

Mobile cloud Computing: The Mobile web Service as Next Generation cloud Computing

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Abstract— Cloud computing is viewed as one of the major developing innovation generally utilized now a days. The use of mobile phones is reached out over practically all zones of our life. But there are such a large number of constraints in the services given by the mobile phones like band width, battery life etc. These limitations can be avoided by combining the idea of cloud computing with the mobile applications. Along with the tremendous development of mobile application and rising of cloud computing idea, mobile cloud computing (MCC) has been emerged as a innovative technology today. The concept of cloud computing is well used in mobile cloud computing. A definitive objective of MCC is to empower execution of rich versatile applications on a plenty of mobile phones, with a rich client experience. In this paper we have discussed about the architecture of mobile cloud computing, it's advantages, challenges and its applications.

Keywords— *Mobile cloud computing, architecture, applications*

INTRODUCTION

A cloud is a framework that gives computing services, executed in a dealt with, a powerfully adaptable and a versatile way. Mobile cloud computing is a combined form of cloud computing, mobile computing and wireless network. Mobile cloud computing gadgets, for example, cell phones and tablets are turning into a significant part of our advanced and virtual way of life. It provides a wide range of computational resources to many users like mobile phone users, cloud service providers and network operators. With the help of cloud services many mobile applications can be designed quickly and delivered easily to different devices. Mobile cloud computing empowers clients or users to rapidly and safely gather and coordinate information from different sources, paying little heed to where it lives. When we are using mobile cloud computing, it is not necessary to install the client application on the phone of the recipient and can be easily accessed with the help of a web browser from a remote web server.

By using the concept of mobile cloud computing, the traditional cloud computing concept of sharing a pool of resources over the internet in a pay per use method can be done very efficiently using our mobile phones. There are so many challenges to be solved in this area. Here we are discussing some of the architectures of mobile cloud computing and its comparison. In the next section we discuss about the various challenges faced by the mobile cloud computing along with its advantages and

disadvantages. The last section deals with the various applications of the mobile cloud computing.

I. MOBILE CLOUD COMPUTING ARCHITECTURE

The general architecture of mobile cloud computing [1]shows that the mobile devices are connected to the mobile networks through the base stations which includes base receiver station, access points or satellite. These base stations establish and control the connections between the devices and the networks. The information and the request of the user are transmitted to the CPU connected to the server of the service provider. Based on the data of the subscriber stored in database, the services like authentication, authorization are provided to the mobile users by the service providers. The request of user is given to the cloud which is processed by the cloud controller and gives the user the requested service.

The mobile cloud computing architecture consist of three different layers[2]

A. Mobile user layer

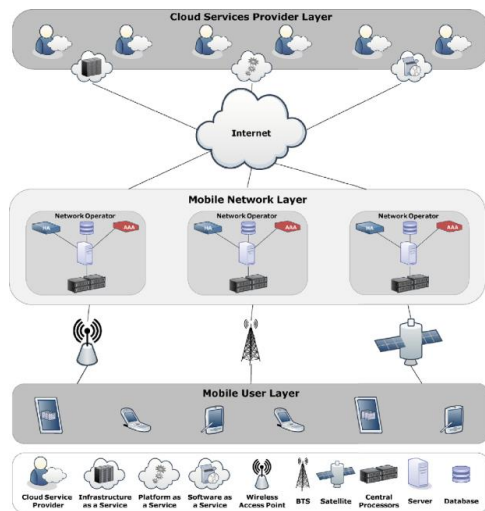
This layer comprises of numerous mobile cloud service users who access the service of cloud utilizing their mobile phones. These mobile phones interface with the mobile network layer through wireless access points(WAPs), Base Tranceiver Station(BTS) or Satellite.

B. Mobile Network Layer

This layer includes various mobile network operators which handle clients' solicitations and information is conveyed through base stations.

C. Cloud Service Providers Layer

This layer comprises of numerous cloud computing providers which give a wide range of cloud computing services including IaaS, PaaS, and SaaS. These cloud computing providers are versatile and can be expanded or decreased dependent on what cloud computing service clients request. Cloud computing furnishes services to clients incorporating those with mobiles can get to cloud services through the Internet.



Mobile Cloud Computing Architecture[9]

II. MAJOR MOBILE CLOUD COMPUTING ARCHITECTURES

- A. A Mobile-Cloud Collaborative Traffic Light Detector for Blind Navigation.**[3] propose a contextaware route framework for the visually impaired and the blind which requires computationally intense image and video handling algorithms. Basically, it is an arrangement of exceptional camera glasses associated with a mobile gadget through Bluetooth innovation. Using this the blind people can rely on WiFi based location tracking system and Text to Speech (TTS) abilities.
- B. A Virtual Cloud Computing Provider For Mobile Devices** [4] propose a structure for making virtual mobile cloud computing suppliers to address the issue of availability to cloud computing resources which isn't constantly accessible and now and again costly. Specifically, the proposed system utilizes mobile gadgets as a virtual cloud computing supplier by distinguishing close by mobile gadgets which are steady (i.e., hubs with less burden). This permits load balancing without associating with an IaaS cloud service provider.
- C. Device-to-device-based heterogeneous radio access network architecture for mobile cloud computing**[5] This article proposes a hierarchical cloud computing architecture to improve performance by adding a mobile dynamic cloud which is formed by powerful mobile devices. A device to device communication is used for data transmission between the devices in a heterogeneous wireless architecture. The main objective of this architecture is to increase in overall capacity of a mobile network through improved channel utilization and traffic offloading from Long Term Evolution-Advanced to device-to-device communication links.

