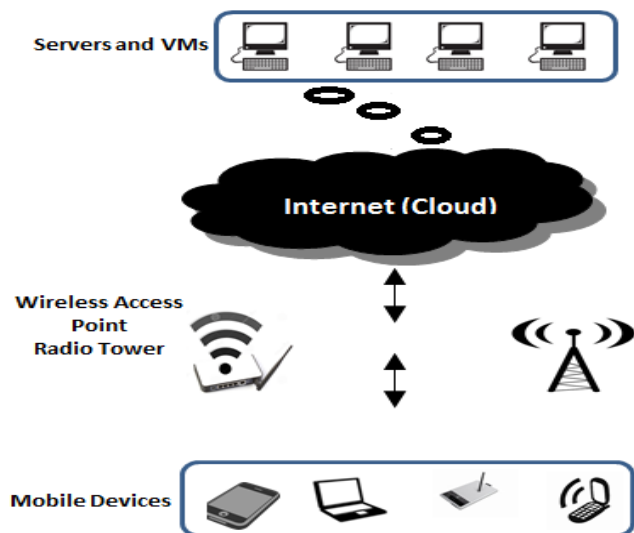
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Figure 1: Overview of Mobile cloud computing

2.1 Advantages of Mobile Cloud Computing

Mobile Cloud computing is known to be a promising solution for mobile computing due to many reasons (e.g. Mobility, communication, and portability). Following confab will define how the cloud is used to overcome problems in mobile computing [3]:-

1. Extended Battery Lifespan: - As battery life is a major concern in mobile devices. With cloud computing approach the processing is done over the cloud thus saving the huge quantity of power consumption.

2. Increased data storage: - Another constraint of mobile devices is limited storage capacity. With cloud computing, the developers are able to develop and store large amount of data on cloud and then can access it via internet.

3. Improved processing power: -The processing power is also increased as the resources required for running the applications are not limited and are available on demand.

4. Improved Reliability: - : The data stored over the cloud is considered very reliable and can be easily backed up in case of any data loss due to accidental reasons.

5. User Access:-With the Mobile cloud services; one can have the information about a particular user's location, context, and requested services to improve user experience.

6. Improved Availability: - The data is always available to clients from anywhere and anytime when stored over the cloud.

7. Scalability: Mobile applications running on cloud need various resources which are provided on pay per use basis. The resources required for running the app can be scaled up and down depending upon the requirements of the user.

8. Multi-tenancy: Even the service providers from different sources can share their resources with one another over the cloud and provide it to the end user.

9. Ease of Integration: Various services provided from different providers are integrated using cloud and is provided to the users on demand.

3. Overview of Big Data

Due to widespread usage of many computing devices such as smartphones, laptops, wearable computing devices; the data processing over the internet has exceeded more than the modern computers can handle. Due to this high growth rate, the term Big Data is envisaged. Big data is a term utilized to refer to the increase in the volume of data that are difficult to store, process, and analyze through traditional database technologies [2]. The properties of signify Big Data are Volume, Variety, Velocity, Variability and Complexity as shown in figure 2 [4].

Sr. No.	Properties	Description
1.	Volume	Many factors contribute towards increasing Volume streaming data , live streaming data and data collected from sensors etc.,
2.	Variety	Data comes in all types of formats-from traditional databases ,text documents, emails, video, audio, transactions etc.,
3.	Velocity	This means how fast the data is being produced and how fast the data needs to be processed to meet the demand.
4.	Variability	Along with the Velocity, the data flows can be highly inconsistent with periodic peaks.
5.	Complexity	Complexity of the data also needs to be considered when the data is coming from multiple sources. The data must be linked, matched, cleansed and transformed into required formats before actual processing.

Figure 2: Properties of Big Data

Big Data Architecture can be viewed in figure 3 [5].The Architecture includes Data Sources, Data management, Data Analytics and Applications.
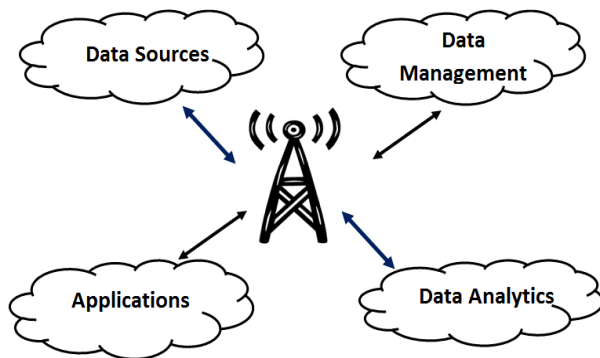

