# Clone Cloud: An Approach To Save The Energy Of Resource Poor Mobile Devices

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***Abstract-****Mobile Cloud Computing is an extension to Cloud Computing. In MCC, all the data processing, mobile –based intensive computing could happen on cloud thus reducing the resource requirement of smart devices such as capability of CPU, memory etc. Mobile devices situated nearby could form a cloud and cooperatively carry out the workload. Mobile clouds provide the resources to local devices to solve the resource-poverty problem. Nearby smart mobile devices forms an ad-hoc network and to provide resources as a service. In the ad-hoc mobile clouds, devices can get off the cloud after providing or acquiring the services to one another. During the process, the nodes perform the operation for other nodes which is responsible for the energy consumption. Cloning of the devices of such ad hoc network is done in cloud infrastructure to save the energy consumption of devices in the network to solve the problem. Poor resource mobile devices in the network offload the applications in clone cloud to optimize the energy and processing time. Studied simulation results shows that the energy used in the smart devices is optimized and improved the overall performance of the entire network.*

***Keywords***-Mobile Cloud Computing, Clone Cloud, Clone Cloud Framework,Energy Optimization

## I. INTRODUCTION

With the rise in the use of Cloud Computing technique Mobile cloud computing came in existence. Mobile Cloud Computing is the blend of Mobile Computing, Mobile Internet and Cloud Computing. By using this technology, resources can be share and data need not be device specific that means could be stored in a certain location and could be accessed from any device. The main aim of this technology is the provision of accurate, valuable and real time information to clients. The arrangement of mobile communication and internet is called as Mobile Internet technology. The main purpose of this technology is to check whether the clients achieve real time network resources and services or not. Mobile Cloud Computing based on three concepts: - Hardware, Software and Communication. Hardware includes mobile devices like smart phones, laptops or PDAs. Software include the mobile applications in the mobile devices like browsers , games , antivirus software, Google's Gmail, Voice Search systems, Navigation and Map systems for smart mobile devices. Communication includes of mobile network infrastructure, various protocols and data delivery methods in their use. In MCC, all the data processing, mobile –based intensive computing could happen on cloud thus reducing the resource requirement of smart mobile devices mobile such as capability of CPU, memory and so on.

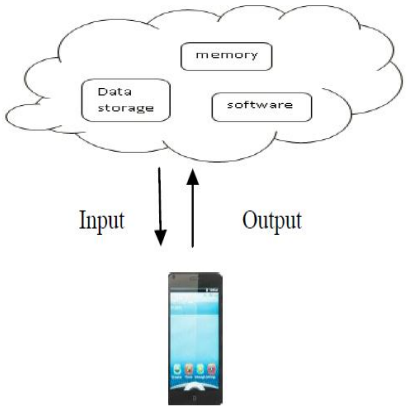


Fig.1 Mobile Cloud Computing

MCC integrates cloud computing era into the mobile computing surroundings and overcomes issues related to the surroundings, usual execution and protection. MCC may be divided into two instructions: first one is carrying out data storages and second is processing outdoor the mobile device. Mobile cloud applications moves away the processing force and data storage from cell phones into the cloud, bringing applications to not just Smartphone customers right into a great contract but also with broader variety of smart mobile phone subscribers.

## II.ARCHITECTURE

The model of Mobile Cloud Computing is similar to Cloud Computing but the consumer end of Mobile Cloud Computing is smart mobile devices. The clients require the services according to their need and the cloud end server provides those services to the clients.

In MCC mobile network and cloud computing are combined, thereby supplying the optimal offerings for mobile clients. Cloud computing exists when obligations and data are saved on individual devices. Applications run on a far off server after which dispatched to the client. Here the mobile devices are related to the mobile networks through the base stations; they may establish and manage the connections (air interface) and functional interfaces between the mobile networks and mobile devices. Mobile users send service requests to the cloud through a web browser or desktop application. The information is transferred to the significant processors which can be connected to the servers imparting mobile network services. Here, offerings like AAA (Authentication, Authorization and Accounting) may be supplied to the customers based on Home Agent (HA) and subscriber's data saved in databases.

