A Multimedia Information Time Balance Management in Mobile Cloud Environment Supported by Case Study

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Abstract—Mobile cloud computing is used to define and determine computing services with a structure model. The data and resource of any service will be retrieved from cloud computing through internet service, some tools, and user interface (web-based or application). Multimedia information could be represented by Audio information, Video information, image information and text information. Mobile Cloud Computing (MCC) is a hybrid of cloud computing and mobile computing. Multimedia Information is the core of Mobile Cloud information because of the sizable information of multimedia particularly video streaming. Mobile Cloud mostly handles and processes that information. MCC is one of the business expressions with the real environment in the IT world. The concept of the MCC is still in the beginner stage of advancement. So, the handle of the innovation in a careful way especially in the bearing of future research should be provide. In this paper, an algorithm is throttled load balancing for mobile clouds has been presented within an example of Multimedia information. The results has shown that the load balancing of cloud computing environment. In this scenario, load balancing techniques in mobile cloud computing can be employed and can successfully manage time through the cloud.

Keywords—mobile cloud computing, load balancing, response time, multimedia information

1 Introduction

The new concept has been appearing when combining between the concept of mobile device and concept of cloud computing, new concept is Mobile cloud computing (MCC). New platform (MCC) will be used when need to create new infrastructure. MCC works as, cloud performs the deep uplift of computing-intensive operations and storing huge of data. In another meaning, in MCC, the data and processing will be make out side of the mobile device. Extending battery lifetime, storage capacity, processing power, and etc. are some advantages of the MCC. The Data centralization is one of the most important advantage because the data are gathered and stored in one place that can access in any time and any location with policy. Also the MCC provide the high reliability which enable and allow the other

technologies such as HTML5 and CSS3 to ease of integration. mobile device is a device with the resource limitation. So, we can avoid these issue in the user device and achieve of benefits for MCC with the Cloud computing resource. As well as cloud computing providers, that leverages diverse cloud resources and network tools towards unhampered functionality, save data, and mobility to provide a set of applications on mobile devices in any location, on the pay-as-you-use principle anytime through the internet. The final goal of MCC is enable of the many mobile devices with rich application to store and processing the data to achieve the user comfort [1].

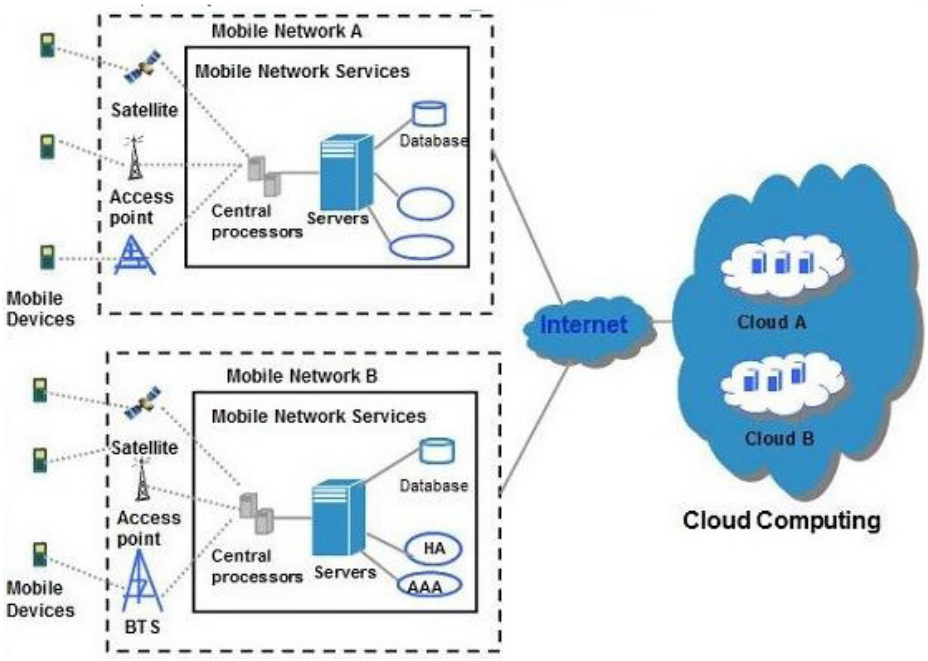

Fig. 1. Architecture of mobile cloud computing [1]

