EMERGENCE OF MOBILE CLOUD COMPUTING

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Abstract- **Mobile Cloud Computing is the way in which mobile users across the globe exploit facilities online. The mobile devices have evolved from the devices that facilitated voice calls to devices that facilitate the user to admit value added services. MCC embraces cloud computing into the mobile environment and overpowers impediments related to performance, environment and security.This paper presents the basic prototype of MCC, its background, key technology, problems, current research state and future research assessments.**

Index Terms - **Cloud Computing, Challenges in MCC, Mobile Cloud Computing, Research Extents in MCC.**

I. INTRODUCTION

The advancements in mobile phones are evolving at a rapid pace. According to IDC [1], the leading global market intelligence firm, the worldwide Smartphone market developed 42.5% year over year in the first part of 2012. The growth of flexibility has changed our lives fundamentally in an extraordinary way. According to Cisco IBSG [2], close to 80 percent of the world's population has contact to the mobile phone and novel devices such as iPhone, Android smartphones, palmtops and tablets have fetched a host of applications at people's palm.

At the same time, Cloud Computing has arisen as a phenomenon that represents the way by which IT services and functionality are charged for and delivered. NIST (National Institute of Standards and Technology, USA) definition [3] from September, 2011 published in its "Special Publication 800-145" of Cloud Computing is:

"Cloud Computing is a prototype for enabling suitable, on-demand network approach to a shared pool of configurable assets (e.g. networks, servers, storage, applications and services) that can rapidly be provisioned and released with minimal management effort or service provider communication."

The key merits of cloud computing from a business perspective as well as its unique features from a technological perspective given by Martson .et.al [4] in their research paper is as follows:

"It is an information technology service prototype where computing services (both hardware and software) are carried on-demand to customers over a network in a self-service fashion, autonomous of device and location. The sources required to run the requisite quality-of service levels are shared, dynamically ascendable, rapidly provisioned, virtualized and liberatedwith minimal service providercontact. Users pay for the service as an operating overhead without incurring any significant initial capital spending, with the cloud services employing a metering system that divides the calculating resource inappropriate blocks."

Unlike orthodox mobile computing technologies, the assets in mobile cloud computing are virtualized and allottedin a group of many distributed computers rather than local computers or servers. Many applications made on MobileCloud Computing, such as Gmail, Maps and Navigation methods for mobile, Voice Search, and few applicationson other platforms have been made and served to users. Supplying cloud services in a mobile environment brings abundant challenges and problems. Mobile devices cannot handlecomplex applications due to their distinctive characters. Also, it is difficult that a mobile device is always online, the offlineresolution of the device need be considered as well. The lack of standards, security and privacy, flexible mobile applicationsrequirement may block the development of Mobile Cloud Computing. In order to comprehend the challenges and providefurther room for research, an understanding of this new approach is essential.

ISSN: 2278 – 7798

II. BACKGROUND

As an inheritance and arise of cloud computing and mobile computing, mobile cloud computing has been developed as a new expression since 2009.From a simple view, mobile cloud computing can be thought of as substructure where data and processing could happen external of the mobile device, permitting new types of applications such as context-aware mobile public networks. As a result, many mobile cloud applications are not limited to dominant smartphones, but to a broad range of less advanced mobile phones and, therefore, to a broader set of viewers. MCC can be divided into mobile computing and cloud computing. The mobile connect with a base position or a hotspot by a radio link suchas 3G, Wi-Fi or GPRS. Although the client is altered from PCs or fixed machines to mobile devices, the main perception is still cloud computing. Mobile users send service demands to the cloud through a web browser or desktop application. The management section of cloud then allocates assets to the request to create connection, while the monitoring and calculating functions of mobile cloud computing are implemented to ensure the QoS until the connection is completed.

III. DESIGN

The mobile devices are linked to the mobile networks through base stations that create and control the connections (air interface) and useful interfaces between the networks and mobile devices. Mobile users' request and data are transferred to the central processors that is associated to the servers which provide mobile network services. The subscribers' requests are then sent to a cloud via the Internet. Cloud controllers existing in the Cloud; process the demands to offer the mobile users with the same cloud services. These services are built based on the concepts of value computing, virtualization and service-oriented architecture.

The foremost purpose of a cloud computing system is storing data on the cloud and exploiting technology on the client to reach that data. Some authors stated that Cloud Computing is not wholly a new concept. You seff.et.al have stated in their paper [5] that Cloud Computing has established itself as a descendent of several other computing areas like service-oriented design and distributed computing and receives their progressions and disadvantages. They offered Cloud Computing as a new model in the sense that it offered a superior advantage over the present under-utilized assets at the data centers. Buyya.et.al has introduced market oriented architecture in [6] and [7]. They have presented Cloud as a type of parallel and distributed system consisting of a group of interconnected and virtualized computers that offer computing assets from service providers to customers meeting their agreed SLA (ServiceLevel Agreement).

IV. PROBLEMS AND SOLUTIONS

The last decade fetched with it numerousprogressions in the way we notice computing and mobility. Calculating will be the 5thutility (nextto water, electricity, gas and telephony) and will give the rudimentary level of computing service that is calculated necessary to meet daily needs of the general community. Cloud Computing is the latest model proposed to deliver this thought. It has shown to be a convincing solution for mobile computing for numerous reasons (e.g. mobility, communication andportability).

