

## **A SURVEY ON CLOUDLET BASED MOBILE COMPUTING MODEL FOR GREEN CLOUD COMPUTING**

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**Abstract** — *Energy ability is more important for approaching information and communication technologies (ICT), because the increased acceptance of ICT, together all-embracing activity burning of computation, accumulator and communications. Mobile Cloud Computing (MCC) is a rise of numerous Internet-based innovations improvement, which empowers versatile clients to get advantages of distributed using so as to compute and accomplish green registering their cell phones. Green Cloud Computing plays an important role on achieving good performance and high system utilization. Cloudlet-based MCC system is introduced, aiming at reducing the power consumption and the network delay of multimedia applications while using MCC. The goal of a task allocation system is to efficiently manage the cloud computing power of workstations, servers, and supercomputers in order to maximize job throughput and system utilization. There are many issues of cloud green computing system with respect to mobile communication.*

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**Keywords**- *Green Cloud Computing; Mobile Cloud Computing; Cloud Computing; Cloudlet ; Cloudlet Model*

### **I. INTRODUCTION**

Now is era of Mobile cloud computing (MCC) is an emergence of multiple Internet-based technologies development, which enables mobile users to gain benefits of cloud computing and achieve green computing by using their mobile devices. MCC technology mainly extend basic three sub functionalities including mobile computing, mobile Internet, and cloud computing. Cloudlet provide a mechanism for communicating between cloud and user to access clouds services. when we combine cloudlet mechanism to achieve MCC to achieve green computing concept that emerge Cloudlet-based MCC system is introduced, aiming at reducing the power consumption and the network delay of multimedia applications. cloudlet based mobile computing model reduces the power consumption of the mobile devices as well as reducing the communication latency when the mobile device requests a job to be performed remotely while satisfying the high quality of service requirements.

### **II. LITERATURE SURVEY**

#### **2.1. Cloud Computing:**

Cloud computing is the environment which provides on-demand & convenient access of the network to a computing resources like storage, servers, applications, networks and the other services which can be released minimum efficiency way. The five essential characteristics composed by cloud design. Cloud design also promotes the availability<sup>[1]</sup>. There are three deployment models and three services models defined by NIST, these are:-

Service Models: There are three service models of cloud-

Software as a Service (SaaS): This is the capability of using applications which are running on cloud infrastructure. The users access these applications through internet connections. These kinds of clouds offer the implementation of some specific business threads that gives specific cloud capabilities. For E.g. GMAIL, Face book.<sup>[4]</sup>

➤ Platform as a Service (PaaS): It gives the computational resources on which services and applications can be host and develop. For E.g. Online Photo Editing, Google Docs, YouTube<sup>[3]</sup>.

➤ Infrastructure as a Service (IaaS): This is the capability of doing processing, storing and run software which is given to the consumer. It's also referred as the "Resource Code" which provides resources as the services to a user. This work is done by the service provider. For E.g. Host Firewalls<sup>[2]</sup>.

#### **2.2. Green Cloud Computing:**

Green Cloud Computing refers to the efficient use of computers and other technologies with respect to environment so that the primary goals such as energy efficient peripherals, improve the consumption of resources and electronic waste can be satisfied. These goals will not only make the resources more efficient but also enhance the overall performance. In the technical way, the Green Computing can have 2 aspects:

(i) For software technology the purpose is to create such methods that can enhance the efficiency of program, storage and energy. While (ii) In hardware aspect there is need of such technologies which can not only minimize the consumption of energy but also make it economically efficient with the help of recycling<sup>[5] [6]</sup>.

Green Cloud Computing is a buzzword that refers to the potential environmental benefits that information technology services delivered over the internet can society. The green cloud computing word depicts the environmental friendly with cloud. Green cloud computing is also known as green technology. It is also environmentally responsible use of computers and related resources. The implementation of green cloud computing includes energy efficient central processing units, servers and peripheral consumption and proper disposal of electronic waste.

Green cloud computing is the environmentally dependable and eco-friendly use of computers and their resources. In other way, it is also explain as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way that reduces their environmental impact. Many IT manufacturers and vendors are invest their money highly to design computing which are energy efficient and reducing the use of dangerous materials and encouraging the recyclability of digital devices and paper. Green cloud computing aims to attain economic viability and improve the way computing devices are used. Green IT practices include the development of environmentally sustainable production practices, energy efficient computers and improved disposal and recycling procedures.