2 Related work

Several related work would be presented:

1. ShahbazAfzal and G. Kavitha describe the Load unbalancing problem as "a multi-variant, multi-constraint challenge that impairs the performance and efficiency of computing resources". It is therefore recommended that this problem (of over- and under-loading) be addressed using load-balanced approaches. In addition, a survey of load-balancing approaches is presented. The following themes are explored in this study: advantages, disadvantages, limitations, difficulties, and suggestions for overcoming these difficulties. Cloud computing load balancing [2].
2. Another problem of cloud computing decentralized architecture is shown in Kalpana, Manjula Shanbhog. ii. Migration of virtual machines might have an impact

on network speed. Because the evolutionary algorithm is a complex process, this research reworked the technique in order to speed up the migration of VMs between hosts. The modified genetic algorithm also minimizes the amount of space and bandwidth that is consumed [3].

3. In addition to Muhammad Asim Shahid and Noman Islam, other notable figures include Muhammad Mansoor Alam and Mazliham Mohd Suud. Load balancing in cloud computing is defined in this paper as equilibrating so that no host is under or overloaded. Many possible algorithms for the load-balancing problem are discussed in this work, including scalability, migration and performance, fault tolerance, response time and overhead as well as resource utilization and throughput. As a result, we've developed a brand-new algorithm that makes use of FT in LB [4].
4. The authors are P.P. Geethu Gopinatha, ShriramK.Vasudevanb, A major challenge in cloud computing is keeping the system running smoothly, and load balancing is a crucial tool for accomplishing this. As a result, the focus of this research is on the load balancing algorithms Min-Min and Max-Min. Finally, calculate the response time and waiting time for cloud computing performance measures [5].
5. Amal Zaouch, Faouzia Benabbou, explain why cloud computing is beneficial to uses for the environment by reducing costs, resources, manpower, and space requirements. Considered one of the most important issues in cloud computing. Various measures (such as reaction time and processing time) in different algorithms are presented in this work. As a last step, a new algorithm can be developed based on this performance standard [6].

3 Multimedia information: General approach

Global access to multimedia information is now the principal motivation behind the design of next-generation computer and communications networks. Also, products are being developed to extend the capabilities in all existing network connections to support multimedia traffic. This is a profound paradigm shift from the original analog-voice telephony network developed by the Bell System and from the packet-switched, data-only origins of the Internet. The rapid evolution of these networks has come about because of new technological advances, heightened public expectations, and lucrative entrepreneurial opportunities.

Multimedia information transmission over networks could be realized by multimedia, It implies data, voice, graphics, still images, audio, and video, and we expect that networks serve many media, frequently simultaneously. Two observations can be made at the outset. The media to be sent, termed sources, are represented in digital form, and the networks used to transmit the digital source representations may be categorized as digital communications networks, even though analogue modulation is commonly utilized for free-space propagation or multiplexing advantages. In addition to media sources and networks, user terminals such as computers, phones, and PDAs have a big impact on multimedia communications and what is possible.

Components of multimedia information transmission could be included:

There is the initiating terminal, the intermediate node, the intermediate node's backbone, the intermediate node's delivery network, and the ultimate node at the destination. This classification allows us to think about symmetric communications scenarios like broadcasting or video streaming along with two-way, peer-to-peer connections like videoconferencing and telephony. [26]. However, multimedia information represent the biggest sizable information to be transmission, thus mobile cloud environment is considered to save and process multimedia information, all information would processed in Mobile cloud not in Mobile device.