D. Security Architecture for Mobile Cloud Computing [6] It proposes a minimalist of mobile cloud computing architecture which is designed in such a way that it ensures the organizations that make legitimate request are granted access to encrypted data.

E. Mobile Cloud Computing Model Using the Cloudlet Scheme for Big Data Applications[7]It proposes that we use mobile cloud computing service to execute the jobs in the cloud and accessing the result using the mobile phones and thus saving memory increasing the processing power. This is an architecture based on cloudlet concept. In this model it is not necessary for the mobile device to communicate with the cloud server and it gets connected to the cloudlet directly with the help of technologies which are not expensive.

F. Multilayer Architecture model for mobile cloud computing paradigm[8] This architecture promotes an adaptation to changing environments and enables a dynamic scaling of computational power able to assume a variable and for intensive application workload in a more effective manner than existing proposals.

III. CHALLENGES IN MOBILE CLOUD COMPUTING

We use the concept of mobile cloud computing for the effective use of mobile phones with an extra benefit of accessing the resources from cloud environment. But it has many challenges and it should be solved properly. Some of the main challenges are

- **Network Latency and limited bandwidth in the mobile network**[10]:The main challenge of mobile cloud computing from transmission channel is because of the intrinsic behavior and constraints of wireless networks and devices. The mobile broadband networks require more execution time for an application to execute in cloud
- **Mobility Management:** In case of heterogeneous network it is difficult to integrate dissimilar wireless networks.
- **Context Processing:** We use mobile devices to collect various information like weather condition, users' voice, gestures etc. So there arises challenges like storing and managing these information.
- **Security and privacy:** It is difficult to manage the threats on mobiles when compared to other devices as it is a wireless network and there are chances of getting no information.
- **Elasticity:** Sometimes the cloud providers need to provide more resources than they actually have. In such cases unavailability or interruption in accessing resources occur.

IV. ADVANTAGES OF MOBILE CLOUD COMPUTING

The important advantages of mobile cloud computing are

- *Cheaper mobile cloud apps*: We will be able to purchase different mobile cloud apps that fits to our budget. Designing a mobile cloud app is cheaper than native app and it is important to know that one app can be used in both the platforms. It is widely used for startups who do not have much to spend.

- *Accessing data using API*: The data sources and data storage services can be used with the help of an Application Programming Interface. These API helps to keep the cloud apps smaller in size

- *No need to install*: It is not necessary to download or install the mobile cloud apps for using in the mobile phones. They can be directly used from the cloud. The cloud apps execute almost like a web based application. The data is directly fetched from cloud and ensure that the app runs smoothly.

- *Scalable*: The maintenance and updation of the apps are very easy by releasing an MVP of the app and adding new features when needed. We can do the updation using native apps, but it is expensive and complexity is high.

- *Data Recovery*: There are chances to lose the data stored in local servers. But it is easy to recover the data from the cloud. A natural disaster can damage your local server and thus data can be lost. But if it is a cloud app, then the data is stored in multiple servers and can be backed up efficiently.

V. APPLICATIONS OF MOBILE CLOUD COMPUTING

The various applications of mobile cloud computing are

- *Mobile Email*: It helps the users to view, manage, and respond to emails without using an office network.

- *Mobile Sensing*: By applying Mobile Computing, we can use the mobile phones that are outfitted with different sensors and gather information from numerous applications on different good gadgets for shifted fields including human services, interpersonal interaction, ecological checking etc

- *Mobile Healthcare*: Using mobile healthcare the details of large number of patients are stored in the cloud which is very easy to access back when needed. It provides many services like emergency management, life style management, easy access to health care information, health-aware mobile devices, comprehensive health monitoring service, patient health management system.

- *Mobile Gaming*: The service of mobile gaming is one of the important source of revenue generation. Many games need a wide range of graphics. Mobile cloud computing is well used in mobile gaming because it helps to establish scalability through scalable computation through which we can update the

data on cloud instantaneously and refresh the screen of mobile device.

- *Mobile Commerce*: It is one of the most used service using which one can purchase the products using mobile anywhere anytime. Mobile cloud computing is applied on mobile commerce for E Banking, E Advertising and E Shopping.

- *Mobile Learning*: The traditional way of learning has many limitations which is solved using mobile learning. A large pool of resources are stored in cloud which can be very easily used by the students whenever they want. By using mobile cloud computing it is possible to increase the scope of mobile learning applications by solving the problems like low network transmission speed, limited availability of educational resources, high price etc.

VI. CONCLUSION

As cloud computing and mobile cloud computing are the emerging trends in the modern world. It is necessary for us to know in detail about the definition, architecture, advantages, challenges and applications of this concept. This study explains about the working of mobile cloud computing and the various fields in which it is applied.

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