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The Overview of Mobile Cloud Computing and its Applications

Dr. Anuj Goel, Dr. Neha Yajurvedi, Mr. Somprabh Dubey
Shobhit Institute of Engineering and Technology (Deemed to be University), Meerut
Email Id- anuj.goel@shobhituniversity.ac.in, nehayajurvedi@shobhituniversity.ac.in, sompradb.dubey@shobhituniversity.ac.in

ABSTRACT: ***Mobile cloud computing (MCC) is a mobile platform providing cloud computing services. MCC blends the features of mobile networks and cloud computing with optimal resources for telephone users. The information and sophisticated processing modules may be stored in databases in mobile cloud computing and equipment like processor speed and processing power, etc. do not require a robust setup. The rapid progression of mobile computing software and modems increases the use of mobile devices considerably. This generates a high mobile app and smartphone user growth rate. MCC provides an extensive overview of the technology to be understood in order to determine all future studies for ever-increasing sectors. It's a fantastic company and analysis tool for mobile cloud computing (MCC). The whole process runs via the web, which makes it susceptible to exploitation since the data are online processing and mobile device access. MCC integrates cloud computing into the digital system and overcomes obstacles to performance (such as battery capacity, room and latency), environment (such as diversity, usability, quality) and security, such as performance and secrecy.***

KEYWORDS: ***Cloud Computing, Mobile Computing, Mobile Cloud Computing, Performance, Security.***

1. INTRODUCTION

Mobile cloud computing (MCC) has recently been identified as a potential breakthrough in digital management in network-based computing and technology. The convergence of mobile computing, cloud applications and cellular connections provides impressive computing properties to server managers, mobile users and cloud service providers. MCC is yet another stage where a new basis for mobile phones and cloud services can be effectively built. It refers to a structure where the data is stored and processed outside of the mobile device. The cloud performs all the difficult work of software-oriented tasks throughout this design and stores a great deal of data. The rapid increase in mobile computing (MC) is growing significantly in IT. Contrary to conventional mobile computer technology, mobile cloud services in a network of many decentralized devices are virtualized and centralized instead of individual devices or networks. Ubiquity and mobility are two major elements of the next-generation network that provide a range of personalized network services across various network interfaces and connectivity forms[1]–[3].

Cloud computing's underlying technology consolidates computing, equipment and specialized applications as a resource for sale to customers like liquid, oil and electric power. The combination of a telephone network and cloud computing is therefore generating a new type of computing, Mobile Cloud Computing. Cloud services innovation today offers additional benefits for telephone users as cloud installations and networks provide virtually huge computing capability with multi-faceted optimization and increased supply and asset use. This can solve several traditional disadvantages through mobile technology. Cloud computing (CC) usually provides us with a range of cloud-based services on the Internet. These cluster systems consist of a series of databases or computers that manage the different computer assets at a minimum cost. Mobile cloud computing (MCC) is implemented by the proliferation of mobile apps as a cloud technology integration with mobile devices and is supported in multiple applications by phone users using cloud technology.

In Juniper Research, the increased use of mobile computing shows that the consumer and business market for cloud-based mobile applications are projected to increase to $9.5 billion by 2014. Applications for mobile devices have begun in recent years to become abundant with applications in various categories such as entertainment, health care, games, business, social networking, travel and news. These are evident in the popularity of browsing mobile app download centers like iTunes or Nokia's Ovi Suite. This is because mobile computing can supply the user with a tool wherever and when it's needed regardless of user movement, and thus support the independence of the location. In fact, 'mobility' is a feature of a computer environment where users can continue their work seamlessly regardless of their movement.

But mobility has its inherent problems, such as resource scarcity, endless energy and low connectivity. These pose the problem of running many useful programmes that can help the user and create a general environment. According to Tim O'Reilly, the future is a service which reacts in real time to data from its users or from non-human sensors. Effective time applications are only one type of mobile applications requiring high responsiveness and demanding intensive computing resources.

Some mobile applications, such as social networking locations, process and use the various sensor data of the phone. Extensive use of sensors, such as GPS reading, is expensive however, and this limits the mobile telephone to better serve the user via its embedded sensors. In addition, applications requiring extensive processing – image processing for video games, language synthesis, natural language processing, enhanced reality, wearable computing – all require a high level of computing capability, thereby restricting developers to implement mobile phone applications. Given the trends in mobile telephone architecture and battery, in future these problems are unlikely to be solved. In reality this is not just a temporary technical shortcoming, but a barrier that has to be addressed if mobile computing is to achieve its full potential.