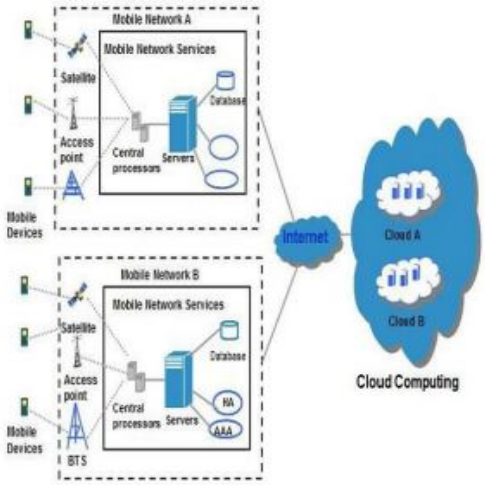


Fig2.Mobile Cloud Computing Architecture

## III.CLONE CLOUD

Clone Cloud is introduced by B. Chun in 2011. The Virtual machine migration technology to offload execution blocks of applications from mobile devices to Clone Cloud either fully or partly extending the smart phone based execution to a distributed environment. In Clone Cloud system, the smart phone is cloned (virtualized) as an image in distributed computing environment. Then it is passes computing or energy-intensive blocks to cloud for processing. Once execution completed, the output will be passed back to the smart phone. Though it reduces battery consumption, it fails in handover delay and bandwidth limitation.

Clone cloud boosts mobile applications through seamlessly off-loading them into the device clones placed in the computational cloud server. Smart phones provide rich user experience in computing term but the resources like memory, computation and energy reserves are limited. Clone cloud technique was introduced to serve as a platform for resource poor smart devices to process as a carrier. The smart device users can deploy onto the cloud infrastructure created or acquired applications created using programming languages and tools supported by the provider. The end user does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage.It is designed to provide a platform for normal cellular-device processing as a service.

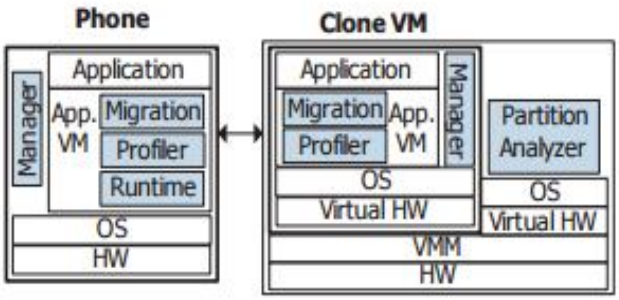


Fig3.The Clone Cloud prototype architecture

## IV.PERFORMANCE COMPARISON

The chart shows the comparison in performance for different devices. These devices can be the mobile and fixed devices which are able to form any mobile ad hoc network and can be useful in MCC infrastructure to share the resources like energy, time and processing power.

The first chart shows that how the processing power of these devices is increased drastically over the years. Net books and tablets are clearly has gone far when it comes to the CPU Power in GHz.

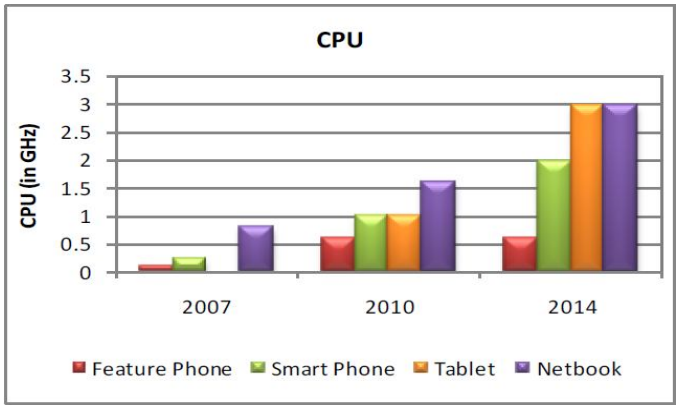


Chart1. Source: Alcatel-Lucent

The Other chart is presenting storage power of these devices. According to the storage bar graph the memory of the

feature phone, smart phone, tablet and net books was not successful enough to fulfill the requirement of the high end mobile applications of smart mobile devices and smart phone and tablets has still not achieved much when it comes to the memory while net books are doing good enough to the past years and able to fulfill the requirement of the mobile applications in comparison to other devices.

