APPLICATIONS, TECHNIQUES, ISSUES ON MOBILE CLOUD COMPUTING

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***Abstract*— The mobile technology becomes robust in the present scenario because now days, mobile devices become capable to support huge variety of applications. On the second thought, the mobile devices are experiencing many challenges as they have narrow pool of resources like battery life, bandwidth and capacity for storing data etc. But after the emergence of mobile cloud computing technologies, the mobile services become more prominent. Mobile Cloud Computing (MCC) refers to cluster of cloud computing and mobile networks where mobile applications transfer the computation power and storage from the mobile devices to the cloud to enhance the capabilities of mobile devices. In MCC, computation offloading is a technique that helps in transferring the complex application modules that require intense computation from a mobile device to the resource-rich cloud. The benefits of cloud based computation offloading are that it helps in improving the performance of integrated application, also enhances the overall execution time of the application and improves battery life of life of mobile devices. This paper focuses on offloading benefits, its techniques, its related issues and challenges.**

Keywords*— *Cloud Computing, Mobile Cloud Computing, Computation Offloading.

I. INTRODUCTION

Before the idea of MCC, the innovation of Cloud Computing was presented in 1996. Distributed computing is a rising figuring innovation that jellies information and applications by utilizing the web and focal remote servers. It helps in arranging and altering the applications effectively. With Cloud Computing clients can get to the assets through web from anyplace, whenever with pre-characterized charges which is referred to as "pay-as-you-use rule." So as to take the upside of Cloud Computing, a theoretical thought of MCC was presented. MCC is the idea that joins the Cloud Computing and the versatile systems. In MCC, the information.

Calculation just as information stockpiling happens in remote cloud servers, outside of the cell phone. This is on the grounds that cell phones are asset obliged gadgets; they have less assets (for example battery life, organize data transmission and capacity limit). MCC furnishes cell phone clients with information.

Stockpiling and preparing administrations in mists, as all the asset concentrated figuring can be completed in cloud. In this manner, there is less utilization of cell phone assets and consequently making cell phones increasingly effective.

A. The Architecture of MCC:

MCC architecture is as follows: Multiple mobile devices are linked to the mobile networks through base stations such as BTS, satellite or access points.

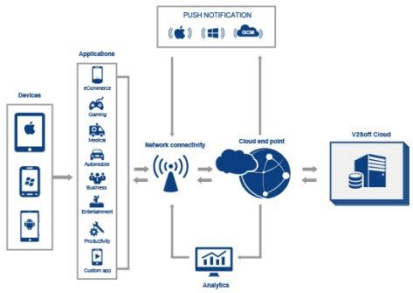

Fig 1. MCC Architecture

These are capable to create and control the connections and functional interfaces between the networks and mobile devices. Mobile user's information and requests are transmitted to the central processors that are connected to servers, providing mobile network services. Now the users are given the services (like authentication, authorization, accounting based on data stored in database) by the mobile network operator. After authorizing user, the cloud server receives the users request with the help of internet. Basically, internet plays the role of intermediator that sends the user requests from mobile networks to the cloud. Afterwards, cloud controllers present in the cloud are responsible to process the user requests and provide the corresponding cloud services.

B. Applications In MCC:

Portable applications have been utilized on huge scale and have an extraordinary offer in an overall versatile market. Different versatile applications like portable trade, versatile learning, portable detecting, portable human services, versatile gaming, sight and sound sharing, portable person to person communication and some more; have exploited versatile distributed computing. In this area, portions of the run of the mill MCC applications are examined quickly.

1. Mobile Gaming:

Mobilerecreations expected to have little degree as cell phones need high handling force, which is required for the realistic rendering. Accordingly, it by and large relies upon basic play as opposed to designs. Because of this, portable gaming use to exchange the diversion motor to the cloud as it is calculation serious and neighborhood gadget can't

deal with such application modules that needs high processing force and cloud consequently sends the yield in the wake of registering which the amusement clients get on their cell phones. This standard brings numerous advantages, for example, control sparing, improving diversion playing speed because of cloud's high calculation speed.