In recent years, researchers have addressed this problem through cloud computing. Cloud computing may be described as a computer aggregation as a software and a service where applications are offered as Internet services and hardware and system software in data centers. The idea behind cloud computing is also known as 'on-demand computing,' 'utility computing' or 'Pay as you go computing' – to download computing to remote resource providers. In terms of the services offered by cloud providers, key strengths of cloud computing are described: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). Extensive studies on cloud computing, such as those in the literature, concentrate here on mobile cloud computing's promise and difficulties.

The concept of downloading data and computing in cloud computing is used to address the problems associated with mobile computing by using other resources than the mobile device itself for mobile applications. A mobile cloud may be called such an infrastructure, in which data storage and processing could occur outside the mobile device. Computer-intensive applications on small mobile devices may be implemented via the use of the processing and storage capabilities of the mobile cloud[4], [5].

Some of the main issues that must be addressed are: How does mobile cloud computing differ? What approaches have been taken to mobile cloud computing and how do they differ? How can computing be effectively discharged and dispersed to the cloud, and how does this differ from conventional distributed computing? What incentives may be utilized to convince nearby substitute devices to share workload? How might contextual knowledge be useful? How does mobility affect mobile cloud performance? The aim of this article is to describe the current

research on these problems in depth. We examine the solutions provided and look at the difficulties of mobile cloud computing research.

Mobile devices (e.g., smartphone and tablet PC) are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. Mobile users accumulate rich experience of various services from mobile applications (e.g., iPhone apps and Google apps), which run on the devices and/or on remote servers via wireless networks. The rapid progress of mobile computing (MC)becomes a powerful trend in the development of IT technology as well as commerce and industry fields. However, the mobile devices are facing many challenges in their resources (e.g., battery life, storage, and bandwidth) and communications (e.g., mobility and security). The limited resources significantly impede the improvement of service qualities.

Cloud computing (CC) has been widely recognized as the next generation computing infrastructure. CC offers some advantages by allowing users to use infrastructure (e.g., servers, networks, and storages), platforms (e.g., middleware services and operating systems), and software's (e.g., application programs) provided by cloud providers (e.g., Google, Amazon, and Salesforce) at low cost. In addition, CC enables users to elastically utilize resources in an on-demand fashion. As a result, mobile applications can be rapidly provisioned and released with the Mobile devices (e.g., smartphone and tablet PC) are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. Mobile users accumulate rich experience of various services from mobile applications (e.g., iPhone apps and Google apps), which run on the devices and/or on remote servers via wireless networks.

Mobile cloud computing is an evolving paradigm of cloud services that follows the development of the cloud to the edge of the network. It contains many mobile gadgets tightly linked to their users. They will participate directly in a number of cloud activities extending the cloud borders across the cyber physical system. As Gartner predicts, mobile telephones are to surpass computers as the world's most popular web access devices by 2013. This will increase mobile devices and incorporate them in almost all areas of our everyday lives. Mobile computing research aims to investigate how mobile systems detect and learn the state of devices and the mobility and networking contexts in an ad hoc communication environment in order to better support mobile applications. Cloud research focuses primarily on the management of computing, storage and communication resources shared by many users in a virtualized and isolated environment. Mobile cloud computing cannot easily be shown as the fusion of mobile computing with cloud technology.

An example of mobile cloud computing is the best way to use a smartphone to minimize its energy usage in the cloud. A computer job may be performed on the mobile device or removed from the cloud. Where to calculate relies on overall agreements between computing and communication while considering the quality of service (QoS) and experience needs of applications (QoE). On the one hand, both the cloud and mobile computer models should reduce system cost, with a greater emphasis on decreasing mobile device resource usage. A mobile cloud service model, on the other hand, should enhance the QoE of mobile consumers to meet their satisfaction with mobile cloud apps. Researchers require a comprehensive perspective of mobile cloud computing to solve the above problems. If research is confined to each research field, it will not be adequate to solve complicated issues emerging from the new model of mobile cloud service.

