

**Survey Paper of Energy Efficiency in Mobile Cloud Computing**Ms. Grishma Tamboli<sup>1</sup>, Mr. Yask Patel<sup>2</sup><sup>1</sup>Department of Computer Engineering, PIET Vadodara,<sup>2</sup>Department of Information Technology, PIET Vadodara,

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**Abstract** - The Technology world, Mobile devices such as Smart Phones, Tablets are becoming important part of the Human life. They are facing some challenges their resource such as battery life, bandwidth and storage. they also facing some challenges of communication and security. Smartphone's have gained wide popularity over the past few years. Some application on Smartphone's has limited resources for battery life so that increases the energy efficiency and performances to the resource constraint device. In this survey paper to explain the overview of energy efficiency in a mobile cloud computing.

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**Keywords** – Cloud Computing, Mobile cloud computing, Energy Efficiency, Offloading.

**I. INTRODUCTION**

Cloud Computing is the network-based environment that concentrate on sharing computation or resources. Actually, cloud Internet based and it tries to guise complication for clients. Cloud computing refers to both the application provides as a services over the internet and the hardware and the software in the data center that provides that services [1]. Here, Cloud provider, has a service that has private cloud part which only authorized by certified staff and protected by firewall from outside accessing and a public cloud environment which external users can access to it [1]. There are three major type of service in the cloud environment: SaaS, PaaS, and IaaS

Cloud Computing is described as a range of services which are provided by an internet based cluster system [2]. such cluster system consists of the group of low cost servers or personal computers (PCs), organizing the various resources of the computers according to a certain management strategy, and offering safe reliable, fast, convenient and transparent services such as data storage, accessing and the computing the clients [2]

Meanwhile, Smartphone's are conceded as the representative for the various mobile devices as they have been connected to the internet with the rapid growing of wireless network technology [2]. if we considered the smart phones which has a processors of limited capacity and limited amount of main memory, it restrict the smart phones to carryout operations that demand more processing power and memory [11]. Another short coming of every Smartphone is its battery life as well which is very poor in all the cases. So in order to overcome these drawback mobile cloud computing can play an important role. with the help of computation offloading process we can offload the demanding task that demand for more processing power as well as memory to the resources rich cloud to get it processed there and the return the final output back to the device resulting in save the energy consumption as well [11]. cloud computing the promising the technology which can offer many benefits of mobile cloud.

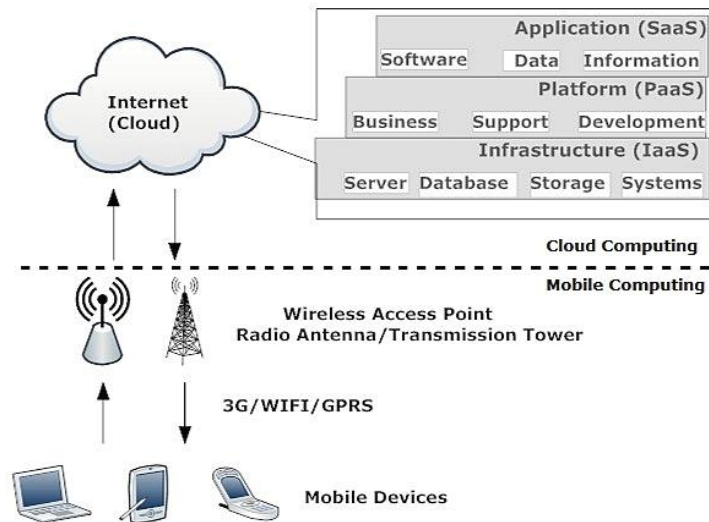
Mobile Cloud Computing offers to meet users increasingly functionality demands, as different servers execute all application logic and only user interface functionalities reside on the mobile [6]. mobile cloud computing its separates the user interface from the application logic in such way mobile device executes only viewer component, operating as a remote display for the application running on different server in the cloud [6].

Offloading reduces the amount of data being carried on the cellular bands, freeing bandwidth for the other users and it also used in situation where local cell reception may be poor allowing the user to connect via wired services with the better connectivity.

The rest of this paper is organized as follows. Section II presents basic architecture of Mobile Cloud Computing. Section III presents Mobile cloud offloading. Energy Consideration are discussed in section IV.

**II. ARCHITECTURE OF MOBILE CLOUD COMPUTING**

Figure 1 shows Mobile cloud computing can be divided in to cloud computing and mobile computing such as devices can be laptops, PDA, smart phones and so on which connect to the hotspot or base station by 3G, Wifi and GPRS.