Resource poverty: As processors are being faster, screens are being sharper and devices are equipped with many sensors, a smartphone's capability to consume energy far outshines the battery's ability to provide it. The two main factors are limited battery capacity and on growing demand from users for energy-hungry applications. User demand is increasing day by day for resource rigorous applications, like audiovisual games, streaming video and sensors fortified on mobile devices that yield nonstop streams of data about the user's environment. Many solutions have been planned to increase the CPU performance [8] and to regulate the assets available optimally in order to reduce power consumption. These explanations, still, needvariations in the structureof mobile devices or need new hardware resulting in extra engineering.

Computation offloading methods transfer the huge computations and complex processing from resource-limited devices to resourceful devices, thus escaping mobile devices to take extra implementation time. Rudenko .et.al have demonstrated in [9] that remote execution of large tasks can decrease their power consumption by upto 50%. Cuervo .et.al have shown in [10] that using MAUI (Memory Arithmetic Unit and interface) to transfer mobile components to servers in the cloud can save 27% ofenergy consumption for computer games and 45% for the chess game.

Data storage capacity and processing power: Storage is also a main concern for mobile devices. MCC is made to enablemobile users to store and access great amounts of data on the cloud. Amazon Simple Storage Service (S3) is one such instance [11]. It delivers a simple web services interface that can be used to store and recover any amount of data, at anytime from anywhere on the web. Flickr [12] is almost certainly the best photo distributing application based on MCC. It lets users to upload and share photos through mobile devices and web. Facebook [13] is the most successful social network application today and isalso a typical instance of using cloud in sharing images. MCC also aidsin reducing the

ISSN: 2278 – 7798

running cost for compute-intensiveapplications. Cloud computing proficiently bolsters several tasks for data-warehousing, controlling and coordinating numerous documents online. Thus, mobile devices are no more restricted by storage capacity because their data is now stored on the cloud. Microsoft will develop new office software [14] to hold cloud computing to fully assimilate with all types of mobile devices. It will allow users to save, publish and share their work with other users as well as their desktop computers and mobile devices.

Division of application services: The mobile devices have inherently fractionalassets. Thus the applications have to be dividedin order to attain a particular performance target (little latency, decrease in data transfer, fast response time etc.).Considering the needs of MCC, the necessary factors for delivering 'good' cloud services have been listed below:

•Optimal partition of application services through cloud and mobile devices

•Low network potential in order to meet application and code offload interactivity

•High network bandwidth for quicker data transfer amid cloud and mobile devices

•Adaptive controlling of network conditions to improve network and device costs against user-perceived performance ofthe Cloud application

The following approaches can be adopted by service providers to address the above issues:

•Network bandwidth strategy: use oflocal data centers or other means to fetch content closer to mobile broadband

•Network potential strategy: Application processor nodes to be transferred to the edge of mobile broadband

•Battery saving strategy: Duplicating the device in the network for compute and energy rigorous management tasks such asautomatic virus scanning of mobile devices

•Mobile cloud application resistance: Dynamic handling of application transport and execution amid the deviceand the network

There are many other issues related to application of MCC. A few of them have been enlisted below:

A. Absence of standards

Although there are various advantages of Cloud computing over the orthodox computing techniques, there is no accepted openstandard present. Portability and interoperability is also not possible between different Cloud computing Service Providers(CCSP). This averts the service providers to widely install and quickly develop Cloud computing. Customers are hesitant totransform their current datacenters and IT assets to cloud platforms owing to several unsolved technical glitches thatexist in these platforms. Some of the glitches existing due to a lack of open standards are the following:

•Limited scalability: Owing to the quick growth, none of the CCSPs can encounter all the requirements of all the users.

•Unreliable availability of a service: Reliance on a single CCSP's service can result in a bottleneck in the event of abreakdown of a service.

In view of the afore mentioned demerits, Rochwerger.et.alhave presented a solution called Open Cloud ComputingFederation (OCCF) in [15], that solves the problems of interoperability and portability among various CCSPs. However, the move to a common cloud standard is impossible because most of the cloud computing firms have their own APIs and for settingthose up huge amount of money was spent. The OCCF thus don't have a practical realization tool. A possible approach is to have aMobile Agent Based Open Cloud Computing Federation (MABOCCF) mechanism as introduced by S. et al. in [16].

B. Access Schemes

MCC will be deployed in a heterogeneous access scenario in terms of Wireless Network Interfaces. Mobile nodes access theCloud through different radio access technologies.Computing needs the following features:

•MCC requires an "always-on" connectivity for a low data rate cloud control signaling channel

•MCC requires an "on-demand" available wireless connectivity with a scalable link bandwidth

•MCC needs a network selection and practice that takes energy-efficiency and costs into account

Access management is a critical aspect of MCC. A possible explanation is to use context and location information to improvemobile access, as proposed by Klein .et.al in [17]. Deploying MCC using the context information, such as device locationsand competences and user outlines, can be used by

ISSN: 2278 – 7798

the mobile cloud server to locally improve the access management.