There are the following four complementary approaches those are employed to promote green computing concepts at all possible levels:

- **Green use:** By using these resources in an eco-friendly manners we can minimize the electricity consumption of computers and their peripheral devices
- **Green disposal:** It is the recycling of unwanted electronics devices. Re-purposing an existing computer or appropriately disposing of.
- **Green design:** Designing energy-efficient computers, printers, servers, projectors and other digital devices
- **Green manufacturing:** Minimizing waste during the manufacturing of computers and other subsystems to reduce the environmental impact of these activities Government regulatory authorities also vigorously work to promote green computing concepts by introducing several voluntary programs and regulations for their enforcement.

**Need of Green Computing:** Green cloud computing efficient way to promote energy efficient products. The main reasons are:

1. To avoid energy wastage when computers are not in use.
2. To avoid paper use. So that you can save trees by avoiding printing.
3. It helps to reduce pollution which generate during manufacturing and disposal.
4. It avoid toxic environment.

### **2.3. Mobile Cloud Computing:**

MCC is the conceptual architecture that combines three technologies, including mobile Internet ,mobile computing, and cloud computing, to enable mobile users to offload data processing and storage on to clouds via wireless networks and mobile devices. Moreover, supported by mobile Internet, mobile computing is a group of techniques for executing wireless communications on both software and hardware sides, such as mobile devices ,protocols, and networking infrastructure. The concept includes most current mobile devices, such as portable computers, smart phones, and tablets. One of the restrictions of using mobile computing is that most devices still suffering from highly rely on the battery life. A high performance usually conflicts with the duration so f battery power and less efficient workload generates energy waste that is non-environmental friendly<sup>[9]</sup>

In MCC, processing of data and storage data can be done using the cloud-based servers, which is an energy-aware approach for many mobile devices while the wireless communications are stable and efficient.

### **2.4. Cloudlets: Bringing the cloud to the mobile user**

Term cloudlet refers to a layer connecting mobile devices and cloud servers in mobile cloud computing, which plays the mediator role focusing on the business logic<sup>[9]</sup>. generally *cloudlets* are distributed and widely-dispersed Internet infrastructure whose compute cycles and storage resources can be weighted by nearby mobile computers. A cloudlet may be a cluster of multiple computers, with gigabit internal connectivity and a high bandwidth wireless LAN. A cloudlet can also be a very powerful multi-core server with Internet connectivity depending on the application scenario.

To study the impact of cloudlets we first present the cloudlet-based network architecture as shown in Figure 1. In this architecture, we have mobile nodes affiliated with their nearest cloudlet with long range wireless coverage. The mobile nodes can send data to or receive data from the reachable cloudlets or other mobile nodes in the network.

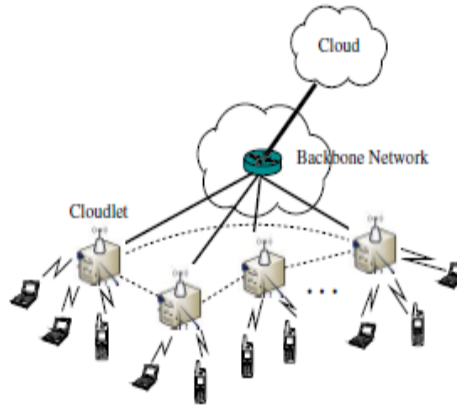


Fig 1. Cloudlet communication

It is a self-management mechanism that is used to strengthen communications between mobile devices and cloud servers by reducing latency. For example, a cloudlet can be utilized to transfer communication information to mobile nodes by wireless networks<sup>[9]</sup>.

## 2.5. Some key differences with the basic cloud computing concept<sup>[10]</sup>.

There is some advantage of cloudlet over cloud . table 1 represent key difference points.

