EVER INCREASING DEMAND OF MOBILE CLOUD COMPUTING

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Abstract: With the global evolution of mobile devices to smart devices over recent years, mobile cloud computing has arisen as a phenomenon to make it possible to provide annoying computational assets towards mobile users, network operatives and cloud computing service providers. MCC has integrated cloud computing with the mobile environment which has increased performance. Owed to its "store at one place, access since anywhere" feature it is highly convenient for users as it has improved data synchronization and data storage capacity. Due to such fostering features of MCC it's demand in the market is skyrocketing. This paper presents the trends and future demands of MCC and discusses the challenges as well.

Keywords: Mobile cloud computing, Trends, demands, challenges, services

1. Introduction

Mobile technology has expanded expeditiously in the global mobile market. The invention of mobile technology and mobile devices is revolutionary as it has shaped human lives in fundamental ways. This growth puts everything in the palms of our hand because of its capability of changing the world and giving more opportunities to the deprived. According to 'Statista', global smartphone users increased by 49.89% in 2017-2022. 'Statista' predicts consequential growth of smartphone devices on a global scale. Also by 2026, The number of people using mobile devices will rise to 7.516 billion.

Simultaneously, mobile cloud computing has transpired as a stunner which is meant to enable the development of amusing mobile requests on a large number of mobile devices. Mobile Cloud Computing (MCC) was described as a unification of cloud computing, mobile computing combined on a wireless network aiming to strengthen computational efficiency of resources for the convenience of the users. Basically, MCC is an extension of services produced by an internet based collection system which organizes different resources of mobile devices according to a management plan. These internet based systems provides secure, high-speed, reliable & favourable services such as secure data storage, data processing & easily accessible data to the clients. As the growth of cloud computing resources in MCC are virtualised and allocated in a cluster of various distributed computers. Numerous applications there has been a lot of focus on mobile cloud computing implemented for the convenience of the users like Google Maps & Navigation system, Gmail, Voice search, LiveMesh by Microsoft, AWS by Amazon, Digital Ocean etc. Figure 1 illustration the general manner of MCC.
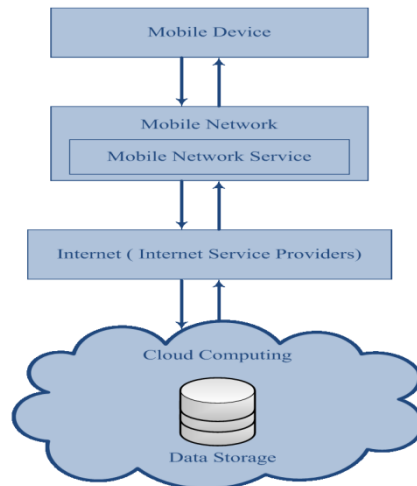
Figure 1. A View of a Mobile Cloud Computing (MCC)

Developing cloud services into a mobile environment comes up through various challenges and problems as well. It's challenging for mobile devices to control applications which are complicated owing with their inherent appeals. Likewise, it's challenging for a mobile device to stay connected with a network that is why alternate offline solutions has to be figured out as well. Due to the lack of security also privacy flexible mobile applications constraint might block the improvement of MCC. But due to it's much needed and convenient advantages it's demand has increased over the years in the global mobile market. This paper presents the basic architecture of MCC, future trends and demands, challenges and future technology perspectives.

2. DESCRIPTION

As an implementation and extension of Mobile computing and cloud computing, Mobile cloud computing was a term derived in 2009 in order to understand it better.

MCC could be simply supposed of as an infrastructure wherever data and handling happens external of the mobile devices, that enables complicated applications which as a result enables MCC to reach a broad variety of less progressive phones rather than only reaching to smartphone devices. Cloud computing has become a famous concept since 2007. MCC can be considered as an enormous scale cost-effective and commercial computing concept which follows virtualization as there fundamental expertise. The cloud model as termed by National Institute of Standards and Technology (NIST) consists of 3 service prototypes which are as follows:-

Software as a Service (SaaS) :- It lets users to associate to cloud-based programmes and usage them done the internet. It delivers a comprehensive software explanation that we rent from a cloud service provider happening a pay-as-you-go basis. It is a method of software dissemination in which software suppliers host a permutation of databases, servers, and scripts in order to construct requests that can be retrieved by users via allied devices. SaaS gives any user, anywhere in the world, access to a firm's workflow at any time. Gaining access to complex apps, free client software, paying only for what you need, effortlessly mobilising your staff, and accessing app data from anywhere are some of the benefits of SaaS. Google Workspace, SalesForce, and Zoom are some examples of SaaS.