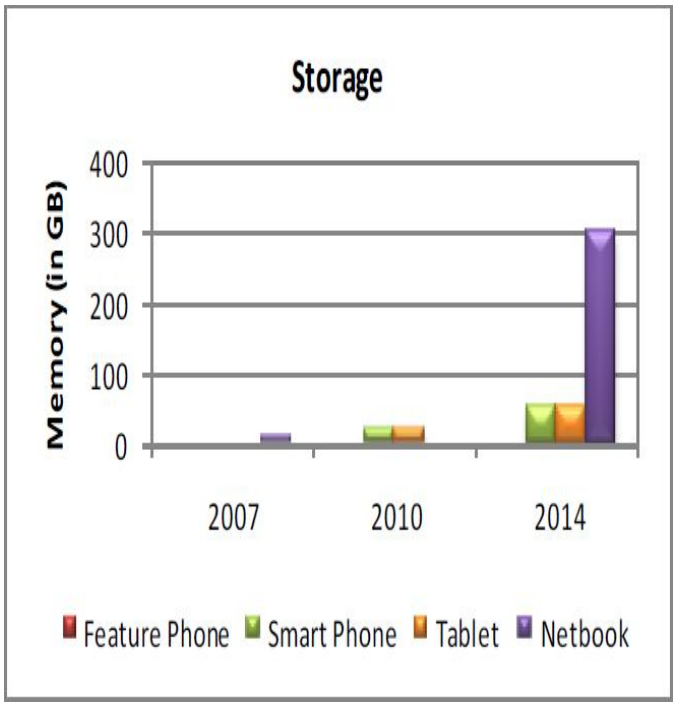


Chart2. Source: Alcatel-Lucent

## V.PROBLEM STATEMENT

To maximize the net utility of mobile devices a framework based on agent oriented methodology was introduced in previous work. A static environment was considered where mobile devices do not move and reward and retribution technique was introduced using third party transitive barter system for cooperating with each other and providing services to each other. Using this system now the devices which are even in work in dynamic environment can also take the advantage of reward and retribution technique. Devices compensate from other devices. A directory based method was used to store the record for the participating mobile devices.

So every participating mobile devices has to be registered in the directory that will help to keep the track of all tasks performed by each device, But this kind of process is responsible for consuming energy by doing tasks for others.

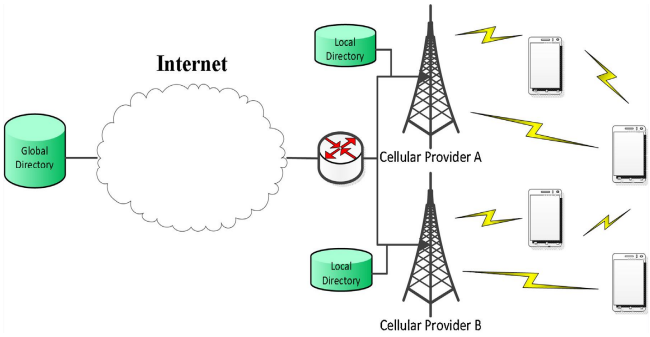


Fig4.Reward & Retribution using local & global directories

As stated the framework used agent oriented methodology, so beside the mobile devices all the agents and components should also be registered with the local and global directories. So the energy consumed by agents for searching nearby mobile devices and then offloading task to others devices is itself high enough which is contributing to the problems in the framework.

## VI. PROPOSED FRAMEWORK

In the Proposed framework a conceptual framework is introduced which is using the Clone Cloud method for offloading the mobile device application and processes in cloud server and then the cloud server transfers the task to the clone of mobile device. When android mobile creates proximate clouds they create their clone in the cloud server. Clone Cloud method which is used for energy conservation. This makes them fast to perform their time consuming tasks at the cloud. When Android mobile(AM) request for computation resource and they don't have their clone then they can request to other AM which has their clone in the cloud. Then at cloning, their tasks are performed and return back to the mobile. We integrate these two technologies which create very energy efficient method and perform all the Processes in less time. A view of the framework is presented in Fig

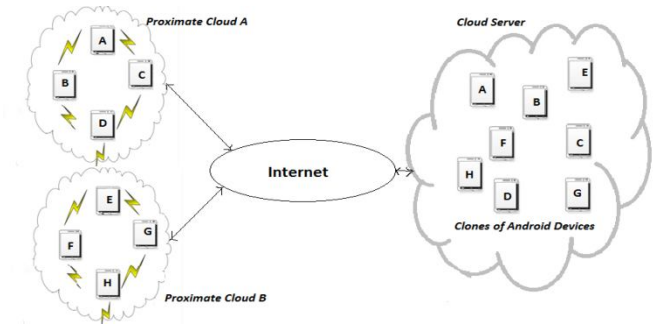


Fig5.A view of proposed framework

Proper security and trust mechanisms are needed to facilitate the adoption of this framework. We consider that the devices are trusted devices in which any third-party computation is executed within well-defined and secure. Any device-to-device and device-to-directory inter-actions should be regulated by off-the-shelf authentication and authorization techniques.