4 Multimedia information processing benefits

The target of Managing data and content of any type is to provide hi level quality information and services. The system employs an intelligent and sophisticated way to communicate with people and operators, using a single web direction for all the systems in use. This process could be represented by:

1. All communication channels are managed from a single, user-friendly web interface.
2. Different departments and positions can customize displays.
3. grouped monitors for numerous displays
4. Displays emergency request
5. maintenance & Remote monitoring
6. Totally free Web Sites to View Documents
7. Timed sequencing for jobs displays
8. Multi-activity system:
9. Personalizing and geo-position information
10. Next generation Digital devices.
11. Services System Management.
12. Organizational resources that aid in making choices.
13. Strategic support to minimize costs and modify business (services)
14. Seeking further digital development [27]

5 Multimedia information protocol

As a relatively recent invention, the WWW was created in the late 1980s by the European Laboratory for Particle Physics in Switzerland. As a result of widespread adoption, this Internet standard is now the de facto standard for exchanging data over the web. The Internet provides not just a means of gaining access to downloadable files, but also a means of traversing the Internet by way of interconnected hyperlinks.

For the most part, the Web's unique style of presenting text is what sets it apart from other media. Tags are used to encode and format various file kinds, including text, images, animations, and sounds. HTML refers to the language used for encoding these tags (Hypertext Markup Language). The tags in the HTML code govern how the file is displayed on your screen. Any webpage's HTML code is viewable by selecting "View Source" from the browser's main menu.

Besides the HTTP, most browsers also support access through FTP, Gopher, telnet, and email, however this may necessitate the installation of supplemental software. This category includes software that integrates with a web browser to open up access to several file formats and protocols [28].

6 Mobile Cloud Computing Management (MCC)

Increasing in information about the world makes the companies needed more storage. These companies use the cloud computing which provide huge storing [17]. Cloud storage customers can access data remotely, by connecting to the Internet.

As the same thing for mobile cloud computing, the mobile device can reach remotely to his data in any time and any location through internet connection. These data are storing in the cloud computing data service. Figure 2 shows mobile cloud computing.

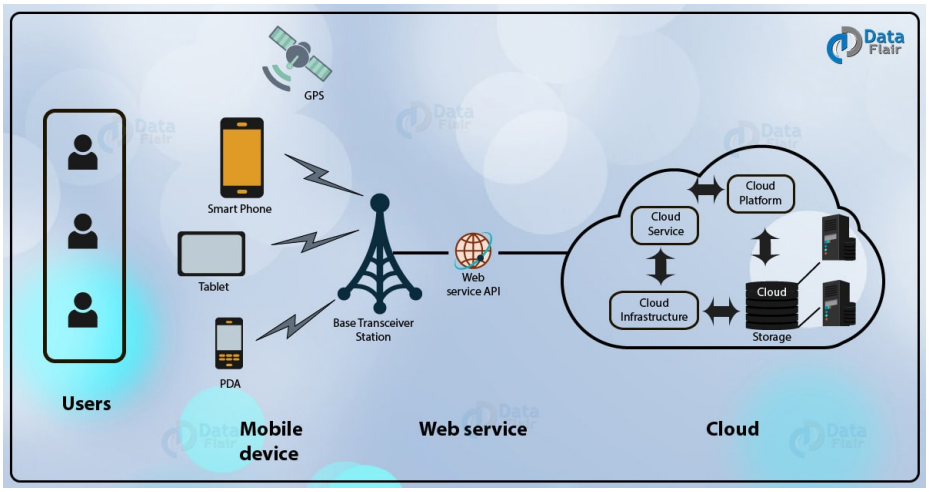

Fig. 2. Mobile Cloud Computing (MCC) [17]

6.1 The purpose of MCC

There are many things used to distinguish between the General Purpose of MCC (GPMCC) and Application-Specific of MCC (ASMCC). Cloud Computing is widely term and will be used in practice to a variety of practices. Below, some general and special purposes that will be briefly presented [18]:

1. Since there are many individual applications that do in one day this gives general resources in use. In mobile devices, there is a limited in the computing power. So to alleviate these limited, cloud computing is used to perform these calculations.
2. There are systems that have been developed to transfer tasks that are performed locally from the transfer device to an external cloud upon implementation. For this

reason, cloud computing resources for remote computers can be used to carry out tasks smoothly without the need to develop applications for this.