MAUI (memory math unit and interface), is a framework that underlines more on vitality sparing, so at the run time, it isolates the application codes dependent on the expense of the system correspondence and CPU handling speed on the neighborhood cell phone. The outcomes show it helps in vitality decrease strikingly for the cell phone. In addition, the execution of portable applications is additionally made strides. The analyzed measurements appeared by MAUI are: vitality put something aside for computer game is 27% and 45% for chess while the invigorate rate of amusement expands from 6 to 13 outlines for every second.

2. Mobile Learning:

Versatile learning applications empower clients to have remove learning by means of portable contraptions, for example, tablets, scratch pad, cell phones and so on. These m-learning applications are essentially the electronic learning with versatility. It gives m-students adaptability, as they can undoubtedly get to the applications from anyplace, whenever, from any convenient gadget and in any configuration. In contrast with customary m-learning applications, Cloud-based m-learning applications give clients remove instruction at quicker preparing velocity with increasingly instructive assets at high system transmission rate.

The connection status between the understudies and instructors has expanded with the development of m-realizing when joined with distributed computing. Through a site based on Google Apps Engine, understudies [9] can associate with their educators whenever. Additionally, the data in regards to the understudy's understanding dimension of the course can be drawn by the educators and can give answers for understudy's questions in an opportune way.

3. Mobile Healthcare:

Health (also written as m-health) is an abbreviation for mobile health, a term used for the practice of medicine and public health supported by mobile devices.[1] The term is most commonly used in reference to using mobile communication devices, such as mobile phones, tablet computers and PDAs, and wearable devices such as smart watches, for health services, information, and data collection.[2] The mHealth field has emerged as a sub-segment of eHealth, the use of information and communication technology (ICT), such as computers, mobile phones, communications satellite, patient monitors, etc., for health services and information.[3] mHealth applications include the use of mobile devices in collecting community and clinical health data, delivery of healthcare information to practitioners, researchers and patients, real-time monitoring of patient vital signs, the direct provision of care (via mobile telemedicine)[4] as well as training and collaboration of health workers.

4. Mobile Commerce:

Mobile commerce or simply M-Commerce means engaging users in a buy or sell process via a mobile device. For instance, when someone buys an Android app or an iPhone app, that person is engaged in m-commerce. There are a number of content assets that can be bought and sold via a mobile device such as games, applications, ringtones, subscriptions etc.

In computer science, computation offloading refers to the transfer of resource intensive computational tasks to an external platform, such as a cluster, grid, or a cloud.[1][2] Offloading may be necessary due to hardware limitations of a devices, such as limited computational power, storage, and energy[3][4]. The resource intensive tasks may be for searching, virus scanning, image processing, artificial intelligence, computational decision making

Offloading is a strategy for relocating the application modules, that require complex handling and substantial calculations, from the nearby cell phones (for example asset obliged gadgets) to remote cloud servers (for example asset rich gadgets).

The idea of MCC includes the offloading of the assignment that will be executed by the remote server. The piece of utilization that should be offloaded from cell phone to cloud should be possible in two designs that is incomplete offloading or full offloading [27,28]. In the full offloading engineering the full application alongside every one of the information related to it has been offloaded to the cloud where the whole calculation happen and the last outcomes have been sent back to the cell phone as appeared in figure 2

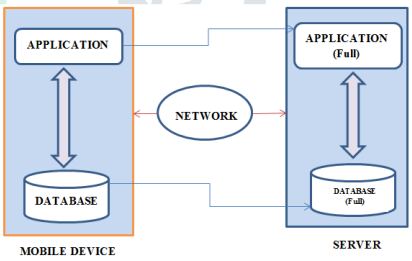

Fig 2. Full Offloading

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In the partial offloading architecture, only that part of the application which consumes more energy or have high complexity in terms of computation has been offloaded to the cloud. In this, both mobile phone and the cloud are responsible for the computation and final results comes after merging the individual results of both the computations that is in mobile device and at the cloud.