## VII.PROPOSED ALGORITHM

1. Start
2. Create proximate clouds of mobile devices
3. Clone is created for each android mobile device in cloud server.
4. If the resource request arrives from the neighbor mobile

   Then

   NM check for its resources availability

   NM calculates their own energy

   Emobile = I+T

   //WHERE INPUT DATA SIZE (I), ENERGY CONSUMED (EMOBILE) AND TOTAL TIME REQUIRED FOR COMPLETING TASK (T)

   Else

   The state of the AM device and its clone is synchronized.
   Data is sent to its clone in the cloud
5. If Emobile ≤ threshold

   Then

   AM device application process enters into sleep state
   The process transfers the entire applications to the clone for computation

   Else

   All the computation is done by the device itself
6. Result from clone execution are re-integrated back into the AM device state
7. The AM device wakes up the sleeping process to continue its execution.
8. AM device updates the directory.
9. End

## VIII.RESULTS

To verify the effectiveness and feasibility of the proposed framework we have shown the results using charts along with two evaluations, where one shows how various factor has been optimized by using the clone cloud method and how the effectiveness will change if the number of devices are removed or not being active in the proximate cloud.

**Energy:**

The energy consumed by mobile devices which participated in proximate cloud is optimized using proposed framework. The energy chart shows that the clone cloud method consumed less energy than before.

In the other scenario within the energy chart, when the number of mobile devices is taken less or the numbers of participating mobile devices are less, clone cloud method still optimizes the energy utilization.

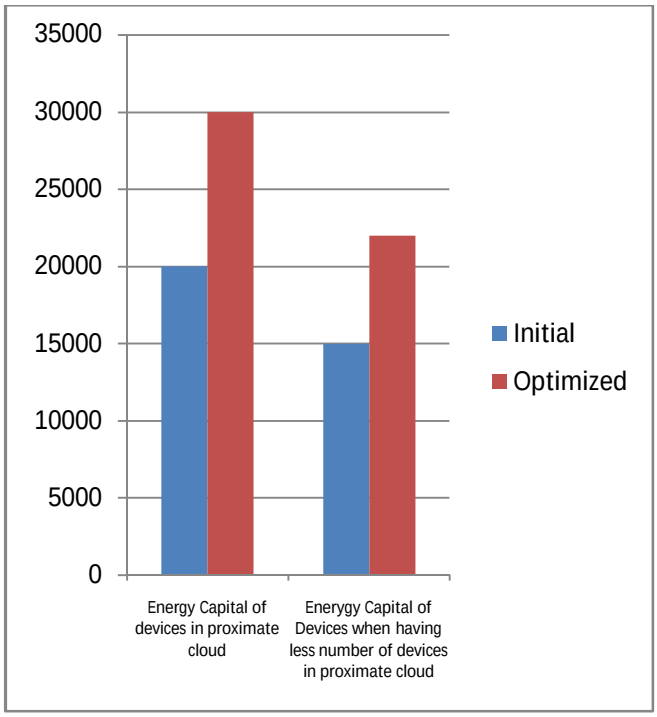


Chart3:Energy capital evaluation

**Throughput:**

Throughput chart shows the evaluation of two scenarios within the chart where one shows the result with possible number of mobile devices in proximate cloud, In which the throughput value is improved using proposed framework.

On the other hand when there are less number of active mobile devices is considered using proposed approach the throughput value is being optimized as well.

