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# Offloading Scheme for Cloudlets Computation Tasks

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***Abstract***- Mobile cloud computing (MCC) has been provided as a viable technique to the derived boundaries of mobile computing. Those barriers include battery lifetime, garage potential and processing power. By using MCC, the storage and the processing of speedy cell device responsibilities will take in the cloud gadget. The outcomes may be repeated to the cellular device. It decreases the required energy and time for reaching such intensive jobs. But, cellular devices connecting with the cloud suffers from the excessive community latency and the massive transmission strength intake mainly whilst the usage of 3G/LTE connections. Then again, multimedia packages are the maximum not unusual packages in modern day mobile gadgets; such packages require excessive computing resources. In this paper, it's been analyzed a cloudlet-based MCC totally machine that determines the cloudlets aiming at reduce the energy intake and a network put off of multimedia applications even as using MCC.

***Keywords:*** MCC, Cloudlets, LTE Network, Multimedia.

## I. INRODUCTION

Smart phones and tablets have end up an important a part of an individual, due to their effective abilities [1]. Customers depend on their mobile gadgets to make calls, create and edit files, perform picture processing, get right of entry to the net social networks websites (fb, twitter, and so on.), arrange meetings and make video and audio calls [2]. Then again, the modern-day proliferation of cloud computing (cc) [3] paradigm makes a considerable evolution in information technology (IT). The concept of CC relies on a community-based totally aid sharing to increase aid availability and to reduce the monetary and control costs. The cloud is merely a collection of excessive-overall performance servers with a large amount of storage resources related and on hand via the net. Despite the benefits provided through the cell smart phones, and the way they make the lifestyles extra comfy; they've many weaknesses, which includes limited battery lifetime, limited processing abilities, and restrained storage capacity. Its miles an essential to don't forget these barriers because they're hindering cell users from correctly doing their daily duties. One answer to triumph over these boundaries is to combine cloud computing generation with cell gadgets to supply what's known as mobile cloud computing (MCC) [4]. In MCC, the processing and storage of intensive jobs are transferred to the resources-wealthy cloud machine to take vicinity there [5]. In case of responsibilities that want excessive processing and computing abilities, these posts are migrated to the cloud where in depth processing can be executed, and consequently the final result is back to the cell tool. With this approach, cc resolves both troubles: restrained processing abilities and confined strength of the cellular telephones. Then again, if there are documents, videos, and pictures with sizeable size, they will be transferred to the garage within the cloud; and whenever the mobile user needs any of them, you possibly can request it from the cloud. With this method, cc resolves the problem of the restrained garage potential of the cellular phones. MCC has lately come to be one of the maximum critical and most recent research topics; as it integrates the new smart phones with the cloud computing technologies [6] [7]. Cellular computing and cloud computing domains are converging as the prominent technology that permit growing the next era of ubiquitous offerings based on the facts-in depth processing [8]. The residue of the paper is ready as follows: section 2 reviews the history of the cell cloud computing. In this paper, a sensible observes of the newly emerged architecture of MCC with a better cloud facility to the users the use of cloudlet based totally cloud machine is delivered.

## II. BACKGROUND STUDY

### 2.1Cloud Computing

Cloud computing is being brought about by means of cloud vendors along with Amazon, Cisco, Google, sales force and yahoo as well as traditional providers such as Hewlett Packard, Ibm, Intel, Microsoft and are approved by using different users[9]. Non-public, public, and hybrid are 3 exceptional forms of clouds:. The combination of a public cloud is called hybrid cloud such as Amazon's ec2 [10] and a non-public cloud which can make use of the same era as the public cloud but is located in the corporation and totally dedicated to it. Distinctly sensitive information is simplest stored within the private cloud. The general public cloud is used for elastic compute capability and for storing less touchy records [11].

The 3-layer system normally molded by way of conventional cloud infrastructure. It consists of system as a service (saas), platform as a service (paas) and infrastructure as a provider (iaas) layer [12].

Saas layer can be defined as a computational environment imparting on line offerings for the web browsers. Saas layer gives unique software program applications for the cloud users [13].

Platform-as-a-service (paas) [14] is development surroundings for cloud programs. It is impartial of the hardware so that the packages may be extra bendy. This platform makes information and packages portable, so groups of engineers which are in one of a kind geographical place can simultaneously paintings the usage of paas.

Infrastructure-as-a-service (iaas) is the last most important layer of cloud provider, which is also the center of the complete cloud shape.

Every other difficulty is powerful mission scheduling, to offer customers and duties distribution between virtual machines to gain the quality system performance [15].

### 2.2 Mobile Cloud Computing

In recent times, both software and hardware of cell devices get greater sizeable improvements than before, some Smartphone's together with iphones, android serials, window mobile phones, and blackberry, are no longer just conventional cellular phones with conversation, sms, e mail and website browser, but are day by day requirements to the user. But, at any given price and degree of technology, issues such as weight, length, battery lifestyles, ergonomics and heat dissipation precise a excessive penalty in computational assets together with processor pace, memory size, and disk potential [16].