	Cloudlet	Cloud
<b>State</b>	Only soft state	Hard and soft state
<b>Management</b>	Self-managed; little to no professional attention	Professionally administered 24/7 operator
<b>operator</b>	Datacenter in a "box" at business premises	Machine room with power conditioning and cooling
<b>Ownership</b>	Decentralized ownership by ownership local business	Centralized by Amazon, Yahoo, etc.
<b>Network</b>	LAN latency/ bandwidth	Internet latency/ bandwidth
<b>Sharing</b>	Few users at a time of users	Hundreds to thousands at a time

Table 1 : key difference between cloudlet and cloud<sup>[10]</sup>

## III. CLOUDLET BASED MOBILE COMPUTING MODEL

### 3.1. Scalable Cloudlet-based Mobile Computing Model<sup>[7]</sup>

Cloudlet-based MCC system is introduced, aiming at reducing the power consumption and the network delay of multimedia applications while using MCC. The power consumption of the mobile devices reduces using the proposed model as well as reducing the communication latency when the mobile device requests a job to be performed remotely while satisfying the high quality of service requirements. model is composed of a set of distributed and well connected cloudlets within one location where most mobiles use cloud services. there were situations where the mobile device leaves the coverage area of the host CL to the coverage area of a new one before completing all of the started jobs. In order to complete the jobs that were running in the host CL, the new CL must be provided with full information about the host CL in addition to the services or files the mobile devices that used them. Next we discuss two approaches to manage this information.

- Centralized approach: In this approach, the EC is responsible for managing and tracking mobile device movement in the system. This management is done by storing the tracking information about the mobile device.
- De-centralized approach: In this approach, the mobile device itself is responsible for managing its movement in the system. The mobile devices store a movement history along with the service that is currently running and the hosting CL to provide this information to new CL as needed.

Using any of the above two approaches is dependent on the simplicity and easiness of management required by the new model takes into account the mobility and the movement nature of the mobile devices and how to deal with this challenge. It also suggests two approaches to manage the mobile application running in the cloud/cloudlet<sup>[7]</sup>.

The main contribution in this work is the scalability of the proposed model that will help in providing high quality communication for mobile device running high demanding and large scale applications e.g. Multimedia applications.

### 3.2. SCORCH<sup>[8]</sup>

Model-driven engineering approach to optimizing the configuration, energy consumption, and operating cost of cloud auto-scaling infrastructure to create greener computing environments that reduce emissions resulting from superfluous idle resources<sup>[8]</sup>.

1. **Auto-Scaling:** Auto scaling is process of optimizing queue with pre booted system providing server utilization and decrease idle time also having draw back how to decide pre booting of the system.

Auto-scaling Process (1) explain how virtual machine configurations can be captured (2) How this model is describe into constraint satisfaction problems (CSPs) for energy consumption (3) How CSPs is solved with a constraint solver, and (4) energy consumption/cost reduction.

Auto-scaling cloud computing situations minimizes the reaction time amid times of popularity, while diminishing the expense amid times of light request. An ideal opportunity to boot and design extra VM examples to bolster applications amid times of popularity, be that as it may, can contrarily affect the reaction time.