1.1 Mobile Cloud Computing:

Mobile cloud computing is initially based on multidisciplinary mobile computing and cloud computing research. Existing research attempts to bridge disciplines via the use of cloud computing solutions in mobile apps or mobile features in the development of new cloud services. However, the vast information in mobile cloud apps and the great complexity with which mobile cloud applications were designed required a new transdisciplinary investigation to better understand the nature and principles of mobile cloud computing. This new transdisciplinary research is what we call mobicloud computing. The word mobicloud is used more often to simplify the presentation in the following context. Functional collaboration is an essential aspect of mobicloud apps. For example, data mining based on mobile social networks needs cooperation among mobile users. To this aim, mobicloud will not only serve as a link between information sources collected from cloud computing and mobile computing sectors, but also as a knowledge center for supporting mobile users in their everyday work[6], [7].

1.2 Towards Mobile Computing:

The development of portable devices, including tablets, PDAs, GPS monitors and Notebooks, has experienced huge expansion with a wide range of mobile computing, networking and security features. Versatility in contemporary computing sectors is becoming a common term and a fast growing feature. Mobile computing is a method of communication between social computers, designed for the everyday usage of a device. Mobile computing is a collection of three key ideas: equipment, software and interaction. Computer ideas rely on mobile devices like phones, laptops or modular smartphones. Finally, the accessibility issue involves the usage of mobile network technologies, standards and data transfer, which must be accessible to consumers. Mobile computing is considerably easier to build utilizing the paradigm of cloud services. The various functions of mobile computing are:

- *Mobility:* Mobile nodes are linked to many other Mobile Computer networks, including static nodes on a Mobile Support Station (MSS) cable connection throughout the trip.
- *Diversity of network conditions:* These may include a high-capacity cable or a 'Wireless Wide Area Network (WWAN)' small-bandwidth network, or an isolated state. Mobile networks are often not uncommon.
- *Regular decommissioning and accuracy:* Mobile devices cannot always maintain the connection, such as battery power limitation, wireless transmission charge, network constraints, etc. and may be separated by the wireless connection directly or indirectly.
- *Network transmission dis-symmetric:* strong sender/recipient capabilities are allowed by data bases and routers and other MSS but very weak mobile network capabilities. There is therefore a difference between downlink and uplink between communication and workload.
- *Low performance:* Computers, servers, storage systems and software development must include a cellular network computing infrastructure to address the problem of security, as a result of signals susceptible to damage and monitoring.

1.3 Cloud Computing:

Cloud computing is the availability of pay-per-use computer services via the Internet. Cloud providers are very important, since they contain online cloud processing, social networking, webmail, internet business software etc. Enterprises may utilize the remote software and hardware of third parties with these devices. Cloud Computing provides a shared set of resources, including digital storage facilities, databases, specialized business applications and consumer apps. Without thinking about their own work, consumers may readily utilize data,

processing power or design environments. The user may simply utilize storage, computing power, or especially designed development environments without thinking about his internal functioning. Cloud computing is usually Web-based computing, masking sophisticated digital infrastructure.

Mobile cloud computing is the enhanced form or synthesis of the two many important functional computing paradigms. This is a contemporary parallel programming approach for mobile devices by moving storage and data gathering via intelligent smartphones to efficient hierarchical servers in computer clouds. As MCC is designed on the cloud model, wireless network methods may be acquired via distributed services, resources and tools based on the smartphone's web browser. MCC is a productive enterprise option for many businesspeople, since it lowers growth; it introduces charges for mobile applications and enables mobile consumers to buy technology on demand. Mobile cloud services primarily aim at providing consumers with a quick and simple method to get information from the Web, which includes utilizing mobile devices to efficiently browse cloud services[8], [9]. The main characteristics of mobile cloud computing are:

- Fulfill increasing cellphones, battery life and power management requirements.
- Enhance the interchange of services and reuse of current cloud computing and web-based applications and services resources.
- Remove all mobile phone limitations.
- Access current and future mobile phone web-based services and capabilities.
- On-demand self-service: A user may have computer services, such as a database space and a file server separately, and need social contact with each provider, if required.
- Wide network access: Bandwidth on the system is available and accessible through common frames that permit any use of different narrow or dense user devices, such as mobile phones, tablets, PDAs, etc.
- Resource Redistribution: The computer resources of the provider are pooled to serve many customers via a multi-tenant system that distributes and relocates distinct virtual assets according to customers' requirements.
- Fast elasticity: Functionality may be rapidly and elastically delivered, frequently instantaneously, to extend fast and to release promptly.