Platform as a Service (PaaS) :- It is a software growth enabler in whichever a third-party service provider delivers regulars with a podium that permits them to progress, path, and accomplish software applications deprived of needing to create and preserve the essential infrastructure. It is a cloud-based development and deployment environment. It enables us to circumvent the price and hassle of acquiring and organization software licences. Cutting coding time, boosting advance competences without adding employees, developing for various platforms, using advanced tools inexpensively, supporting globally distributed development teams, and efficiently managing the application lifecycle are just a few of the benefits of PaaS. AWS Elastic Beanstalk, Windows Azure, and OpenShift are some instances of PaaS.

Infrastructure as a Service (IaaS) :- It provides consumers by simple computation, network, and storing competences on demand, over the internet, then on a pay-per-use origin. End users can scale and downsize possessions as desirable, minimising the essential for outsized, truthful capital investments or unnecessary owned infrastructure. In dissimilarity to SaaS and PaaS, IaaS contributes you the maximum control above your cloud resources. Moderates capital expenditure and optimises expenses, intensifications scale and presentation of IT workloads, progresses stability, steadfastness, and supportability, expands business continuity and disaster recovery, improves safety, and assistances us revolutionize and become new apps to users earlier are just a few of the benefits of IaaS. Some examples of IaaS are DigitalOcean, Cisco Metacloud, AWS, and Microsoft Azure etc. Figure 2 presents the cloud service model.
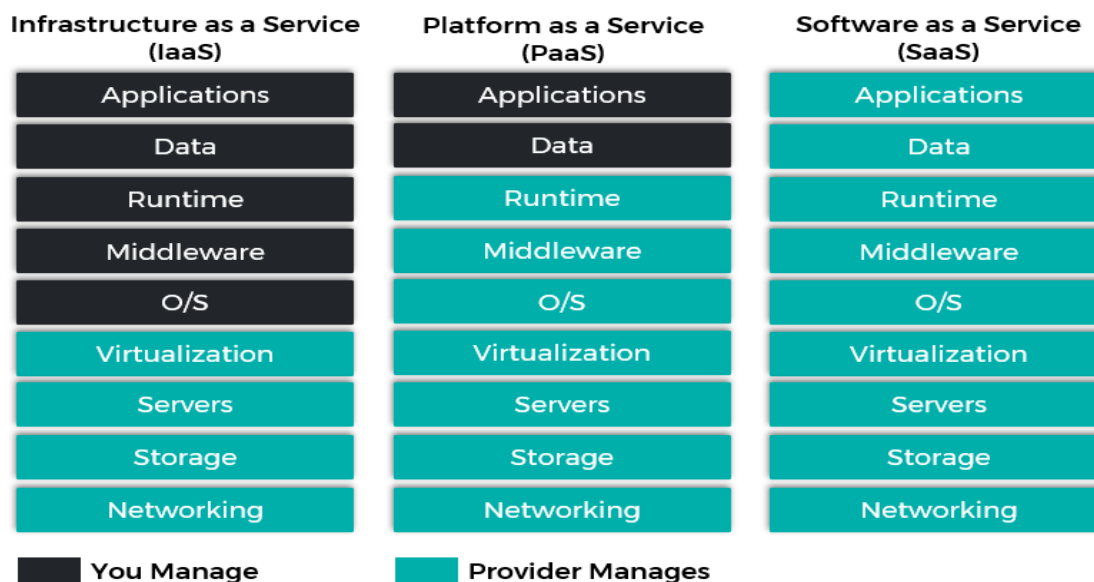