Figure 3: Big Data Architecture [5]

Big Data accession on mobile devices via cloud allows widespread availability of data to the users. MCC aims to overcome many limitations like, computation and storage capacity, energy, shared wireless medium, by integrating cloud computing into the mobile environment to elastically utilize resources. Big data has been categorized into different types. Figure 4 describes the classification to understand big data over the cloud. [2]
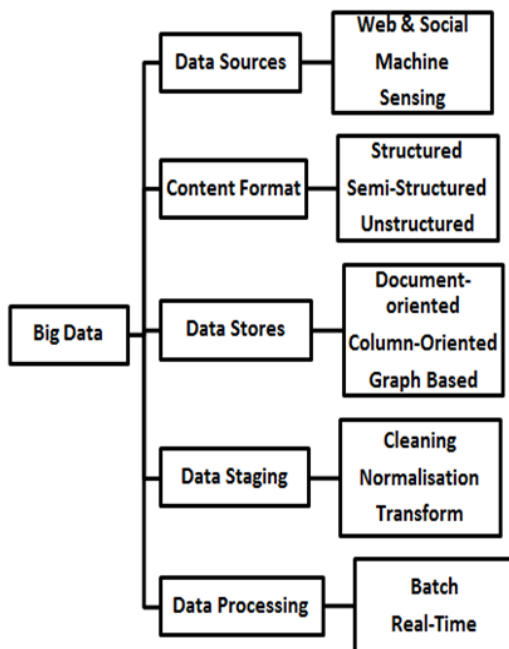

Figure 4: Classification of Big Data [2]

4. Relationship between MCC and Big Data

Big Data and cloud computing are complementary technological paradigms with a core focus on scalability, agility, and on-demand availability. According to Gartner Inc.'s in 2012 Hype Cycle for Emerging Technologies Big data and cloud computing are both the fastest-moving technologies. [6]. In this section, the relationship between Cloud Computing and Big Data is discussed. The Relationship between Mobile cloud computing and Big Data can be viewed in figure 5.
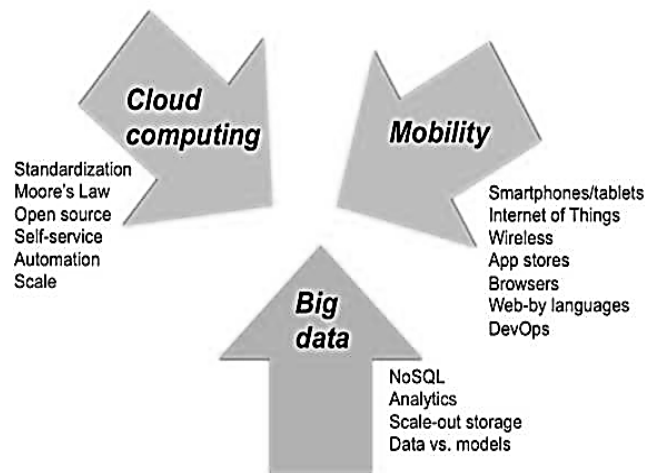

Figure 5: Relationship between Mobile, cloud computing and Big Data [7]

Cloud computing and big data are connected. With help of big data users has the ability to access data distributed across multiple environment in timely manner. Along with Cloud computing, Big Data is facilitated with a service model having all computation and processing power for large amount of data. Cloud computing provides a powerful, flexible and elastic platform which enables collection, analytics, processing and visualization of Big Data [8]. The storage of Big Data is realized by file systems that determine standardized methods such as MapReduce. Cloud computing provides the underlying engine through the use of Hadoop, a class of distributed data-processing platforms. Hadoop provides most of the essential features for a mobile-cloud computing infrastructure, making it suitable to use as a basis for Hyrax [9].Hyrax provides an infrastructure for mobile cloud computing, providing an abstract interface for using data and executing computing jobs on a mobile device cloud.

5. Conclusion

With increase data network traffic over internet due to large amount of mobile computing devices, cloud computing along with Big Data provides solution to many challenges such as increasing computational power, increased battery life, more data storage, etc. This paper provides a prescriptive roadmap in understanding Big Data in the cloud and how both these concepts are used in mobile computing. It highlights key considerations about Mobile cloud computing and Big data relationship.

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