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CWC: Load Balancing and Distributed Computing Infrastructure Using Smartphones

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ABSTRACT

Every night people put their phones on charging which makes them unused at night. Which means it is mostly the time when phones are unused. Not only at night but while charging, smart phones are typically unused. Here we are proposing load balancing architecture where we will perform distributed computing using smartphones only when they are charging.

Key Words:- CWC, mobile computing, load balancing, image processing

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I. INTRODUCTION

By recent surveys we come to know that organisations sometimes provide their employees with smartphones so that they can access companies' database easily and privacy is maintained. 66 per cent of surveyed organizations provide their employees the smartphones for various reasons. For example, Novartis handed out smartphones to its employees to manage e-mails and calendars; Lowe's did so for its employees to have real-time access to key product information and to allow managers to handle administrative tasks [6].

Here In this paper we say that in such settings, an organisation can hinder the aggregate computing power of smartphones; hence we propose a distributed computing architecture. Using such an infrastructure can help us reduce the cost and save the energy eventually. If the organisation can use their employees' smartphones to perform a part of their work load they can save their energy usage and computing power as well. As smartphones CPU use less power than server CPU they are convenient and reasonable to use and implement. In fact, there are already proposals for ARM-based data centres to harness the energy efficiency of embedded processors [6].

Other than its benefits, we realize that such a smartphone computing architecture faces numerous amount of challenges. We need to tackle these challenges to build a framework which makes this platform viable. Battery life and bandwidth are the biggest challenges to be faced in such an infrastructure. If the owner of the smartphone uses it for computing heavily, the battery may drain, rendering the phone unusable. Thus we envision using the smartphones while they are typically idle and charging at night and unused so as not to interrupt owner's own tasks [7].

Moreover, the phones will be stationary and will be likely connect to Wi-Fi in owners' homes; this will reduce bandwidth ambivalence and allow the transfer of computing data to or from the phone at no cost. We name our framework CWC, which stands for computing while charging. CWC uses a single server connected to the Internet, for scheduling jobs on the smartphones and collecting the outputs from the computations. A rudimentary low cost PC will suffice as the scheduling algorithms on the server are lightweight. In building this architecture, we use phenomenon as follows:

- Profiling charging behaviours
- Scheduling task on smartphones
- Migration of tasks across smartphones
- Automation of task execution
- Preserving user experience
- Volunteer computing

II. MATHEMATICAL MODEL

Set Theory:
Let S (be a main set of) ≡ {SER, DB, V, C, A, SUB,}
where,

SER is the server which will balance the load and distribute the task evenly on the streak. The server takes the information from the submitter, schedules and provides to the volunteers and return back to the submitter. It is a finite set.

DB is the database. This database is responsible for storing user information related to cloud interactions. It also stores the tasks provided to them in a productive manner. The database also stored the user related and logging information. It is a finite set.

V is the set of volunteers which will basically be the android based phones. They will volunteer only when they have their chargers plugged in. These volunteers perform the piece of task given to them by the load balancer which is our server. Also $(v_1,v_2,v_3,\ldots\ldots v_n)$ Є V. Also it is an infinite set.

C is a set of all clients using the server database and mining services from the server. And $(c_1, c_2, c_3, \ldots\ldots\ldots c_n)$ Є C. Here the clients are our submitters which will give the task to the server and receive the final done task for its purpose. It is an infinite set.

A is a set of algorithms applied on the input data to get mining results. This set incudes algorithms such as linear programming for scheduling the task, K-means for distributing the task, grayscaling, thresholding and edge detection or processing the image. We also use SHA for encryption and decryption.

SUB is the set of submitter systems which are also our clients. And $(SUB_1,SUB_2,SUB_3,\ldots\ldots,SUB_n)$ Є SUB. Submitter here, will submit an image to the server and server will do its task. It is an infinite set which means there can be multiple submitters.

Functionalities:
DB' = RegisterUser(uid, password, fullname);
password = SHA1(input_password);
U = AuthenticateUser(uid, password, DB');
C = RegisterUser(DB);
SUB = Register(uid, password, ipadd);
password = SHA1(input_password);
SUB = Task = V
ED(Encoded data) =Encode Transactions (U, Encoding Algorithm (EA));
UPLOAD(ED);
A = Apply image processing(ED);
Results = Decode(Download(A));

III. MOTIVATION

While surveying we found that most of the people put their phones on charging while sleeping at night. Thus we try to consume the energy and resources the phone uses at night while they are usually being neglected. We in this project are going to work on the following aspects:

A Load balancing and scheduling tasks on the cloud server using basic algorithms and storing the task in the respected databases.

B While using the phones when they are on charge will not hinder the conviniency of the phone user.