3. The applications of the mobile cloud are trying to minimize resource requirements without loss the quality of these applications at its peak despite its consumption.
4. The male phone applications and through the application of new updates constantly provide the best services to the user. To provide the maximum possible services that the end user benefits from

7 Load balancing

It is a technique for dividing the workload among numerous computers. Or other resources across a network link to optimize resource use, increase productivity, minimize response time, and avoid overload.

Since the concept of cloud computing has changed the field of parallel and distributed computing, it has become necessary to link it to the load balancing algorithm because cloud computing enables a large group of users to access applications and devices distributed via the Internet and this will improve the performance of businesses in the computer IT sectors using this algorithm [19].

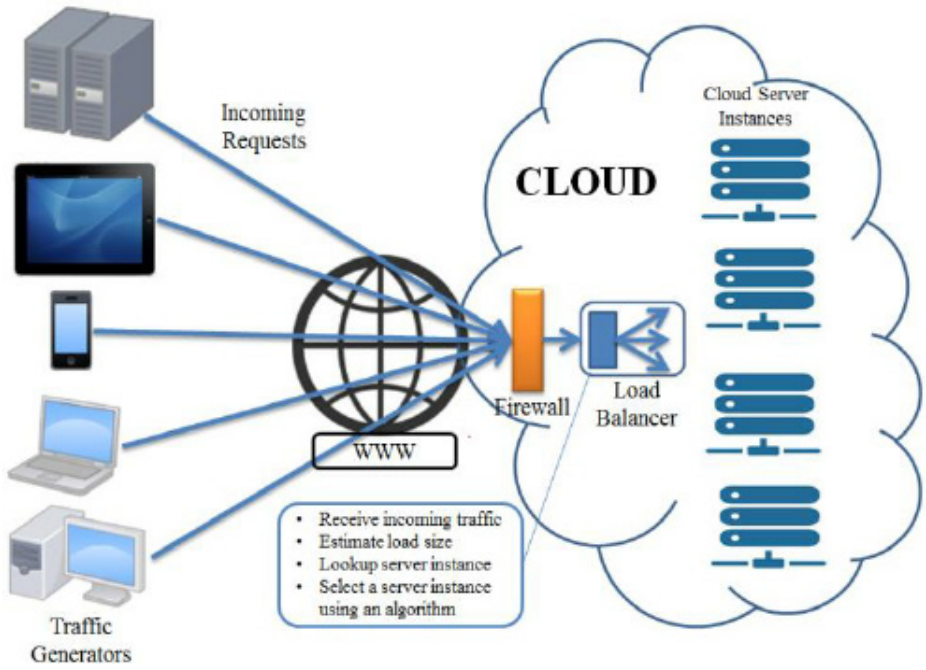

Fig. 3. Cloud computing with load balancing algorithm[19]

7.1 Idea of load balancing algorithm

Network or application traffic can be evenly distributed among numerous servers in a server farm using load balancing.

Each task's response time can be optimized by using load-balancing strategies to avoid overloading certain computing nodes while leaving others idle [19]. The increasing in complex for applications, traffic volume, and user demand grows are leads to need the new concept, is Load balancing. The companies use the load balanced to create flexible and balanced network traffic. Load balance can face these challenges without losing the security service or system performance.

Reduced downtime, scalability, redundancy, adaptability, and efficiency are just a few of the advantages of load balancing [21].

7.2 Throttled algorithm (load balancing algorithm)

Load and load performance are two most important factors, which is used to measure the effect of load balancing. The CPU queue index and CPU utilization are two measures of load. Performance is defined as the time it takes a user to receive a response. There are many parameters that input to the load-balancing algorithm, such of these parameters are: configuration of VM, arrival time, task of cloudlet application (length, completion time, and expected completion time). According to this formula, response time is computed by taking into account both processing and queuing time for the request [7].