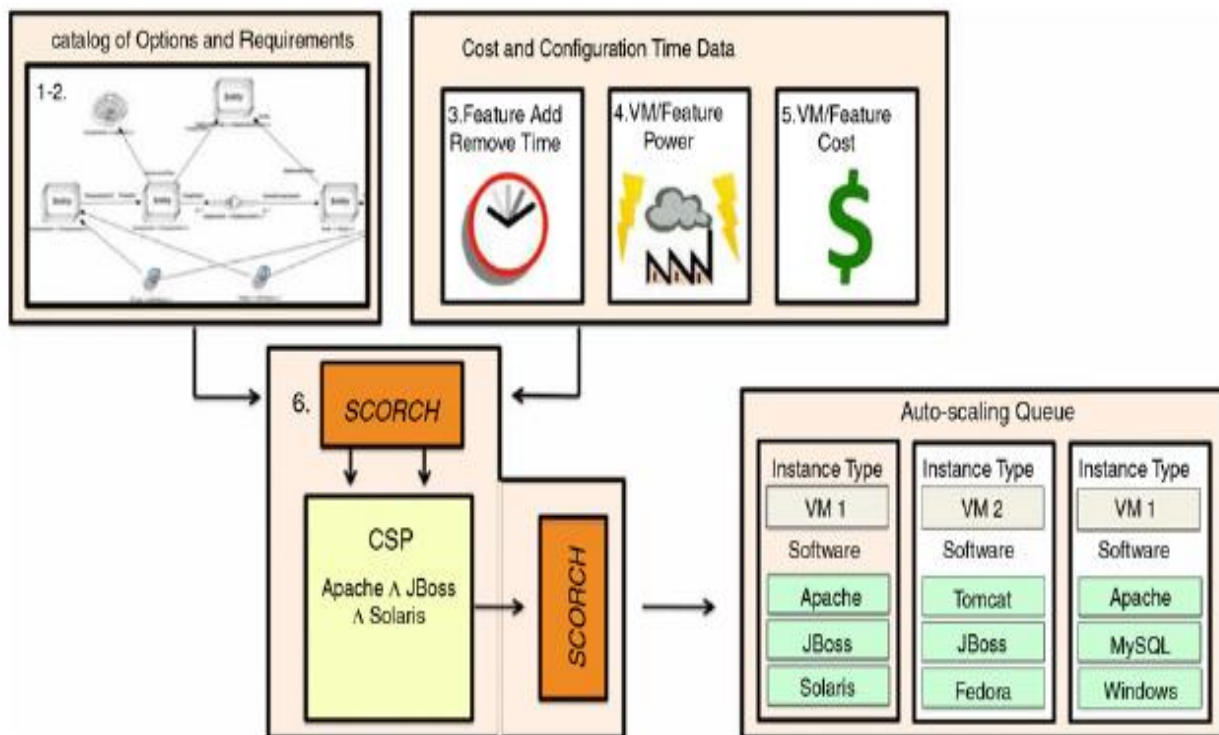


Fig 2. SCORCH Model

2. **Smart Cloud Optimization for Resource Configuration Handling (SCORCH):** SCORCH is required to predefine queue of system having constraint satisfaction.

SCORCH resolves the challenges of auto scaling (1) Capture VM configuration options (2) Translate model into CSPs (3) derive the optimal queue size using constraint solvers (4) while meeting auto scaling response time requirements contained VM configuration options to minimize the energy consumption and operating costs.

### 3.3. DECM<sup>[9]</sup>:

DECM stand for dynamic energy-aware cloudlet-based mobile cloud computing model. The objective of DECM can empower green computing in light of the fact that the model is intended for mostly decreasing power utilizations, which coordinates one of the qualities of green processing as a vitality mindful element. DECM model give weight age to technical portion such as VM, Wireless network and dynamic programming. energy consumptions can be reduce using our proposed model during the process of the wireless communications. green cloud computing aim to reduce the cost of communication. DECM to reduce energy consumptions on mobile devices without weakening the performance of cloud services to achieve green cloud concept. DECM uses a dynamic wireless communication that uses CDLs to dynamically select and determine the most nearby and efficient cloud servers based on the business needs. figure 3 is showing that

how communication taking place using cloudlet layer which is middle layer between cloud and user devices. figure 4 show a scenario using DECM model to transfer information.