C. Security

Mobile devices today have all the functionalities of a standard computer. This also brings a security threat to the mobile devices. The threat discovery services run on the mobile devices to fight these security threats,warrant intensive usage of assets, both in terms of computation and power.A possible solution is to move these finding services to the cloud. It preserves the device CPU and memory necessities withenhanced bandwidth as the cost to be paid. This approach has the following benefits:

•Improvedrevealing of malicious software.

D. Elastic Application Models

Cloud computing facilities are scalable, through dynamic provisioning of assets on a fine grained, self-service basis close to real-time, deprived of customers having to engineer for peak loads. This need particularly reveals in Mobile Cloud Computing due to the fundamental limits of mobile devices. For example, the iPhone 4s is built with 800 MHz CPU, 512 MB RAM allowing about 8 hrs of talk time and 14.4 Mbps speed on HSDPA 4G network, [18]. On comparison to today's PC and server platforms, these devices cannot run compute-intensive applications. Thus, an elastic application model is needed to crack the essential processing problem.

V. RECOMMENDEDED METHOD

Qureshi .et.al[19] have categorized MCC into two broad categories viz. General Purpose Mobile Cloud Computing (GPMCC)and Application Specific Mobile Cloud Computing (ASMCC) .

A. GPMCC

1) Approach

Cloud Computing has an extensive perspective and finds viable applications in varied applications. This enforces a mobile device to exploit the internet to practice a resource in an on-demand method. Thus computation hungry tasks that are usually performedon a resource constrained mobile device can now be outsourced to the cloud.

2) Augmented Execution

Chun .et.al have suggested an architecture in [20] that reports the challenges of implementing potential applications on mobiledevices via flawlessly but partially off-loading execution from the smartphone to a computational structure hosting a cloudof smartphone clones.

This enlarged execution overcomes smartphone hardware risks and it is provided (semi)-automatically to applicationswhose developers need little or no modifications to their applications.

Chun.et.al [21] firstly realized the cloud vision. Clone Cloud boosts novel mobile applications by off-loading the correct portionof their achievement onto device replicasworking in a computational cloud. The principal stimulus was as long as the execution on cloud is considerably faster than execution on the mobile device, the price paid for sending the pertinent data and code from thedevice to the cloud and back would be worth it. The next stimulus was to take the programmer out of application division. Clone Cloud uses a mixture of static analysis and dynamic profiling to divide applications spontaneously at afine granularity while enhancing execution time and energy use for a target calculation and communicating environment This show that the prototype can adjust application partitioning to various environments, and can aid few applications as much as a 20x execution speed-up and a 20-fold decrease of energy spent on the mobile device. This however suffers from drawbacks because only a fixed computation planning in the mobile device is deliberated.Wen .et.alhave proposed energy-efficient application execution in the cloud assisted mobile platform in [22]. The objective was to decrease the total energy consumed by the mobile device. When the applications are implemented in the mobile device, thecalculating energy can be minimized by optimally planning the clock frequency of the mobile device.

B. ASMCC

1) Approach

Application Specific Mobile Cloud Computing constitutes developing specific applications for mobile devices. While bothpotentially offload the computation from and progress the efficiency of the mobile device, ASMCC has an merit overGPMCC that it offers more than simply computation power. For example, e-mail or chatting requires ASMCC as internet is usedas the communication resource and not mere storage.

2) Mobile Service Clouds

Samimi .et.al have presented service clouds for MCC in [23] and named them Mobile Service Clouds. This model allows dynamic instantiation, composition, configuration and

ISSN: 2278 – 7798

reformation of services on an overlay network to back mobilecomputing.

3) Think air

Kosta .et.al have anticipated Thinkair in [24] which takes the finest of MAUI [10] and CloneCloud [27, 28] projects. Ittalks about MAUI's lack of scalability by making Virtual Machines (VMs) of an ample smartphone scheme on the cloud, anderadicates the limits on the applications that CloneCloud brings by adopting an online method-level unloading. It alsooffers an effective way to achieve on-demand resource allocation and use parallelism by dynamically making, resuming,and destroying VMs in the cloud when needed. 5) Partitioning and execution of applications

4) Elastic Application Weblets

Zhang .et.al[25] have proposed a prototype that permits the unified and lucid use of cloud assets to add the competence of resource constrained mobile devices. The striking features of this model include the divider of solo application into multiple components called weblets, and a dynamic adjustment of weblet execution configuration. While a weblet can be platform free (e.g., Java or .Net byte code or Python script) or platform contingent (native code), its execution location is lucid – it can be executed on a mobile device or transferred to the cloud, i.e., executed on one or more nodes offered by a CCSP.

VI.CONCLUSION

Mobile Cloud Computing, as an expansion and grant of Cloud Computing, is the most emerging and well established technology with firm growth. The mixture of cloud computing, wireless communication structure, portable computing devices, location-based services, mobile Web etc. has decided the foundation for the new computing model. In this paper we have specified an imprint of Mobile Cloud Computing that includes architecture, some benefits, key challenges, present research.

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ISSN: 2278 – 7798