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Dynamic Allocation of Resources and Offloading Of Mobile Application to Cloud

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Abstract: *Smartphone are becoming more and more popular, at the same time its capabilities are increasing. So to improve these capabilities developers are building more and more complex operations. These applications require more computation power and energy; also to keep pace with this performance hardware updating is required. Hence there is a need to offload mobile application task to cloud. Due to number of tasks submitted to cloud and availability of number of resources to execute those tasks there arise a need to perform scheduling in cloud, which will improve cloud efficiency. Hence our project exploits concept of load balancing in cloud ad-hoc network. Submitter will submit the tasks to cloud and cloud will divide and assign those tasks to available volunteers depending upon their capabilities. To divide this task cloud uses K-means Algorithm and Linear Programming Algorithm. Volunteers can be different devices for example computers, laptops, mobile phones etc. hence we are using laptop and mobile phone as volunteers. Depending upon the data processed by the volunteers they will be paid by cloud.*

Keywords: *Ad-hoc, Offload, Submitter, Volunteers, Linear programming, K-means, Cloud*

1. INTRODUCTION

In the recent times smart phones have become very popular with more connectivity that has a feature phone and advance computing. There are many advantages that are associated with smart phones like web browsers, GPS, high-resolution touch screen, pocket video cameras as well as low-end compact digital camera and portable media player [1].

Cloud computing is on demand computing kind of internet-based computing where shared resources, data and information are provided to computers and other devices on demand[5] .The task management or task scheduling become very easy on cloud with help of various algorithms[5].

Cloud computing is technology that uses the internet and central remote server to maintain data and application. Cloud computing allows consumers and business to use application without installation and access their personal information [1].

Cloud computing is divided into three segments: application, storage, connectivity.

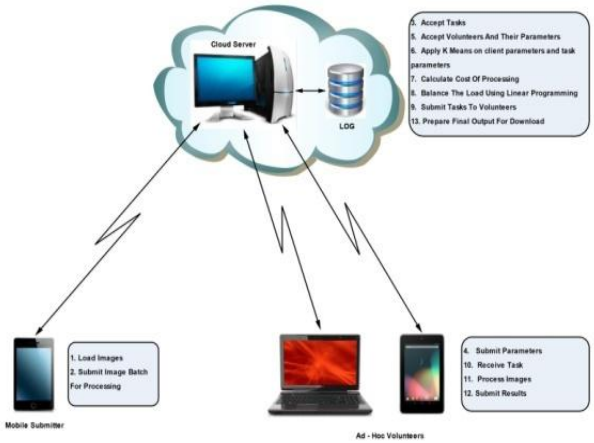

Fig 1: *System overview*

In our project, there will cloud server which handle the client request, manage load and distribute data for processing to the volunteers .These volunteers will processed data and give their individual results to cloud and again cloud will give response to clients request[2].Now depending upon amount of data processed by volunteers they will be paid by cloud.

2. LITERATURE SURVEY

1. Sokol Kosta, Andrius Aucinas, Pan Hui, Richard Mortier and Xinwen Zhang "ThinkAir: Dynamic resource allocation and parallel execution in cloud for mobile code offloading". IEEE, 2012:

2. Think Air takes the best of MAUI and Clone Cloud i.e. addresses lack of scalability and adopts online method-level offloading. Parallel execution can be exploited much more efficiently on the cloud than on Smartphone. Divide-and-conquer method is used, allowing sub-solution computation to be parallelized.
3. Gaochao Xu, Jungie Pang and Xiaodong Fu "A Load Balancing Model Based on Cloud Partitioning for the Public Cloud". Tsinghua Science and Technology, 2013.
4. Public cloud is divided into several cloud partitions. Main controller is the cloud which chooses the suitable partitions for arriving jobs and the best load balancing strategy is choose by the balancer for each cloud partition.
5. Prabavathy .B Priya.k, Chitra Babu "A load Balancing Algorithm for private Cloud Storage". IEEE, 2013.
6. Data placement, load rebalancing and data migration are the algorithms proposed to achieve load balancing in private cloud storage. Data placement receives the status of the storage cluster and the chunks; load rebalance is responsible for periodically checking whether the storage nodes are lightly or heavily loaded and data migration balance the load across the storage cluster.
7. Rene Leistikow & Djamshid Tavangarian "Secure picture Data Partitioning for cloud computing Services". IEEE, 2013
8. Privacy and data security are main issues in Cloud Computing. Data can be sensitive data or non-sensitive data, sensitive data must be prevented. Hence using face recognition and stripping algorithms sensitive data remains with the cloud server.
9. Nitish Chopra, Sarbjeet Singh "Deadline and Cost based Workflow Scheduling in Hybrid Cloud". IEEE, 2013
10. Initially task is performed on private cloud, on shortage of resources public cloud is meet. Hybrid cloud is the merge of private and public cloud. The output must be achieved before the given deadline else the output would be of no use. Hence workflow scheduling for cost optimization within deadline in hybrid cloud is proposed.
11. Shivani Dubey,Vismay Jain,Shailendra Shrivastava "An Innovative Approach for Scheduling of Tasks in Cloud Environment".IEEE,2013

This paper discusses task scheduling in cloud computing environment. The main focus of this paper is to minimize the overall completion time for an application to execute in a heterogeneous environment by eliminating the communication cost between dependent tasks by assigning them to the same processor. The results are compared with Task duplication based scheduling Algorithm for Network of Heterogeneous systems (TANH) and the conclusion is that the proposed scheduling algorithm yield less completion time then TANH algorithm.

