BIG DATA AND MOBILE CLOUD COMPUTING: ISSUES AND CHALLENGES

Kirti Vijayvargia

Assistant Professor,IIPS,DAVV

ABSTRACT

Modern era is the use of mobile devices like smart phones etc. As the technology has changed we are using mobile phones for each and every application we used to do with our computer system in previous times. But smart phones have their own limitations in terms of their small screen, small battery size, less memory as well as processing power. On the other hand applications running on mobile are becoming more and more complex. With the advent of IOT (Internet of Things) this demand has increased in form of processing capability as well as data handling requirements. Massive data or big data collected from different sensors used in mobile devices also place a demand for large computing infrastructure and processing power for data processing and analysis. Therefore there is a gap between demand and available resources. Mobile Cloud computing tries to overcome these Big Data handling issues but still there are many issues and challenges. The issues, existing solutions and approaches are presented.

Key words- Big data, MCC, Mobile Cloud computing.

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INTRODUCTION

Cloud Computing: Cloud computing is an emerging trend in the today's world of technology. Cloud computing is an Internet based computing in which services are delivered on demand and on pay per use basis over the Internet. [1]

Cloud computing services can be categorized as given below:

- **Software as a service (SaaS)**

- **Platform as a service (PaaS)**

- **Infrastructure as a service (IaaS)**

Cloud can have four types of deployment models Public cloud, Private cloud, Community cloud and Hybrid cloud. [2]

Mobile cloud computing: As the use of smart phones has increased, they are being used for a large no of applications and mobile computing has become a powerful trend in the field of Information Technology. But mobiles have their limitations like low battery, storage and computing power etc. To overcome these issues it can take advantages of cloud computing. When cloud computing is integrated in mobile environment, it is called mobile cloud computing (MCC). Mobile cloud computing introduces new types of services and facilities for mobile users to take full advantages of cloud computing but at the same time it has many challenges like security, offloading decision, scheduling, Big Data handling etc. [3]

Definition and characteristics of Big Data:

In today's scenario there is a great increase in data collected from various sensors and different devices in different formats. These large and complex datasets are difficult to store, process, understand and analyze using existing database, methodologies and data mining techniques. This data is generally referred as big data. [4]

Big data is a relatively new term but many researchers have tried to define it. For instance, [5] referred to big data as a large volume of scientific data for visualization, [6] defined big data as "the amount of data beyond technology's capability to store, manage, and process efficiently." For instance Dumbill [7] asserts that data is Big when it "exceeds the processing capacity of conventional database systems. [8] Specified that big data is characterized by the four Vs, namely, volume, variety, velocity, and value (Fig. 1).

Figure 1: Four V's of Big Data
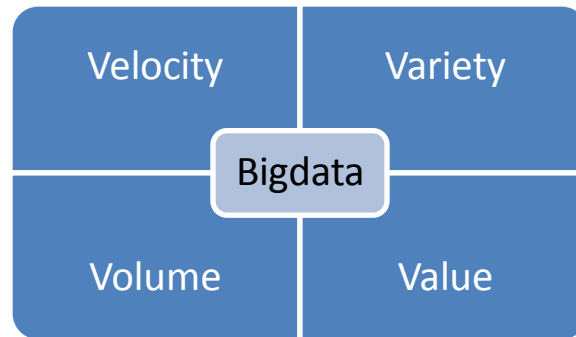
Rest of the paper is as follows: section 2 discusses Big Data issues and the existing solutions. In Section 3, conclusion and research directions are presented.

BACKGROUND

A large body of literature is available on Cloud computing and big data. Various research groups are exploring the ways to use cloud computing as the next generations paradigm shift by handling big data efficiently.

Although cloud computing has been broadly accepted by many organizations, research on big data in the cloud is still not sufficient. There are several issues that have to be addressed. Moreover, new challenges continue to emerge as their usage is being increased in different applications in different organization. In this section we will discuss these research issues, existing solutions and also the direction for future research.

➢ **Availability of hidden big data**
Availability refers to the resources of the system accessible on demand by an authorized individual [9]. In a cloud environment, availability of the data stored in the cloud within a short span of time with high quality service is an important issue. Lee et al. [10] introduced a multi-cloud model called "rain clouds" to support big data exploitation. "Rain clouds" involves cooperation among single clouds to provide accessible resources in an emergency. Ensuring this availability is big issue.

➢ **Scalability**

Scalability is the ability of the storage to handle increasing amounts and time evolving data in an appropriate manner. For example, the data stream mining field has very powerful techniques for this task [11].

➤ **Distributed mining**.

To take advantage of distributed computing, a lot of research is needed with practical and theoretical analysis using parallel processing methods.[12]

➤ **Visualization**

An important task of Big Data analysis is to visualize the results. As the data is so big, it is very difficult to find user-friendly visualizations. New techniques and frameworks are needed for this purpose.

➤ **Data transformation**

Transforming data into a form suitable for analysis is an obstacle in the adoption of big data [13]. Owing to the variety of data formats, big data can be transformed into an analysis workflow in two ways. In the case of structured data, the data is pre-processed before they are stored in relational databases to meet the constraints of schema-on-write. The data can then be retrieved for analysis. However, in unstructured data, the data must first be stored in distributed databases, such as HBase, before they are processed for analysis. Unstructured data are retrieved from distributed databases after meeting the schema-on-read constraints.

➤ **Data heterogeneity and data quality**

Data is originated and collected from many different sources; For example, huge amounts of data are generated from smart phones, where inconsistent data formats can be produced as a result of heterogeneous sources. The data quality problem is usually defined as "any difficulty encountered along one or more quality dimensions that render data completely or largely unfit for use" [14]. Therefore, obtaining high-quality data from vast collections of data sources is a challenge. High-quality data in the cloud means data consistency. If data from new sources are consistent with data from other sources, then the new data are of high quality. [12] Ensuring this high quality data is a big issue.

➤ **Data Compression**

While dealing with Big Data the quantity of space needed to store it is very relevant. There are two main approaches: compression and sampling. Using compression, we loose nothing but we may take more time and less space, so we can consider it as a transformation from time to space. Using sampling, we are losing information, but the gains in space may be in orders of   magnitude. For example Feldman et al. [15] use coresets to reduce the complexity of Big Data problems. Coresets are small sets that provably approximate the original data for a given problem. Using merge-reduce the small sets can then be used for solving hard machine learning problems in parallel.

➤ **Privacy and legal issues**

Privacy concerns are very big in cloud environment where users put their private data into the cloud storage. With the advent of big data analytic, which require personal information such as personalized and location-based services for profiling [16]. Information on individuals is exposed to scrutiny, a condition that gives rise to concerns on profiling, stealing, and loss of control [17].

CONCLUSION

Big Data is going to increase with time due to the emerging trend of IOT (internet of things). Cloud Computing is another technology of this era which can handle this large amount of data. We discussed the cloud computing, mobile cloud computing and big data characteristics in this paper. We also discussed some issues of big data and cloud computing, its solution and future research directions, which can become key research topics to study and help other researcher to go forward in this direction.

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