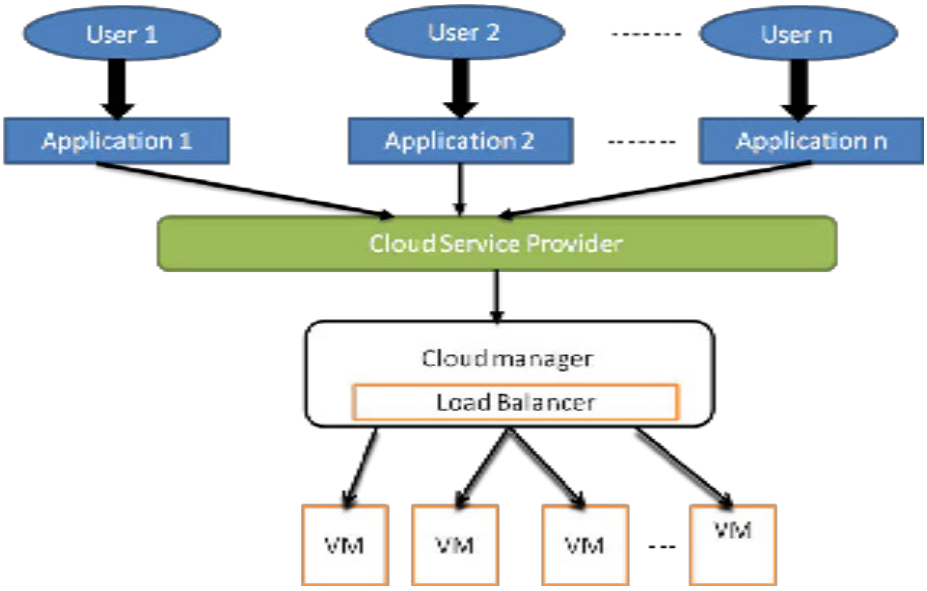

Fig. 4. Architecture of load balancer in cloud computing

The following formula is used to computing the expected response time for task [9]:

$$Expected\ Response\ Time\ (ERT) = TC - TA + TT \quad (1)$$

where:
TC: Complete Time.
TA: Arrival Time.
TD: Transfer Time (delay time).

Datacenter Broker algorithm is used to executes the load balancing, So only the algorithm level has an impact on processing time in a local data center setting. The communication delay is set to zero as a result. Compute expected completion time of task [9]:

It is possible that the scheduling approach is either Timesharing-Space sharing or Space sharing-Timesharing. Then the calculation according to the formula, which defined in (2), (3):

$$eft(p) = est + \frac{rl}{capacity * cores\,(p)} \quad (2)$$

Formula (3) used to compute the capacity parameter [9]:

$$capacity = \sum_{i=1}^{np} \frac{cap(i)}{np} \quad (3)$$

Else when the scheduling policy is Space share-Timeshare or Timeshare-Timeshare, then the calculation according to the formula which defined in (4), (5):

$$eft(p) = ct + \frac{rl}{capacity\ *\ cores\,(p)} \quad (4)$$

Formula (5) used to compute the capacityparameter[10]:

$$capacity = \frac{\sum_{i=1}^{np} cap(i)}{\max\left(\sum_{j=1}^{cloudlets} cores(j), np\right)} \quad (5)$$

For each formula in (2), (3), (4) and (5), that and for Cloudlet p:
eft(p): expected completion time.
est: arrival time.
rl: total number of instructions must execute on a processor.
capacity: average processing power (in MIPS) of a core.
ct: current simulation time.
Cores (p): number of cores required.
np: actual number of core that the host is considered.
Cap: processing power of the core [8].

Thus, according to these formulas and algorithms, the overall system makes faster and more efficient.

The throttled algorithm is a more efficient from others algorithms because the throttled algorithm has ability to transfer the requests from one virtual machine to another virtual machines. The throttled algorithm utilizes its resources to the maximum [9].