#### 2.2.1 Extending the access to cloud offerings to cellular gadgets

On this technique users use cellular gadgets often through net browsers, to access software/packages as offerings provided by means of the cloud. The cellular cloud (MC) is most customarily regarded as a saas cloud, and all the data handling and computation are normally executed inside the cloud.

#### 2.2.2 Allow mobile devices to work collaboratively with cloud resource providers

This approach helps use of the aid at character cellular gadgets to offer a digital mobile cloud, which is beneficial in an advert-hoc networking environment without the usage of internet cloud.

#### 2.2.3 Augmenting the execution of mobile applications on portable devices using cloud assets

This method uses the cloud garage and processing for packages walking on cell gadgets. The cellular cloud is taken into consideration as an infrastructure-as-a-service (iaas) or platform-as-a-service (paas) cloud. On this partial offloading of computation and information storage is achieved to cloud from the mobile gadgets. In the subsequent section are ready special offloading techniques for coping with computation intensive packages that are nevertheless challenging for executing at the cell side [5].

#### 2.2.4 The Limits of Cloud Computing

An apparent way to mobile gadgets aid poverty is to leverage cloud computing. A cellular tool may want to execute a resource-intensive utility on excessive-performance compute server or compute cluster and support skinny-consumer user interactions with the software over the internet. Unfortunately, long wan latencies are an essential impediment [17].

## III. CLOUDLETS

A cloudlet is a mobility-stronger small-scale cloud datacenter this is positioned at the threshold of the internet. The primary cause of the cloudlet is helping interactive cell applications and aid-in depth with the aid of presenting effective computing resources to cellular gadgets with decrease latency. Its miles and new architectural detail that boom in scope latest cloud computing infrastructure. It takes the location of the middle tier of a three-tier hierarchy: cell device - cloudlet - cloud. A cloudlet can be considered as a records middle (DC) in a container whose aim is to deliver the cloud closer [9].

### 3.1 Proposed Offloading Scheme for Cloudlets

The following figure represents the offloading scheme by using a proposed system.

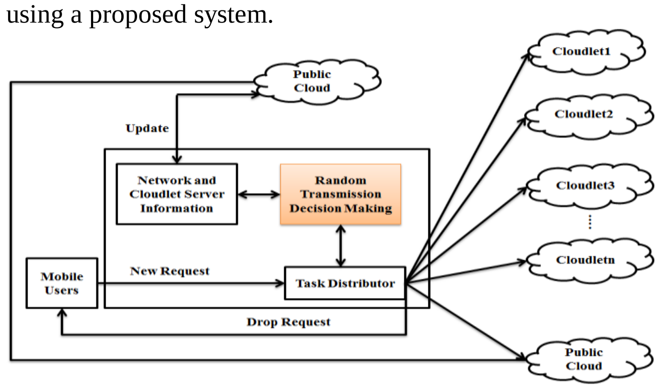


**Figure 1:** Transmission decision making Offloading Scheme for Cloudlets

 

Figure 1 depicts the proposed architecture of Offloading scheme for cloudlets computation tasks. In this architecture, the selection of the cloudlet has done by the proposed system by using Random Transmission. The mobile users initiate the new request to the task distributor, the task distributor communicate with the random transmission decision system for allocating the cloudlets to the user. The arbitrary transmission decision-making system then communicates with the network and cloudlet server for checking the availability of the cloudlets. Once the cloudlet is allocated to the user, then the status of the cloudlet is updated in the cloudlet server.

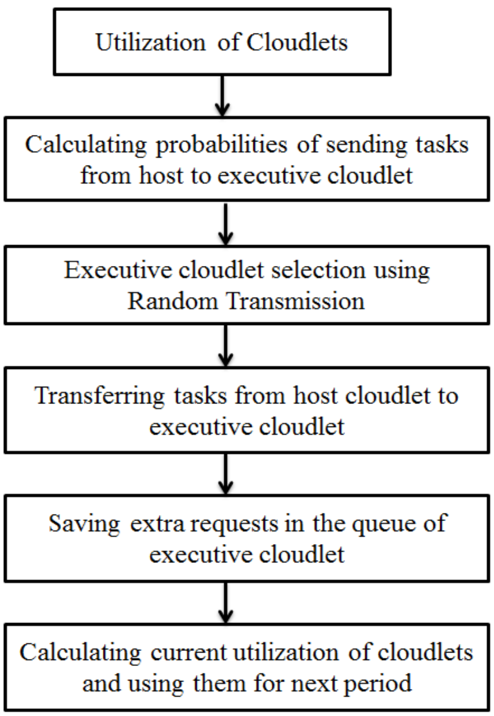


**Figure 2:** Proposed Framework for offloading transmission decision-making system

Figure 2 presents the proposed framework for the proposed offloading scheme for cloudlets computation task. Here the selection of cloudlet is explained in the flowchart.