**Figure 1. Architecture of Mobile Cloud Computing<sup>[2]</sup>**

Mobile computing and major data processing phases have been migrate to ‘cloud’ ,the capability requirement of mobile device is limited and some low cost mobile device or some non smartphones can also mobile cloud computing by using the cross platform middleware[2].the clients in mobile computing is change from PCs and fix machine to mobile devices this is the main concept of mobile cloud computing.Mobile users send and receives request to the cloud through a web browser or desktop application,then the management componenet of the cloud allocates the resources to the request to established the connection ,while the monitoring and the calculating the function of mobile cloud computing will be implemneted to ensure the QOS until the connection will completed[2].

### **III. MOBILE CLOUD OFFLOADING**

Our Cloud Offloading is used to past seven years. It’s focused on preliminary on advancing various program analysis and transformation techniques and as well as dynamic run time support.

Mobile Cloud Computing to maximize energy saving in different and volatile mobile networks, cloud offloading schemas must be supportive adaptive offloading strategies. The runtime system controls the adaptively. It manages the network connection between client and server; estimation mobile device’s energy consumption identifies the offloading strategies to follow and synchronized to the transferred check point state, and provides the loss in the case of disconnected [4].Maximizing save energy requires trailing runtime execution to account for the specific applications and business logic to support this kind of customization runtime systems need to programming in abstraction level to be express energy optimization parameter and triggering strategies[4].

In Offloading scenario to be shows the task can be sent to the server via Wife or 3G cellular data. The propose communication model for both the cases in context of the energy consumption involved. Here some and many intermediate component which consumes more or less energy compared to the other components is not possible with time constrain and confidentiality reasons to the our best to approximation to the energy consumption of major nodes involved in the communication.

#### **A. Wi-Fi Commutation Model**

In The Wi-Fi model, the Smartphone through the sorting client application send the input file to the nearest access point from the access point ,the packets gets routed to the services provider edge router[9].this edge router to the packets gets routed to the core router behind the internet and the data center. the power consumption of switches has been excluded as in the most cases there will be only a few number of them and their power consumption in significant when considered[9].while the energy limitation has a direct impact on the time a mobile device is operational, the power limitation is related to the heating of the mobile device[8].in such a case batteries are more popular because they can offer many times the energy of other types of batteries in a fraction of the space in a particular way to easily mention to the mobile devices.

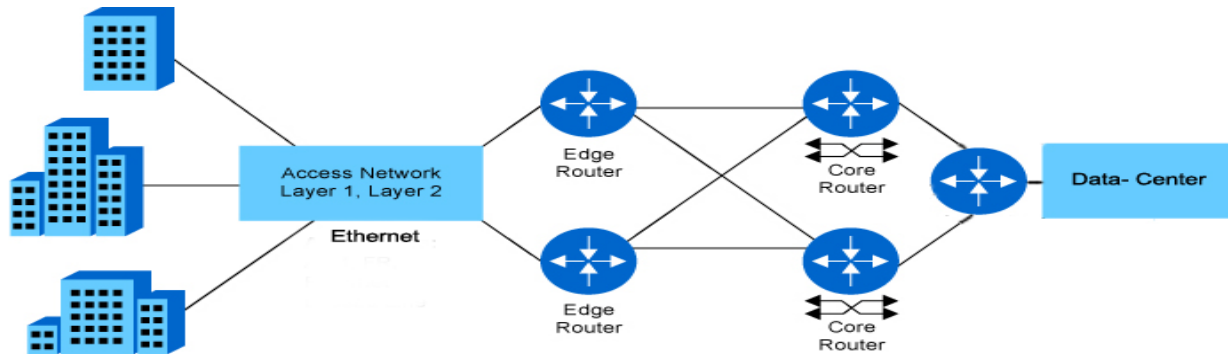


Figure 2. Offloading Via Wi-Fi<sup>[9]</sup>

### B. Offloading via 3G

In the 3G model, the input file sent to the nearest base station. The 3G communication has three main components: 1. User Equipment which is the cell phone with subscriber identity module (SIM), 2. UMTS terrestrial radio access network, which is the base station and the radio network controller (RNC), 3. core network which is the circuit switched network and packet switched network [9].