In diverse mobile applications, mobile smart information systems may simply be installed and executed through connection to various antenna networks and mobile devices, mobile data and software sharing, online applications and so on. Reduce the cost of developing, executing and managing mobile apps utilizing existing cloud technologies. Reduce the use of cloud telephone resources via efficient computer technologies, mobile cloud storage, networks and communication systems. Wireless cloud Computing has the major difficulty of designing smartphones and wireless devices, as well as their own limits and drawbacks. The creation, configuration, and deployment of applications on mobile and decentralized devices is extremely challenging rather than on static cloud devices. Limits on mobile phones, types of wireless apps, and support from cloud providers to mobiles all contribute to evaluations of cloud services in the realm of mobile cloud computing.

1.4 The Working Principle:

mobile cloud computing is an extension of cloud computing for desktop computers. In mobile cloud computing, data storage, and large-scale data processing based on previous cellular devices have been moved to the "internet" reducing the limitations on computational capabilities and properties for Mobile Apps.

The interfaces used by users for communication and the acquisition of cloud computing, on the other hand, are suitable and not limited to static devices (such as computers), which reflect the advantages and original purposes of cloud services, for mobile devices such as phones, PDAs, iPad and laptops. Mobile cloud computing therefore combines both techniques, the development of decentralized, networked and hierarchical technologies from both mobile and cloud-based computer perspectives and has a wide range of implementation possibilities[10].

2. DISCUSSION

In the last few years, progress has led to explosive growth of app models such as cloud computing, software as a service, community network, web store, and so on in the field of network based computing and on-demand applications. Cloud Computing has become a major research theme in the scientific and industrial community since 2007 as a major application model in the internet era. Cloud computing is commonly described as a range of services provided by an Internet cluster system. Such cluster systems consist of a group of low-cost servers or personal computers (PCs), organize the diverse computer resources according to certain management approaches and provide safe, reliable, quick, convenient and transparent services such as data storage, customer access, and customer computing. Cloud computing is on the top, meaning cloud computing will have an increased impact on the company and most organizations in 2012.

Meanwhile, smartphones have become the representative of different mobile devices because they are connected to the Internet with wireless network technology that are rapidly expanding. Ubiquity and mobility are two key characteristics of the next-generation network, offering a variety of customized network service through a number of network terminals and access modalities. Cloud computing is a core technology that concentrates computing, services and specific applications as a supply to be sold for users such as water, gas or electricity. Thus, combining a mobile network with a cloud computer generates a new mode of computing, Mobile Cloud.

The heritage and development of cloud computing is virtualized and assigned resources in mobile cloud computing networks in a number of distributed computers rather than conventional local computers or servers to mobile devices such as smartphones, mobile terminals, etc. In the meanwhile, many apps based on mobile cloud computing have been created and used by users including Google Mail, Maps and Mobile Navigation Systems, Voice Search and certain Android-based applications, Apple's MobileMe, Microsoft's Live Mesh and the Motorola-based MotoBlur. According to Juniper research, cloud-based software and applications are forecast to increase by 88 percent each year between 2009 and 2014, which may generate US$ 9.5 billion in 2014.

Although mobile cloud computing contributes significantly to our everyday lives, it also brings many difficulties and issues. In summary, the heart of these issues and difficulties is how to smoothly integrate the two technologies. To guarantee, on the one hand, that mobile devices take full use of the benefits of cloud computing to enhance and expand their functionalities. On the other hand, the limitations of restricted processing resources on moving devices may be addressed so that high-efficiency cloud computing like conventional PCs and servers can be accessed. Therefore, a comprehensive knowledge of the new computing paradigm - mobile cloud computing - is required to address these problems and highlight future study. This article presents the fundamental concept of mobile cloud computing, its history, essential technologies, current research conditions and its future prospects.

We are living in a new mobile computer age. Technological advancements are accelerating: (1) mobile devices are becoming much quicker to process speed and storage; and (2) wireless networks are increasingly faster and less latent and new applications such as LTE are changing the sector. Alongside these advances, the popularity of cloud computing has increased. A new approach to utility computing with unparalleled resource flexibility, agility and scalability is provided by Cloud Computing. A new Gartner research study forecasts the availability of cloud computing in the next two to five years. Mobile gadgets are inherently restricted by computer, storage and energy restriction compared to their tethered equivalents. This Digital or Hard Copy Authority may be given without charge for all or part of this work for personal or classroom use provided that no copies are produced or disseminated for profit or trade and copies of this notice and the entire quotation on the first page are included. For copying elsewhere, republishing, posting on servers or redistributing lists, a special license and/or charge is required.