IV. LITERATURE SURVEY

The literature review consists the existing approaches as:

A. Using the android phones when they are not in use usually
B. Do not hinder or affect user environment
C. Load balancing using convenient algorithms
D. Distributing tasks to volunteers based on their available resources.
E. There are many challenges in load balancing including Elastic stabaility, Network topology Independence, Communication interface, algorithm configurability, Service level agreement (SLA), and Environment friendliness. Here in this paper we try to overcome the above listed challenges by applying load balancing algorithms and scheduling alorithms [4][2].

V. PROPOSED WORK

System Design architecture shows how the user will enter the product into trolley which consists of RF-ID reader and Bluetooth controller and that product will display on table of trolley and same data of products will store at administration part and there is Gate Pc which will look out whether customer had paid bill or not [5][6].

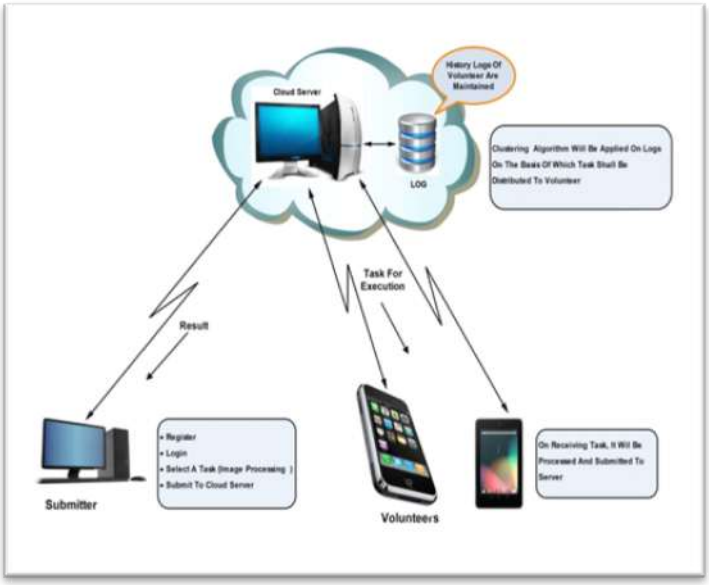

Fig -1: Architecture Diagram

VI. MODULES

I. Task Submitter:

Task submitter gives the cloud server a particular task to perform. The reasons behind this outsourcing of task can be energy saving, expenditure saving(as the submitter need not buy the infrastructure or software's needed to perform the task).

II. Cloud Server:

Roles of a cloud server- Maintaining logs of Volunteers Task Accepting from submitter. Task Aggregation from volunteers. Gives Task to Load Balancer [1][4].

III. Volunteer:

Our testbed consists of Android phones with varying network connectivity and CPU speeds.The phones host the CWC software which maintains a persistent TCP connection with the server and permits dynamic task execution as instructed by the scheduler [2][9].

IV. Load Balancer:

A load balancer basically distributes the task to the volunteers dased on their availability ; In case, if one or more volunteers do not perform the task due to their technical issues of is not available, the load balancer migrates the task to another one. Thus task migration takes place. Also the load balancer schedules the task [1][9][10].

VII. COMPONENTS

A. Android based smartphones: as shown in the figure above we will be using smartphones of ant vailable version of android. Though the latest one is prerred[5][7]

B. GlassFish server: GlassFish is an open-source application server project started by Sun Microsystems for the Java EE platform and now sponsored by Oracle Corporation. The supported version is called Oracle GlassFish Server. As GlassFish is free software, we are using it for the conveniency of our project and it will be serving us as the cloud server [3]

Platforms:

3) Editor-Net Beans
4) Language - Java
5) Database-My-Sql
6) Android
7) Admin GUI: AWT

VIII. CONCLUSIONS

In this paper, we envision building a distributed computing infrastructure using smartphones for organisation. Our aim is based on several observations including

(a) organisations provide their employees with smartphones in many cases,

(b) the phones are typically unused when being charged, and

(c) such an infrastructure could potentially yield significant cost benefits to the enterprise.

We concatenate the technical challenges in building such an infrastructure. We address many of them to design CWC, a framework that supports such an infrastructure. We have a prototype implementation of CWC on a test bed of 2 Android phones. Using this implementation, we demonstrate both the viability and efficacy of various components within CWC.

IX. FUTURE SCOPE

We propose that in future, this infrastructure can be used not only for enterprises but also for daily mobile users. We can pay the volunteers depending upon the amount and time of task performed by them. The task is obviously distributed by the cloud server-task scheduler.

Task submitter can also submit the task in form other than image. The CWC-infrastructure can be deployed on actual cloud instead of using Wi-Fi (VPN). When this service will be available over a large area and common users will be using this, so as to make distribution large, cloud can be used by volunteers for registering to get the tasks, and submitter can use the cloud to upload the task to be executed.

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