Figure 2. Cloud Service Model

3. ARCHITECTURE

The architecture of MCC may be seen in the notion of MCC, where mobile devices are associated to mobile networks thru base stations that institute and control the influences and boundaries between mobile devices and networks. Information access requests from users are sent to processors through servers that provide mobile network services. Based on the Home Agent (HA) and subscriber data recorded in the database, operators deliver AAA (Authentication, Authorization, and Accounting) to users. The user's request was then shown to the cloud through a wireless network. Following then, cloud controllers process the requests in order to enable and create the appropriate cloud services. Computing, virtualization, and service orientation approaches were used to create these services. Reserved in proximate mobile computing, mobile cloud, proximate in computing entities, and hybrid cloud are the four categories of cloud-based resources in MCC. MCC, in general, is a enormous-scale distributed network system built on a quantity of servers housed in data centres. The architecture basically demonstrates the efficiency of the MCC model with reference of user's needs. Fig 3. shows the layered architecture of MCC.
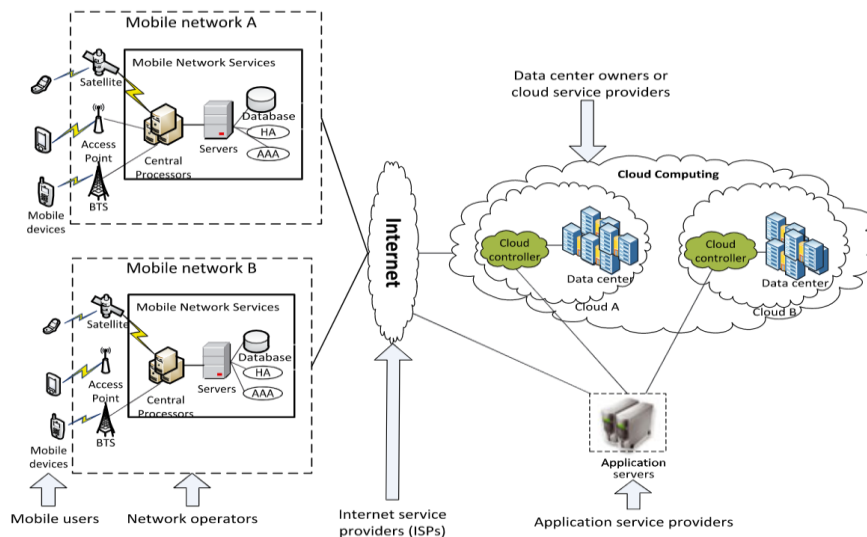
Figure 3. Mobile Cloud Computing Architecture

4. ADVANTAGES OF MCC

We discussed the architecture of MCC in the previous section now we'll move on to the reasons and advantages of MCC which makes it's demand skyrocketing in this technological era.

I. Extended battery lifetime: The purpose of the computation offloading technique is to move massive calculations and composite dispensation from restricted mobile devices to cloud servers. This helps in reducing the execution time of a large application which results in less power consumption.

II. Improved data storage: The development of MCC enabled mobile device Wireless networks allow operators to stock and admission vast quantities of data in the cloud. With this feature of MCC users can conserve a they have a significant amount of storage space on their gadgets because all the data and files are transferred and stored on the clouds. For Illustration: Amazon Simple Storage Service, Facebook supports file and media storage features.

III. Improved reliability: The development of MCC has improved reliability much effectively as running applications and transferring data files on clouds has reduced the chances of data then application loss from mobile devices because it gets Multiple computers were used to store and back up the data. MCC has been deliberate as a complete security model on behalf of both users as well as service operators as cloud security services makes efficient usage of the preserved records from various users to progress the efficiency of facilities.

IV. Flexibility: MCC is flexible as it consents the access of data after anyplace at any time. Users only require an internet association and a device by which they could contact cloud data.

V. Economical: MCC's development has reduced the price of hardware and has become one of the utmost cost-effective approaches of use and maintenance. MCC has a low initial cost, and users simply pay for the services they use.

VI. Multiple platform availability: Due to it's feature "The platform concept "store in one place, accessible from everywhere" has improved data synchronization. Regardless of the platform, the cloud is simple to use and change.