The answer is certainly yes. We have recently seen many instances using cloud computing to address mobile computing issues. Apples iCloud stores and automatically sends customers' music, pictures, applications, calendars, documents etc. to all their devices over the wireless network. In Amazon EC2 and Microsoft Azure, Apple's iCloud stores are hosted. Amazon's new "cloud accelerated" Web browser Silk has been launched. Silk a "split browser" with both Kindle Fire and EC2 software. Silk dynamically calculates a division of labor between mobile hardware and Amazon EC2 (i.e. which browser subcomponents are running where) on each Web page request, which takes account of variables such as web conditions, page complexity and the location of cached material. We use public-cloud mobile applications (e.g., Amazon EC2 and Windows Azure) as mobile cloud applications or mCloud short applications. We refer to the field of mobile computing research which uses cloud resources as mobile cloud computing or short mCloud computing. Today's public cloud is built with no specific consideration of mobile apps for company applications. Mobile computing requires essential public cloud improvements. We refer to a public cloud that easily supports mobile apps such as mCloud.

3. CONCLUSION

Mobile cloud computing is a hybrid architecture that combines secure mobile devices that enable services on the Internet. Mobile cloud computing is by far the most popular and quickly growing technology in the creation and improvement of cloud services and mobile technology. The new computing paradigm was paved by the convergence of cloud, wireless transmission, mobile computing, area-based networks, mobile internet, etc. Furthermore, the development in private cloud data storage which leads to advances in MCC is significantly enhanced by internet activity. As the whole transaction uses the web of your mobile network, several of the difficulties Mobile Cloud Computing faces are addressed as opportunities for various kinds of assaults. In sophisticated technological settings, MCC is extremely important and offers the criteria to discover solutions to future MCC assaults.

REFERENCES

[1] T. H. Noor, S. Zeadally, A. Alfazi, and Q. Z. Sheng, "Mobile cloud computing: Challenges and future research directions," *J. Netw. Comput. Appl.*, 2018, doi: 10.1016/j.jnca.2018.04.018.

[2] A. N. Khan, M. L. Mat Kiah, S. U. Khan, and S. A. Madani, "Towards secure mobile cloud computing: A survey," *Futur. Gener. Comput. Syst.*, 2013, doi: 10.1016/j.future.2012.08.003.

[3] K. Akherfi, M. Gerndt, and H. Harroud, "Mobile cloud computing for computation offloading: Issues and challenges," *Applied Computing and Informatics*. 2018, doi: 10.1016/j.aci.2016.11.002.

[4] N. Fernando, S. W. Loke, and W. Rahayu, "Mobile cloud computing: A survey," *Futur. Gener. Comput. Syst.*, 2013,

doi: 10.1016/j.future.2012.05.023.

[5] H. T. Dinh, C. Lee, D. Niyato, and P. Wang, "A survey of mobile cloud computing: Architecture, applications, and approaches," *Wirel. Commun. Mob. Comput.*, 2013, doi: 10.1002/wcm.1203.

[6] L. A. Tawalbeh, R. Mehmood, E. Benkhlifa, and H. Song, "Mobile Cloud Computing Model and Big Data Analysis for Healthcare Applications," *IEEE Access*, 2016, doi: 10.1109/ACCESS.2016.2613278.

[7] R. Somula and R. Sasikala, "A survey on mobile cloud computing: Mobile Computing + Cloud Computing (MCC = MC + CC)," *Scalable Comput.*, 2018, doi: 10.12694/scpe.v19i4.1411.

[8] Z. Sanaei, S. Abolfazli, A. Gani, and R. Buyya, "Heterogeneity in mobile cloud computing: Taxonomy and open challenges," *IEEE Commun. Surv. Tutorials*, 2014, doi: 10.1109/SURV.2013.050113.00090.

[9] M. Alizadeh, S. Abolfazli, M. Zamani, S. Baaaharun, and K. Sakurai, "Authentication in mobile cloud computing: A survey," *Journal of Network and Computer Applications*. 2016, doi: 10.1016/j.jnca.2015.10.005.

[10] M.-A. Anwar, "Data security issues in the realm of mobile cloud computing: A survey," *PeerJ Prepr.*, 2018, doi: 10.7287/peerj.preprints.27050.