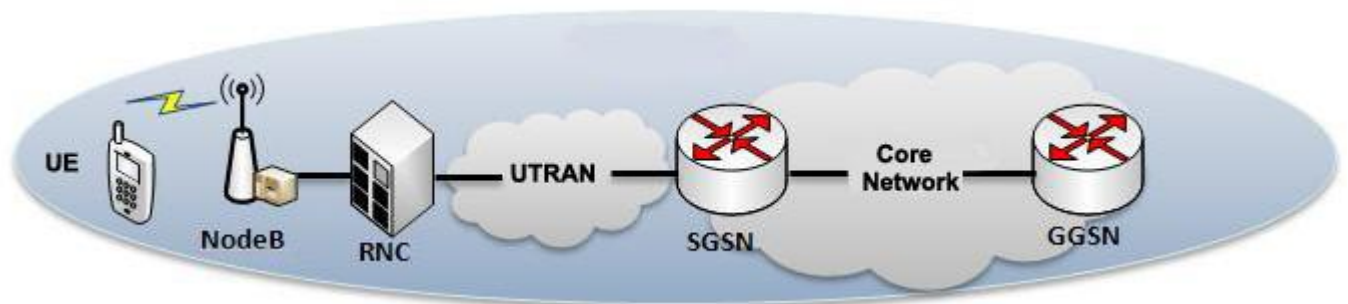


Figure 3. Offloading Via 3G<sup>[9]</sup>

### IV. ENREGY CONSIDRATION

The Offloading of a mobile cloud computing task is a tradeoff between the energy used for local processing and the energy processing required for the offloading task used for uploading data and downloading the result [12]. one can express the offloading energy tradeoff with the formula,

$$E_{\text{Trade}} = E_{\text{local}} - E_{\text{Delegate}} > 0$$

Where  $E_{\text{local}}$  is the energy used for complete local execution and  $E_{\text{delegate}}$  is the energy used from the perspective of the mobile device if the task offloaded [12]. If  $E_{\text{trade}}$  is greater than zero then there is an energy is beneficial for delegating the task to the mobile cloud [12]. Here  $E_{\text{local}}$  break down to the task complicity in  $C$  (number of instruction to be executed) the speed of local execution  $X_{\text{local}}$ , and the power used for local execution  $P_{\text{exec}}$  [12].  $E_{\text{local}}$  then becomes the energy used when executing  $C$  instruction at  $X_{\text{local}}$  instruction per second with the power  $P_{\text{exec}}$ ,

$$E_{\text{local}} = P_{\text{exec}} \times C / X_{\text{local}}$$

$E_{\text{delegate}}$ , the cost of delegate to the task in a mobile cloud to be combine the energy spent sending the task and data to the cloud  $E_s$ , idly waiting for the cloud to complete the task  $E_{\text{idly}}$  and receiving the result of the task  $E_r$ ,

$$E_{\text{delegate}} = E_s + E_{\text{idly}} + E_r$$

Since  $E = P \times T$ , each energy variable can be broken down to corresponding average power  $P$  and time duration  $T$  [12].

However, there is a fundamental assumption under lying to the analysis with the server client model in that the way server does not already contains the data, all the data must be send to the server provider that way client must offload the program and data to the server [3]. Mobile Cloud Computing services will be significantly different to the cloud server for

desktop because they must have offer energy saving. The service should consider the energy overhead for privacy security, reliability and data communication before offloading [3].

Mobile application such as location based social networking, process and make use of the phones various sensor data to extensive used of the sensor, such as obtaining GPS reading is expensive in terms of energy and limits the mobile phones in providing the user a better service through its embedded sensors [5].offloading is a solution to augmented mobile cloud system capabilities by migrating computation to the more resourceful computers [7].

Battery is an element that permits the mobility as a luxury feature in the first place to improvement of energy usage in order to prevent mobile device becoming low bandwidth and resource hungry application [10].energy efficiency always been critical for mobile device and important seems to be increasing are developing towards always online connectivity, high speed wireless communication, high definition multimedia and rich user interaction[13].in development better technology it's not able to match the power requirement of the increasing resource demand.

Improving energy efficiency and extended battery life for mobile device becoming the increasingly design consideration especially for active usage for many capable and interactive uses and energy efficient to provide smooth user experience [14].The offloading mobile cloud computing is different state it is important to understand whether or not MCC Extended the Smartphone's battery life by EaaS [15].

## V. CONCLUSION

Mobile cloud computing is the combination of Mobile computing and Cloud computing to providing a seamless and rich functionality regardless of the limitation of the energy saving of mobile device to easily understand the offloading based system. Energy consumption is basically in a Smartphone when executing computation task and end-to-end energy consumption to the same task to be offloaded to the en energy consideration. This paper has to main communication technology i.e. Wi-Fi and 3G so that offloading using more energy efficient to compared to offloading using 3G.

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