All these advantages of MCC are providing a user rich experience along with ease to all service providers. Along with it there are several factors which support the adoption of MCC, *(1) Trends:* users expect comfort in consuming websites and presentations from wherever at anytime and MCC is developed for this determination, it helps in increasing the productivity of business applications of users even when they remain on transform. *(2) Better-quality Broadband Coverage: 3G and 4G, WiFi, and femtocells are all improving internet connectivity for cloud computing on mobile devices. (3) Facilitating technologies: HTML5, CSS3, a cloudlets, hypervisor, and web 4.0 are all examples of enabling technologies that are promoting MCC adoption.*
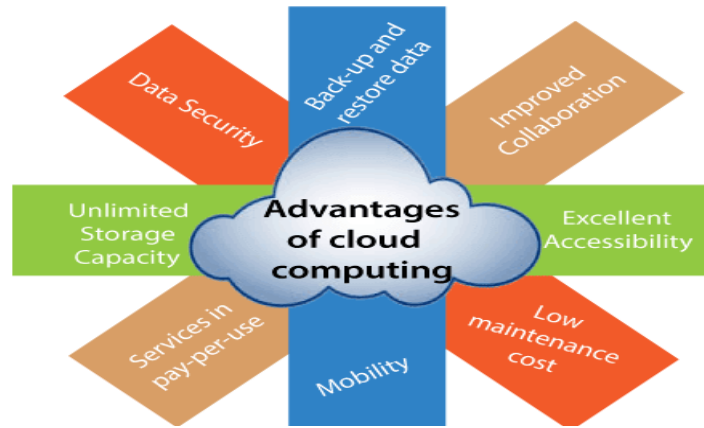
Figure 4. Advantages of cloud computing

5. APPLICATIONS OF MCC

In the global market, mobile applications are gaining traction. The advantages of MCC have been employed in a variety of applications to become as effective as they can. In this section we'll discuss some applications of MCC.

I. Mobile learning: It is built on the principles of e-learning and mobility. Mobile learning apps that are cloud-based have become increasingly popular been developed to make it effective. These applications make use of the cloud, which has a big storage capacity and influential processing capability, to afford learners with easy services in positions of information size, long battery life, and fast processing speed. The arrangement of m-learning also cloud computing has enhanced the announcement superiority amongst teachers and students. It has also been observed that a cloud-based m-learning system makes it possible for users to access information from anywhere.

II. Mobile Commerce: It has been designed as a business model for employing mobile devices to do business. Tasks that need mobility, such as online purchases, mobile texting, and online ticket booking, are made possible by these programmes. To complete these duties, these applications are integrated into a cloud computing environment. This combination improves data processing speed as well as security.

III. Mobile Healthcare: The development of m-healthcare has reduced the limits of customary medicinal treatment. It helps users in accessing resources such as persistent health records straightforwardly. Also m-healthcare provides hospitals with a variety of demanding services on clouds such as widespread health monitoring that enables patients to be diagnosed at anytime over wireless communications. Also there is backup administration system that manages emergency vehicles efficiently and at the time of acceptance calls since coincidences and instances. Health-attentive mobile devices have also been designed which detects pulse rates, blood pressure to alert healthcare emergency system.

IV.Mobile Gaming: M-gaming has emerged as a huge revenue generator for service operators. M-game offloads game engine whichever necessitates huge computing assets for server in the cloud. This depositing saves energy on behalf of mobile devices, thus aggregate the game playing time. There is also one system proposed named MAUI which enables grained energy alert depositing of mobile codes to a cloud. It dividers the presentation codes at a runtime centered on the prices of network communications and CPU to exploit energy savings. The goal is to improve energy consumption and performance of mobile applications as well.

Along with these there are several practical applications of MCC such as it helps mobile users share media efficiently and tagging friends on famous social Medias such as Twitter, Instagram, Facebook. MCC develops the utmost operative when users necessitate penetrating services such as location, searching information, video clips, images, files etc. It includes *Keyword-based searching, tag-based applications Voice-based searching,*. Also, there is a collaborative MCC application which detects *traffic lights* instead of blind, MCC framework for analyzing various corners of a house via mobile device.

All these applications prove that MCC has emerged as a phenomenon over the past few years and is a predominant expertise tendency with different benefits in an upcoming future.

Figure 5. Applications of cloud computing

6. CONCLUSION

Mobile cloud computing, are inherent of mobile computing besides cloud computing is the most fast rising and demanding technology in the global market. The mixture of wireless communication arrangement with computing devices has designed the cloud service model in a way which is giving the utmost benefit to users as well as service providers. Providing convenience to sectors like healthcare, commerce, education, gaming it has become the most accepted and trending technology today. In this paper we have introduced a brief description about the architecture, recompenses, applications and future benefits of mobile cloud computing. It clearly shows the applicability in MCC to a broad variety of services.

7. REFERENCES

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