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Overview on Mobile Cloud Computing

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Abstract: Mobile cloud computing has gained popularity recently because of less power consumption and overhead of mobile devices. Mobile cloud computing-based health monitoring, gaming, learning, and commerce are gaining importance day by day. This paper discusses the revolution of mobile cloud computing including its architecture, advantages, and applications.

Key Words: mobile cloud computing, cloud, bandwidth, resource, energy, security, latency.

I. INTRODUCTION

In recent years, as a result of the tremendous developments in mobile networks and technologies, mobile computing (MC) has become an emerging area of research. In the past decades, people used computers for computing purposes. According to the recent surveys, people are willing to use mobile devices such as laptops, Smartphones, personal digital assistants (PDAs), tablets, i-Pads, and so on, rather than the immobile desktop computers. The current smartphone user base already has reached the 1 billion mark. So, computing through mobile devices has become a more feasible concept than the conventional approach. But still some drawbacks such as lack of storage, computational power, and limited battery life of mobile devices have become the challenges for MC technology. To overcome these challenges, cloud can be a useful solution. Cloud is the combination of virtualization of a high amount of resources with a distributed computing paradigm incorporated with software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). Various cloud providers such as Microsoft Azure and Amazon EC2 provide seamless elastic storage and processing in an "On demand," "Pay as you use" manner. So, integration of mobile computing with cloud computing (CC) has given birth to a newer and better technological approach called mobile cloud computing (MCC). In a simple sense, MCC is nothing but cloud computing in which mobile devices are involved as the thin clients. Here, data will be offloaded into cloud from mobile devices for computation or storage.

II. MOTIVATION TO MOBILE CLOUD COMPUTING

Mobile cloud computing is defined as a rich mobile computing technology that controls integrated elastic resources of different clouds and network technologies toward unlimited functionality, mobility, and storage in order to serve a large number of mobile equipment anywhere and at any time through the Ethernet channel or Internet in spite of heterogeneous environments and platforms on the basis of the pay-as-you-use principle [1]. MCC is an infrastructure where the data storage and the data processing are performed outside the mobile device but inside the cloud. In MCC, the computing power and data storage are moved away from mobile devices and performed in the cloud, bringing mobile cloud applications and mobile computing not only to smartphone users but also to a wider range of mobile subscribers [2]. So, MCC is an infrastructure that combines the mobile computing and cloud computing domains where both data storage and data processing happen outside the mobile device. It is not always that offloading will be to a remote cloud, but it can be to a local cloudlet or to the collective resources of mobile devices in the local vicinity. The motivation behind MCC is simply to remove the existing drawbacks of mobile computing. There are several limitations of mobile computing discussed, which are as follows [1–3]:

1. Limited battery life of mobile devices: Because of the mobility of the device, it is impossible to find an external power source every time. Mobile devices have to rely on the internal battery, which has a charge life of only a few hours, in most cases. If computation is continuous or various applications are running continuously, battery will drain soon.
2. Limited storage capacity of mobile devices: Each mobile device has a limited amount of internal memory. A well-configured smartphone has only 8 GB of internal memory, and a laptop has 500 GB of storage. Though they can be expanded using external memory, in case of organizational data backup, they are insufficient.
3. Limited processing power of mobile devices: Smartphones have ARM processors, which are capable of running only small and a limited number of applications. Though laptops have i3, i5, and i7 type 3G high processing units, often they are not affordable due to their high cost. Processors are an irreplaceable part of a mobile device, so if anyone wants to upgrade it, it may not be possible.

4. Low bandwidth: In mobile computing, EDGE, GPRS, and GSM technologies have very low bandwidth. Though 3G and 4G technologies such as HSPA, WCDMA, LTE, and so on, are popular, they are available only in a limited number of cities/ towns, at too high a cost.

III. ARCHITECTURE OF MOBILE CLOUD COMPUTING

The service-oriented architecture (SOA) of MCC consists of three layers [3],
SOA of MCC consists of the following components [3]:

1. Mobile network
2. Internet service
3. Cloud service

1. Mobile network: A mobile network contains mobile devices and network operators. Mobile devices may be smartphones, PDA, satellite phones, laptops, and so on. They are connected to the network operator via the BTSs (base transceiver stations), access points, or satellites. They establish and control the connection between the functional interface between mobile device and network operator. A mobile device's request and information, such as ID and location, are transmitted to the central processor and servers of the network providers. Here, operators provides various services such as AAA (authentication, authorization, and accounting) based on the HA (home agent) and subscriber data stored in database.

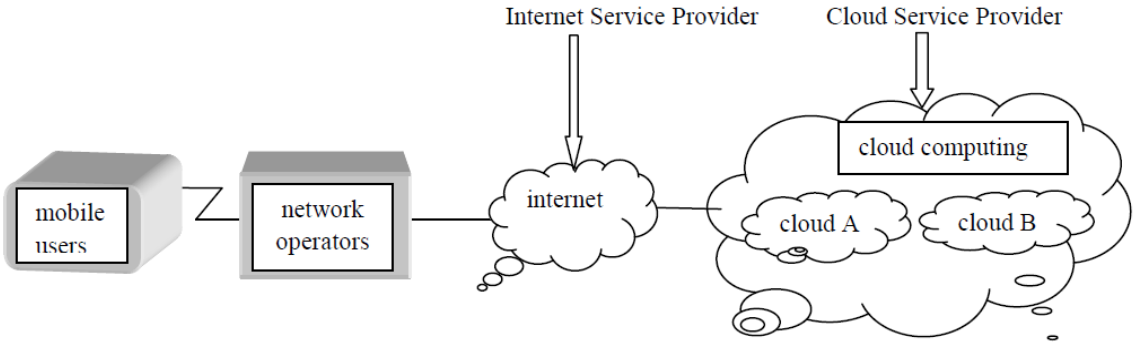

Figure 1 Architecture of Mobile cloud computing

2. Internet service: Internet service plays the role of a bridge between the mobile network and cloud. Subscriber requests are delivered to the cloud via a high-speed Internet service. Using wired connections or advance 3G or 4G technologies such as HSPA, UMTS, WCDMA, LTE, and so on, the user can get seamless service from cloud.
3. Cloud service: After getting all the requests from the users, the cloud controller processes the requests and provides service to them according to their requirements. Cloud has a few service providing layers.
These service layers are discussed as follows:

a. Data center layer: Data center provides the hardware facilities and infrastructure for the cloud. In a data center, there are several servers connected with high-speed networks and high power supply. Normally, they are built in less populated places with a low risk of disasters.

b. Infrastructure as a service: IaaS resides on the top of the data center layer. It provides storages, servers, networking components, and hardware to its clients on a "pay as you use" basis. It has an elastic nature, so infrastructures can be expanded or shrunk dynamically according to user demands. Amazon EC2 and S3 are examples of IaaS.

c. Platform as a service: PaaS provides an integrated environment or platform for users to build, test, and deploy several applications. Any kind of platform such as Java, .NET, PHP, and so on, is available. Google App Engine, Microsoft Azure are examples of PAAS.

d. Software as a service: SaaS is a software delivery model provided by application service providers (ASPs). Software and the associated data are centrally hosted on the cloud. SaaS can provide numerous kinds of software solutions such as CRM, ERP, MIS, HRM, and so on, on demand without any dedicated installation in client site.

This way, in mobile cloud computing, data storage and computations are moved into the cloud, and the user gets seamless, on-demand service without having to worry about battery life or the processing power of mobile devices.

IV. ADVANTAGES OF MOBILE CLOUD COMPUTING

There are several promising advantages of MCC, which are due to the use of a cloud environment as discussed here:
1. Extending battery lifetime: In MCC, data storage and processing happen outside the device and in the cloud, so it automatically increases the battery lifetime of the device. Any large computation drains the battery very quickly as it consumes a lot of power. It has been observed that offloading task into cloud like large-scale matrix computation can reduce the battery power by 45%, and in the case of chess game using cloud, a 45% energy saving is possible [4]. So offloading and task migration are effective solutions to extend the battery life of mobile devices.
2. Extending storage capacity: As was pointed out earlier, storage was a big constraint for a mobile device. But MCC provides a huge amount of storage. Amazon's simple storage service and Drop box are examples of cloud that provides storage to the user. Flickr is an application for photo-sharing based on MCC. Even Facebook application is an example of image sharing based on MCC.

3. Extending processing power: Many applications such as transcoding, playing games, broadcasting multimedia service, and so on, require high-processing power, which can be made available by offloading tasks into the cloud.
4. High reliability: In MCC, data and applications are stored in multiple computers, so there is no chance of data loss. Disaster management has become faster because of multisite availability. Many times, the cloud provides copyright to digital content such as music and video, thus preventing unauthorized distribution. Apart from this, cloud provides security services such as virus scanning, authentication, malicious code detection, and so on. In this way, MCC has improved reliability.
5. On-demand service: In MCC, the user gets, on demand, seamless service from the cloud. Because of the elastic nature of the cloud, users need not install dedicated hardware or software in their device. Everything can be obtained from the cloud. As an example, an Android user can get plenty of mobile apps from Google Play Store any time and in any amount they want in a "pay as you use" fashion.

V. APPLICATIONS OF MOBILE CLOUD COMPUTING

Because of the massive use of smart mobile devices and cloud, many applications of MCC have emerged [5]. These applications are very promising in terms of mobility and availability.

i) Mobile Commerce
ii) Mobile Learning
iii) Mobile Gaming
iv) Mobile Health Monitoring

VI. CONCLUSION

In this paper, we discussed the features, architecture, advantages, and applications of MCC. MCC is a mixture of mobile computing and cloud computing. MCC integrates cloud computing into the mobile environment to enable users to utilize resources in an on demand fashion. MCC provides a simple infrastructure for mobile applications and services by performing both data storage and data processing outside the mobile devices and in the cloud.

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REFERENCES

[1] Z. Sanaei, S. Abolfazli, A. Gani, and R. Buyya, Heterogeneity in mobile cloud computing: Taxonomy and open challenges, *IEEE Communication Surveys and Tutorials*, 16(1), 369–392, 2014.
[2] N. Fernando, S. W. Loke, and W. Rahayu, Mobile cloud computing: A survey. *Future Generation Computer Systems*, 29(1), 84–106, 2013.
[3] H. T. Dinh, C. Lee, D. Niyato, and P. Wang, A survey of mobile cloud computing: Architecture, applications, and approaches, *Wireless Communications and Mobile Computing*, 13(18), 1587–1611, 2013.
[4] E. Cuervo, A. Balasubramanian, D. K. Cho, A. Wolman, S. Saroiu, R. Chandra, and P. Bahl, MAUI: Making smartphone last longer with code offload, in *Proceedings of the Eighth International Conference on Mobile Systems, Applications, and Services*, San Francisco, CA, ACM, pp. 49–62, 2010.
[5] S. M. Butt, *Cloud Centric Real Time Mobile Learning System for Computer Science*, GRIN Verlag GmbH, Munich, Germany, 2014.