Offloading decision helps to: (i) improve performance, (ii) save energy, (iii) Increase storage capacity, (iv) Increasing reliability.

w	Amount of computational data
S(m)	Speed of the mobile system
D(i)	Sending input data
T(m)	Total Time to execute the application in mobile device
S(c)	Server Speed
T(c)	Total Time to offload and execute application in cloud
b	Bandwidth
P(m)	Power on the mobile system
P(c)	Power required to send data from the mobile system over the network
P(i)	Power consumption during execution of data in server

II. ISSUES AND CHALLENGES IN OFFLOADING :

A. Security:

Security is the foremost issue of the users in mobile environment. The major concern is the protection of private data of users. For instance, the sensitive data of the user stored in the cloud can be misused by the cloud service provider, without the awareness of the user. For example, when visualizing the integrated global positioning system (GPS) devices [12], the privacy concern arises. The GPS devices are considered to be more security intensive because it can cause subscribers to be tracked. Hence, it is a major concern to provide security and privacy to users.

B. Authentication:

As huge amount of data/applications are stored on a cloud both the cloud providers and the users should be careful while tackling with the sensitive data or applications. Such sensitive data need to be authenticated to avoid any misuse. Users should have authorised keys [13] while using external resources, therefore secure authentication mechanisms should be implemented.

C. Low Bandwidth:

Bandwidth is the critical issue in mobile cloud environment. Bandwidth utilisation [16] relies upon the sub modules of the application that are offloaded from local mobile device to the remote cloud. If the offloaded data is huge then it results in the delay between the transferring the data on cloud and the final result to be sent back to local mobile device which in turn results in less efficiency and high energy consumption.

D. Heterogeneity:

In mobile environment, WCDMA, GPRS, WiMAX, and WLAN are various network types that are used simultaneously for mobile communication. As a result, it becomes very difficult to handle heterogeneous network [13] connectivity while fulfilling mobile cloud computing requirements (i.e. scalability, improved mobility, on-demand availability etc.). So, heterogeneity is a major problem in computational offloading.

III. CONCLUSION

MCC is one of the developing versatile advances as it works together the advantages of both portable processing and distributed computing, in this manner conveying best administrations for versatile clients. We talked about couple of mobile applications that are exploiting MCC in light of the fact that cell phones don't urge some intricate applications to be registered locally as these gadgets face inadequacy of enough equipment, programming and battery lifetime. Offloading is strategy of MCC that relocates the overwhelming calculations to cloud servers which are progressively ingenious and the outcomes are gotten by the versatile frameworks. This strategy empowers the cell phone clients to get to each one of those applications which require substantial memory stockpiling, high computational power, long battery lifetime and vast system data transfer capacity. In this paper, we investigate the circumstance in which execution can be enhanced and vitality can be spared by offloading. We recorded down a portion of the exploration territories identified with offloading. Further this paper introduced some serious issues in offloading, for example, security, confirmation, low transmission capacity, heterogeneity. These issues in the long run obliterate the effectiveness of the procedure. In this way, these issues ought to be mulled over for the future work.

REFERENCES

[1] R.N. Calherios, R. Ranjan, A. Beloglazv, C.A.F.D. Rose and R. Buyya,"CloudSim:a toolkit for modelling and simulation of cloud computing environments and evaluation of resource provisioning algorithms," in Software- Practice and Experience, vol.41, pp.23-50, 2011.

[2] X. Zhang, J. Schiffman, S. Gibbs, A. Kunjithapa, and S. Jeong, "Securing elastic applications on mobile devices for cloud computing," in Proceedings of the ACM Workshop on Cloud Computing Security (CCSW'09), Chicago, Illinois, USA. ACM, pp. 127–134, November 2009.

[3] G. C. Hunt and M. L. Scott, "The Coign automatic distributed partitioning system," in Proc 3rd Symposium on Operating systems design and implementation (OSDI), pp. 187- 200, Feb 1999.

[4] J. Kim, "Design and evaluation of mobile applications with full and partial offloadings." Advances in Grid and Pervasive Computing, Springer Berlin Heidelberg, pp. 172-182, 2012.

[5] M. Shiraz and A. Gani, "A lightweight active service migration framework for computational offloading in mobile cloud computing" in The Journal of Supercomputing, pp. 1-18,2014.