According to the Figure 5, the following steps of algorithm:

1. for all VM, allocation status= AVAILABLE.
2. Hash map= no entries.
3. from user, Datacenter (DC) controller= new request.
4. in load balancer, DC controller= next allocation.
5. Compare between sizes
   5.1. if size (hash map) < size (VM status) then allocate the VM.
   5.2. else wait until any VM free.
6. To de-allocate the VM once it finishes processing, the DC controller asks a Load Balancing for the VM.
7. The Hash map list and VM state list are updated by the load balancer.
8. It's possible that the load balancer will use the evenly spread current execution algorithm (ESCE) to look for a VM with the least amount of load, in which case it'll route the new request to that VM. LAYERED.

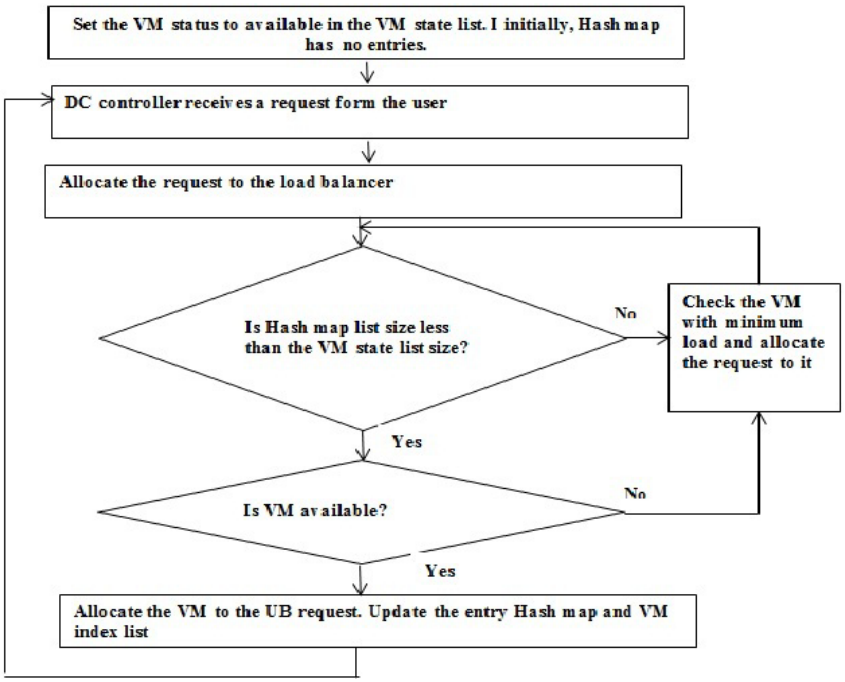

Fig. 5. Flow chart of the throttled load balancing

8 Results of the experiment

In this experiment, has simulated a cloud of the following parameters: 30 cloudlet (task), Information considered via Multimedia streaming (multiple files), 1datacenter, 3 VM; with parameters in Table 1, Simulation on the Throttled and, response time results as follows:

Table 1. Results of throttled algorithm

Cloudlet ID	VM ID	Time (ms)	Start (ms)	Finish (ms)
0	0	125	100	225
3	0	187.5	225	412.5
1	1	422.5	100	522.5
4	0	220	412.5	632.5
6	0	140	632.5	772.5
5	1	250	522.5	772.5
7	0	187.5	772.5	960
9	0	125	960	1085
2	2	1095	100	1195
10	0	220	1085	1305
8	1	642.5	772.5	1415
12	0	250	1305	1555
14	0	125	1555	1680
13	1	375	1415	1790

15	0	220	1680	1900
16	1	220	1790	2010
11	2	815	1195	2010
17	0	220	1900	2120
20	0	125	2120	2245
21	0	187.5	2245	2432.5
19	2	532.5	2010	2542.5
18	1	642.5	2010	2652.5
22	0	330	2432.5	2762.5
25	0	125	2762.5	2887.5
26	0	110	2887.5	2997.5

Results show the logical performance of time division via multiple VMs. The results of the experiment indicate that the algorithm could be considered successfully.