**Proposed Algorithm**

**Step 1:** Consider a cloudlet based MCC system- N={1,2,…N} mobile devices

**Step 2:** The set of channels is denoted as M={1,2,…M} where M wireless channels

**Step 3**: Consists of B equal-size data packets

**Step 4:** Quasi-static scenario, where the set of mobile devices N remains unchanged during a computation offloading period (milliseconds)

**Step 5:** The cloudlet via a wireless channel can process their tasks offload

**Step 6:** Computer offloading decision of the mobile device n; $a_n$ є {0}U M if ($a_n$=0) the mobile device decides to compute its task locally else –the mobile device n will offload its task via the wireless channel $a_n$ є M

**Step 7:** Time slot(τ) index - τ and k є K={1,2,…} In every time slot, if mobile device select more than one same channel for locally or offloading, a Carrier Sense Multiple Access (CSMA) method is utilized to handle the possible impacts which is denoted as a =(a1,…,aN), in each time slot k

**Step 8:** It has been computing the Random Transmission (TR) rate of a mobile device 'n' that selects to offload the calculation to the cloudlets through the wireless channel $a_n$ є M as:

$r_n(a,k) = \beta_n(a,k)$

Where β n (a,k) indicates whether mobile device n successfully contends the channel in slot k and can be represented as β n (a,k)-1 or 0

**Step 9:** If mobile device n contends channels as successfully in slot k

else nil

**Step 10:** Cloudlet computing: For cloudlets computing, a mobile device first offloads its computation tasks (step1-9) to the cloudlet via a wireless channel, and then the cloudlet will execute the computation tasks on behalf of the mobile device.

**Step 11:** Specifically, for the computation offloading, the mobile device would incur on overhead for transmitting the computation task to the cloudlet

**Step 12:** According to the communication model introduced before, the transmission time and energy consumption of each mobile device for offloading one task have been derived

**Step 13:** After receiving the data, the cloudlets will execute the requested computation tasks

## IV. IMPLEMENTATION AND MODEL VALIDATION

To evaluate the performance, it has been implemented the model in CloudSim to get analytical results.

**Table 1:** Allocation of Cloudlets in Datacenter ID 3 by using proposed architecture

| Cloudlet ID | Virtual Machine ID | Time | Start Time | Finish Time |
|---|---|---|---|---|
| 4 | 4 | 3 | 0.2 | 3.2 |
| 16 | 4 | 3 | 0.2 | 3.2 |
| 28 | 4 | 3 | 0.2 | 3.2 |
| 5 | 5 | 3 | 0.2 | 3.2 |
| 17 | 5 | 3 | 0.2 | 3.2 |
| 29 | 5 | 3 | 0.2 | 3.2 |

 

| | | | | |
|---|---|---|---|---|
| 6 | 6 | 3 | 0.2 | 3.2 |
| 18 | 6 | 3 | 0.2 | 3.2 |
| 30 | 6 | 3 | 0.2 | 3.2 |
| 7 | 7 | 3 | 0.2 | 3.2 |
| 19 | 7 | 3 | 0.2 | 3.2 |
| 31 | 7 | 3 | 0.2 | 3.2 |
| 8 | 8 | 3 | 0.2 | 3.2 |
| 20 | 8 | 3 | 0.2 | 3.2 |
| 32 | 8 | 3 | 0.2 | 3.2 |
| 10 | 10 | 3 | 0.2 | 3.2 |
| 22 | 10 | 3 | 0.2 | 3.2 |
| 34 | 10 | 3 | 0.2 | 3.2 |
| 9 | 9 | 3 | 0.2 | 3.2 |
| 21 | 9 | 3 | 0.2 | 3.2 |
| 33 | 9 | 3 | 0.2 | 3.2 |
| 11 | 11 | 3 | 0.2 | 3.2 |
| 23 | 11 | 3 | 0.2 | 3.2 |

Table 1 allocates cloudlets in datacenter ID3 by using the proposed system in architecture. This table is composed of cloudlet ID, Virtual Machine ID, Time, Start time of the request and Finish time of the request.