3. ALGORITHM

3.1 K-means algorithm

Let X = {x_1, x2, x3,……., x_n} be the set of data

Points and V = {v_1, v2,……., v_c} be the set of centers.

1) Randomly select *'c'* cluster centers.

2) Calculate the distance between each data point and cluster centers.

3) Assign the data point to the cluster center whose distance from the cluster center is minimum to all the cluster centers.

4) Recalculate the new cluster center using:

$$v_i = (1/c_i) \sum_{j=1}^{c_i} x_i$$

Fig 2: *formula for calculating cluster*

Where, 'c_i' represents the number of data points in i^{th} cluster [6].

5) Recalculate the distance between each data point and new obtained cluster centers.

6) If no data point was reassigned then stop, otherwise repeat from step.

3.2 Linear Programming

A linear program is a problem with n variables x1,…,xn, that has:

1) Linear objective function, which must be minimized/maximized. Looks like:

Max (min) c1x1+c2x2+… +cnxn.

2) A set of m linear constraints.

3) A constraint looks like:

ai1x1 + ai2x2 + … + ainxn ≤ bi (or ≥ or =)

Note: the values of the coefficients ci, ai,j are given in the problem input.

4. ARCHITECTURE

There are three components in system architecture.

1) Cloud server

2) Volunteers

3) Task submitter (client)

First mobile client that is task submitter will give tasks which are nothing but images of various sizes for gray scale application [1]. Then it will receive by cloud server and cloud server will make clusters or group according to size of images and maintain array in cluster for large and small size of images, and last cluster include both size of images with the help of k-means cluster algorithm [3].Server will give these images to volunteers for processing which is nothing but gray scale application situated at volunteer's sides. Next which image goes to which volunteers for processing decide by server with the help of linear programming situated at cloud server [2][3].

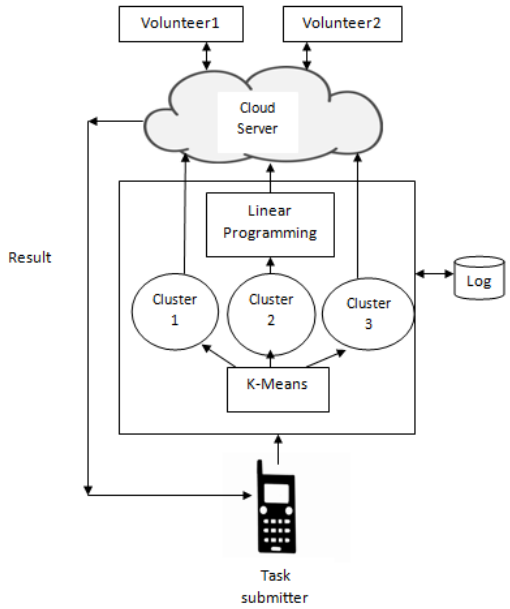

Fig 3: *Architecture of system*

The volunteers, laptop/pc and android phone have different processing speed and according to that processing power server will decide that large size images goes to laptop/pc and next small size images goes to android phone [3].

Now depending upon amount of data processed by volunteers, they will be paid by cloud. Then volunteers are performing their task individually and submit result separately to cloud [2]. Cloud will collect that result and again send to mobile client which is nothing but gray scale images as output.

5. ADVANTAGES

Processing time: Processing time is significant problem faced by many applications. Volunteers are doing processing work which requires minimum processing time.

Hardware up-gradation: The smart phones devices have wide range of capabilities which requires up-gradation in hardware to keep pace with performance. But as in our system processing is performed at cloud so there is no need to upgrade hardware.

Security: Security is important aspect of any cloud application. SHA-1 provides security to application [4].

Computational power and energy: This aims to improve both computational performance and power efficiency of mobile devices bringing smart phone applications to cloud.

6. APPLICATIONS

Data processing application: Large data processing is required in various applications like e-commerce site. Smartphone have small bandwidth, so they don't have enough support for ecommerce application. To do this dynamic load balancing can be used.

Virus Detection: This is another example implemented using load balancing. Virus detection for Android takes database of 1000 virus signatures and path to scan. Suppose total size of files in directory is 10 MB and number of files are around 3500.So the execution of this on phone takes more than one hour to finish, while less than 3 minutes if offloaded[1].

Image processing: There are many image processing applications which require load balancing. For example, conversion of RGB images to Gray scaled image using load balancing.

N-queen puzzle: In this application, we have to find the solution for N-Queen puzzle & return number of solution found. Computationally it is expensive as there is more possible arrangement. So it is not possible on phone and it can be done using cloud load balancing [1].

7. FUTURE SCOPE

The proposed system has successfully achieved its objectives i.e. optimization of execution time and cost.

While applying virtualization, this proposed system can be improved in various aspects of system. Along with it we can add more number of resources.

8. CONCLUSION

Load balancing is main research topic in the area of cloud computing. In this paper, we have proposed that scheduling of processes using k-means and linear programming approach. Main objective of system is to schedule the client submitted tasks to the cloud volunteers in such a way that it minimizes cost required for processing. As security is important aspect hence we are using SHA-1 for security [4]. We conclude that this system minimizes overall completion time of given tasks, in heterogeneous environment.

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