8.1 Discussion the results of related work

The below couple of tables show the result of related work [12], The first table shows the response time without applying Load Balancing Algorithm and the second table shows same results when applying the algorithm. The related work case study for couple of servers.

Table 2. Without load balancing algorithm[12]

No.client connect	Start (ms)	Process Time (ms)	Response Time (ms)
1	831.2213	831.221	0.000825
2	128.9281	128.9397	0.011624
3	301.9516	301.9635	0.011837
4	450.5069	450.5205	0.01362
5	766.0477	766.0642	0.0165

Table 3. With throttled load balancing with two server in (MCC) [12]

No.client connect	Start (ms)	Process Time (ms)	Response Time (ms)
1	509.9236	509.92245	0.00115
2	413.9547	413.94365	0.01105
3	282.845	282.83391	0.01109
4	450.5069	450.5205	0.011103
5	766.0477	766.0642	0.011766

Due to the previous tables [12], It is clear that there are real differences in response time when suing Throttled Load Balancing versus not applying the Algorithm, Particularly, we talk about multiple Mobile devices. Thus it is important to manage the distributed time for each device among Mobile Cloud .Node laying there response time because the load is distributed to more than one server, and this is the target of the Load Balancing Algorithm.

8.2 Discussion of results

Results show the logical performance of time division via multiple VMs. The results of the experiment indicate that the algorithm could be considered successfully. There is a real advantages when using Load Balance Algorithm. For bot researches, the target of the load balancing algorithm ensuring no delay time no waste of time when the algorithm used in Mobile Cloud environment.

9 Conclusion

The new concept has been appearing when combining between the concept of mobile device and concept of cloud computing, new concept is Mobile cloud computing (MCC). New platform (MCC) will be used when need to create new infrastructure. MCC works as, Cloud computing provides a significant efficiency boost for data-intensive computations and massive amounts of data storage. In another meaning, in MCC, the data and processing will be making outside of the mobile device. The computing power of the cloud play important role when the number of mobile application is increase. Also the computing resources will be used to efficiently manage the resource of these applications to improving the performance. The increasing in the responsiveness of the jobs will lead to improving the performance. Therefore, it is difficult to schedule jobs in a way that optimizes resource use and job responsiveness simultaneously. Multimedia information could be represented a challenge via Mobile Cloud, Throttled Load Balancing Algorithm can successfully manage and process that information of Multimedia in the cloud environment.

10 Suggestions for future work

The author would like to present professional ideas for related tops, deals with environment of Mobile Cloud Computing, those ideas have been selected through studding a handbook “MOBILE CLOUD COMPUTING, Architectures, Algorithms and Applications” [5]. Those ideas are:

1. Develop a time load balance for the environment of Green Mobile Cloud, Reduce Mobile Phone Storage and CPU Consumption, in order to reduce time of execution. Processing of reduce data center (compression of multimedia information, compression of Images, Compression of text using selected Algorithm like LZW and compression of video in mobile files like H264 algorithm.

2. Reduce energy in Mobile Cloud Environment, As per the flexible techniques of Mobile Cloud Environment, there is an ability to manage resource allocation. It could be to accomplish transcoding job in the cloud environment particularly to interact online videos with Mobile. Videos could be uploaded to the stations. Offloading can do the task of manage power required. Therefor Offloading is an important approach for research to manage time for schedule of tasks in Mobile Cloud regarding Multimedia information.
3. Applying the algorithm of time balancing in real time sharing system via Mobile Learning Environment, when multiple students using same mobile learning lessons in real time aspect.
   Real time sharing systems via cloud environment requires effective algorithms to manage time balancing between participated users.
4. Minimize sizable Multimedia Information via Mobile device using specific compression algorithms like H. 264 and H. 265, Those techniques are effective in reducing sizable multimedia information particularly video files.

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