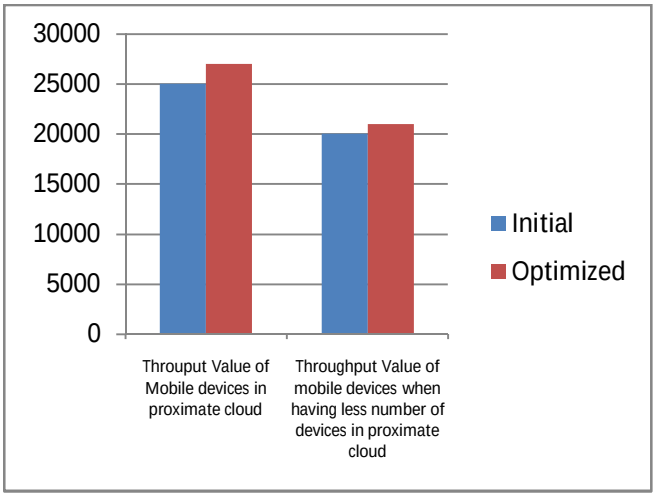


Chart4: Throughput evaluation

**Packet delivery ratio:**

Packet delivery ratio value is also much improved for each mobile device in proximate cloud using proposed framework. Clone cloud method helped improving PDR value of mobile devices when the number of devices is regular in proximate cloud. Other category in the chart shows the result for PDR value for mobile devices in proximate cloud that even when the number of devices is less, proposed framework still optimizes the PDR Value.

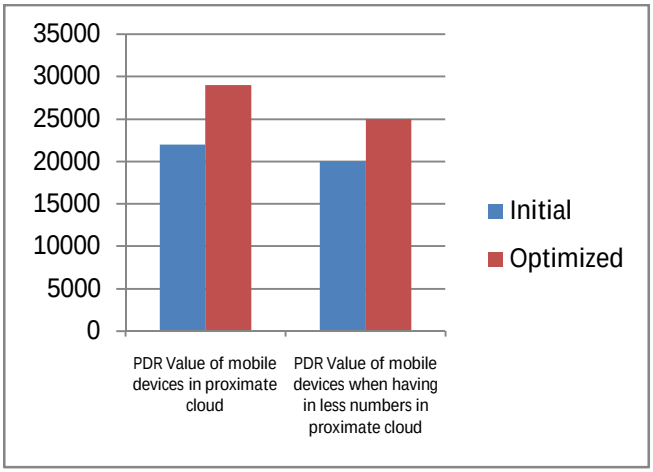


Chart5.PDR evaluation

**Routing overhead:**

The chart represents the results for routing overhead, In which the first category of the chart shows the result when using the clone cloud concept used in out proposed framework. The proposed approach has an extra overhead than the base approach. Since the overhead be supposed to be minimum except as the routing increases in the proposed work the overhead also increases.

Whereas the routing overhead was found a bit less when there are less active or participating devices in proximate cloud.

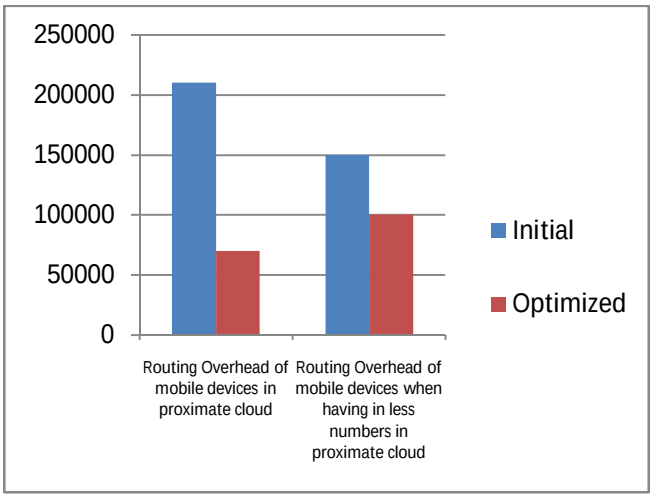


Chart 6.Routing overhead evaluation

## IX. CONCLUSION & FUTURE WORK

This paper has presented a study on mobile cloud computing via clone cloud with its definitions, architecture and various challenges and solutions which come across. The applications of MCC include mobile commerce, mobile learning etc. Mobile cloud computing is applicable to wide range of mobile services. Mobile cloud computing covers several research areas and topics.

Simulation results are studied to prove that how clone cloud offloading technique can optimize the energy of the mobile devices and improve the performance of the overall network.

The future research in mobile cloud computing can come up on various security issues at different levels such as platform, service and applications. New algorithms and frameworks can be introduced to optimize the energy in computation of mobile device applications. Various load balancing, Directory based frameworks can be introduced to monitor the energy consumption.

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