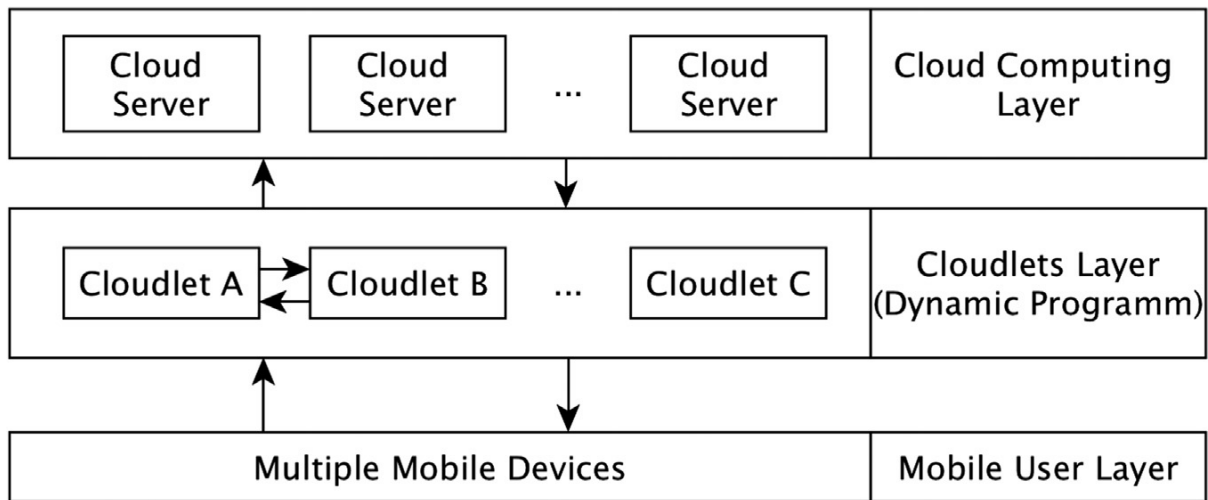


Fig 3. Communication using Cloudlet layer

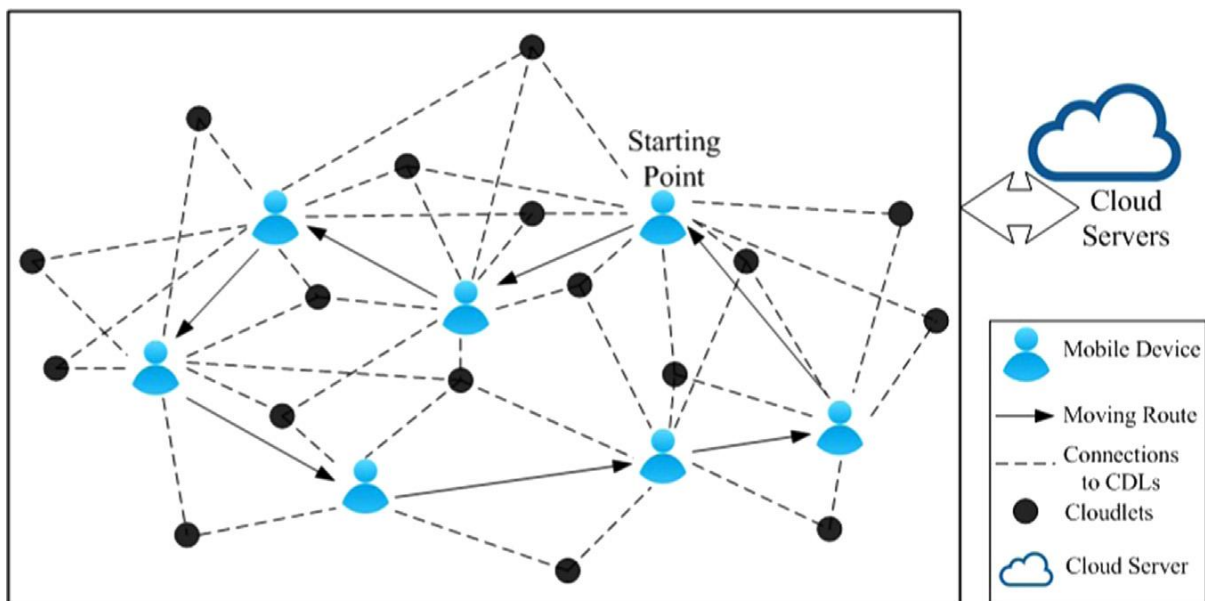


Fig 4. Communication Scenario

#### SUMMARY:

Sr no	CLOUDLET based Model	Advantages	Disadvantages
1	Scalable Cloudlet-based Mobile Computing Model	<ul style="list-style-type: none"> <li>➤ Reduce power consumption</li> <li>➤ Reduce network delay</li> </ul>	<ul style="list-style-type: none"> <li>➤ No services implement for quality improvement</li> </ul>
2	SCORCH (Smart Cloud Optimization For Resource Configuration Handling)	<ul style="list-style-type: none"> <li>➤ Reducing the cost</li> <li>➤ Auto scaling queue</li> </ul>	<ul style="list-style-type: none"> <li>➤ Predefine the task</li> <li>➤ queue size</li> </ul>
3	DECM (Dynamic Energy-Aware Cloudlet-Based Mobile Cloud Computing Model)	<ul style="list-style-type: none"> <li>➤ Avoid energy waste during communication between user &amp; cloud</li> </ul>	<ul style="list-style-type: none"> <li>➤ Examined whether DECM with different service requirements</li> <li>➤ CDLs to strengthen communications between cloud servers and mobile devices.</li> </ul>

Table 2 : comparing different model for MCC



#### **IV. CONCLUSION**

In this paper, we have reviewed many mobile cloud computing model like scalable, SCORCH and DECH model, auto driven model. Each model has its own advantages and disadvantages. For the future work, we will try to modify any of the above model and apply a techniques on it for achieving green cloud computing concept for better power consumption and time to measure performance for wireless communication to reduce the delay time, fault tolerance, scheduling and achieving higher performance and system utilization. also we will compare the results with existing system.

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