**Table 2:** Allocation of Cloudlets in Datacenter ID 2 by using proposed architecture

| Cloudlet ID | Virtual Machine ID | Time | Start Time | Finish Time |
|---|---|---|---|---|
| 0 | 0 | 4 | 0.2 | 4.2 |
| 12 | 0 | 4 | 0.2 | 4.2 |
| 24 | 0 | 4 | 0.2 | 4.2 |
| 35 | 0 | 4 | 0.2 | 4.2 |
| 1 | 1 | 4 | 0.2 | 4.2 |
| 13 | 1 | 4 | 0.2 | 4.2 |
| 25 | 1 | 4 | 0.2 | 4.2 |
| 37 | 1 | 4 | 0.2 | 4.2 |
| 2 | 2 | 4 | 0.2 | 4.2 |
| 14 | 2 | 4 | 0.2 | 4.2 |
| 26 | 2 | 4 | 0.2 | 4.2 |
| 38 | 2 | 4 | 0.2 | 4.2 |
| 3 | 3 | 4 | 0.2 | 4.2 |
| 15 | 3 | 4 | 0.2 | 4.2 |
| 27 | 3 | 4 | 0.2 | 4.2 |
| 39 | 3 | 4 | 0.2 | 4.2 |

Table 2 allocates cloudlets in datacenter ID3 by using the proposed system in architecture. This table is composed of cloudlet ID, Virtual Machine ID, Time, Start time of the request and Finish time of the request.

**Table 3:** Task Completion Time using Cloudlet based on Service Time (in seconds) and Job Completion time (in seconds) for proposed system with cloudlets and without cloudlets

| Service Time (in seconds) | Job Completion Time (in seconds) | |
|---|---|---|
| | Proposed System with Cloudlets | Without Cloudlets |
| 40 | 155 | 158 |
| 45 | 150 | 157 |
| 50 | 156 | 160 |
| 55 | 163 | 163 |
| 60 | 185 | 185 |
| 65 | 180 | 190 |

Table 3 depicts the task completion time using cloudlet based on service time (in seconds) and job completion time (in seconds) for the system without cloudlets and proposed system with cloudlets. From the table 3, the proposed method with cloudlets gives the less job completion time than compared with the system without cloudlets.

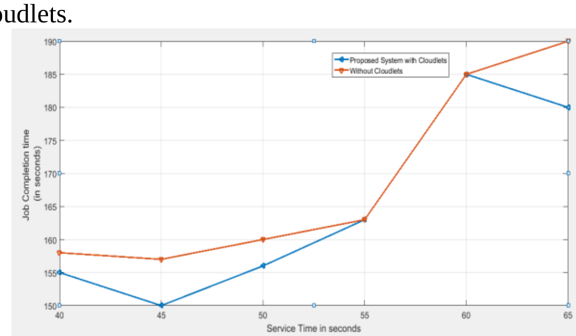


**Figure 3:** Task Completion Time by without cloudlets and Proposed system with cloudlets

Figure 3 gave the graphical representation of the task completion time by without cloudlets and proposed with cloudlets. The x-axis represents the service time in seconds, and the Y-Axis gives the job completion time in seconds.

**Table 4:** Depicts the average number of users in cloudlet based on service in (seconds). The number of users in the system with cloudlets is more than the existing system without cloudlets.

| Service Time in (Seconds) | Number of users | |
|---|---|---|
| | Without Cloudlets | Proposed System with Cloudlets |
| 40 | 3 | 4 |
| 45 | 4 | 5 |
| 50 | 6 | 7 |
| 55 | 8 | 8 |
| 60 | 10 | 10 |
| 65 | 10 | 11 |

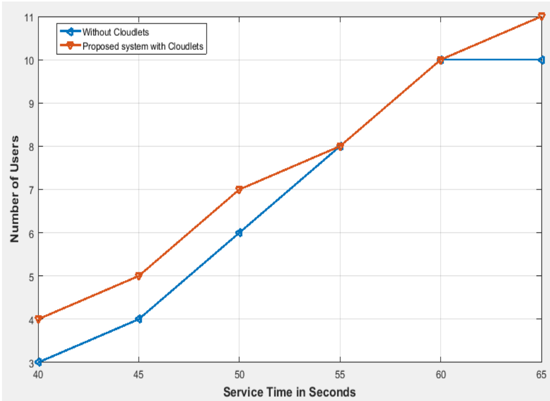


**Figure 4:** Average number of users in the cloudlet

Figure 4 gives the graphical representation of the average number of users in cloudlet. The X-axis represents the service time in seconds, and the Y-axis represents the number of the users.

## V. CONCLUSION

In this paper, a new algorithm is presented which is a mobile device resource sharing framework for performance enhancement of the resource-constrained cloudlets. It addresses many issues in existing mobile device resource sharing frameworks. This proposed algorithm ensures that load on mobile devices is a fraction of their requirements from the cloudlet and the mobile devices always benefit from the cloudlet services concerning application execution time.

## VI. FUTURE ENHANCEMENT

As a future enhancement, an Availability of the resource through cloudlets shall be increased, and the resource provisioning mechanism can be investigated further to minimize the access time. In the ad-hoc virtual cloud, some strategies should be formed and rotate the Head node and stretched to the micro rural users.

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