Preserve Available Sensing And Interactivity Capabilities Of Mobile Devices

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ABSTRACT: Mobile applications are becoming increasingly ubiquitous and provide ever richer functionality on mobile devices. At the same time, such devices often enjoy strong connectivity with more powerful machines ranging from laptops and desktops to commercial clouds. Despite increasing usage of mobile computing; using its full potential is difficult due to its inherent problems such as limited resource. Cloud computing can address these problems by executing mobile applications on resource providers external to the mobile device. The foundation of cloud computing is the delivery of services, software and processing capacity over the Internet, reducing cost, increasing storage, automating systems, decoupling of service delivery from underlying technology, and providing flexibility and mobility of information In this paper, we developed an architecture that uses cloud to do computations that consume resources badly on mobiles. It aims at finding the right spots in an application automatically where the execution can be partitioned and migrated to the cloud. Thus, an elastic application can augment the capabilities of a mobile device including computation power, storage, and network bandwidth, with the light of dynamic execution configuration according to device's status memory, and battery level. We demonstrate results of the proposed application model using data collected from one of our elastic application..

Keywords : Cloud computing, Mobile cloud computing (MCC), GPS, offloading, Partitioning and migration

1 INTRODUCTION

Mobile cloud computing is the cloud structure where the computation and hardware are moved departed from mobile devices .Mobile devices and applications acquire enjoyed rapid development in past years but mobile devices comfort cannot run data qualifier applications, much as search, large-scale information management and defense, etc., and have limitations in battery cognition, screen situation, wireless communication etc. In primary, the energy render from the controlled battery ability [1] has been one of the most stimulating arrangement issues with mobile device. Thence, program decisions for mobile applications have to accept considerateness of the resource regulating in the pattern. The emerging cloud computing field [2] offers a tense the capabilities of mobile device for energy-hungry salient applications. Different cloud-assisted mobile platforms acquire been planned, specified as cloudlet [3], cloud copy [4], and etc. In primary, each design is related with a system-level clone in a structure. The mobile clone, which runs on a virtual Machine (VM), can effect mobile applications on behalf of the mobile device. This structure requires both a performance to apply task offloading and a contract to adjudicate when to offload applications. Existing investigate [5], [6], [7], [8] has proposed a show of application-offloading mechanisms. Nonetheless, the search on best policies for remedy offloading to cloud process is constricted in that they mostly take an unchangeable computing planning in the device and a fixed bandwidth model for the wireless canalize [9]. Mobile cloud technology (Figure.1) brings new types of services and facilities for mobile users to take full advantages of cloud computing. This paper introduces the basic terminology of cloud computing and mobile cloud computing, its background, key technology, current research status, and its further research perspectives as well. We focused on the problem of energy-optimal application execution in the cloud-assisted mobile platform. The objective is to minimize the total resources consumed by the mobile device such as memory, time, and power consumed.

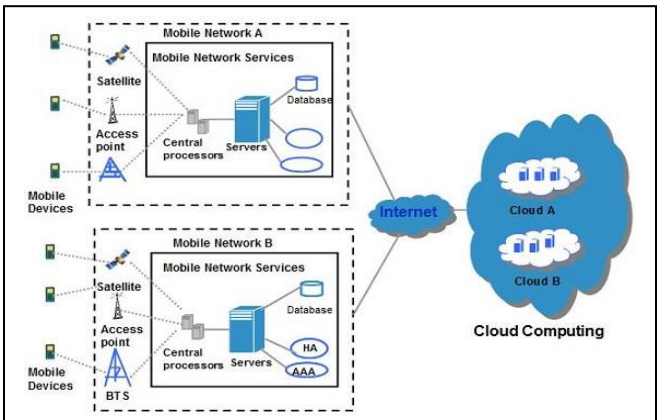

Fig. 1. Mobile Cloud Computing (MCC).

The rest of the paper is organized as follows. Section 2 present cloud computing definitions and basic terminology of mobile cloud computing and its architectures Following that, respectively in the next section the discussion of related work of mobile cloud computing. Following that, respectively in the in section 4 present problem definitions and system model, and the description of partition cost module and the evaluation. Finally, the conclusion lies in the last section.

2 OVERVIEW

In order to help us better understanding of Mobile Cloud Computing, let's start from the two previous techniques: Mobile Computing and Cloud Computing followed by mobile cloud computing.

- **A.** Mobile Computing
- **B.** Cloud Computing
- **C.** Mobile Cloud computing

A. Mobile Computing

Mobility has become a very popular word and rapidly increasing part in today's computing area. An incredible growth has appeared in the development of mobile devices such as, smartphone, PDA, GPS Navigation and laptops with a variety of mobile computing, networking and security technologies. In addition, with the development of wireless technology like Wi-Max, Ad Hoc Network and WIFI, users may be surfing the Internet much easier but not limited by the cables as before. Thus, those mobile devices have been accepted by more and more people as their first choice of working and entertainment in their daily lives. So, Mobile computing can described as a form of human-computer interaction by which a computer is expected to be transported during normal usage [10]. Mobile computing is based on a collection of three major concepts: hardware, software and communication. The concepts of hardware can be considered as mobile devices, such as smartphone and laptop, or their mobile components. Software of mobile computing is the numerous mobile applications in the devices, such as the mobile browser, anti-virus software and games. The communication issue includes the infrastructure of mobile networks, protocols and data delivery in their use. They must be transparent to end users. Mobile computing has the following Feature

- Mobility
- Diversity of network conditions
- Frequent disconnection and consistency
- Dis-symmetrical network communication
- Low reliability

B. Cloud Computing

Cloud Computing is a general term used to describe a new class of network based computing that takes place over the Internet, basically a step on from Utility Computing. In other words, this is a collection/group of integrated and networked hardware, software and Internet infrastructure (called a platform).Using the Internet for communication and transport provides hardware, software and networking services to clients (Fig.2).These platforms hide the complexity and details of the underlying infrastructure from users and applications by providing very simple graphical interface or API (Applications Programming Interface). In addition, the platform provides on demand services that are always on, anywhere, anytime and anyplace. Pay for use and as needed, elastic (scale up and down in capacity and functionalities). The hardware and software services are available to the general public, enterprises, corporations and businesses markets. The term Private Cloud is used when the cloud infrastructure is operated solely for a business or an organization. A composition of the two types (private and public) is called a Hybrid Cloud, where a private cloud is able to maintain high service availability by scaling up their system with externally provisioned resources from a public cloud when there are rapid workload fluctuations or hardware failures. In general, cloud providers fall into three categories as shown in Figures 2(a), 2(b), and 2(c) {that show the comparison of different type of services provided by cloud computing

- ***Infrastructure as a Service (IaaS)*:** offering web-based access to storage and computing power. The consumer does not need to manage or control the underlying cloud infrastructure but has control over the operating systems, storage, and deployed applications.
- ***Platform as a Service (PaaS):*** giving developers the tools to build and host web applications (e.g., APPRIO [11], software as a service provider, is built using the Force.com [12] platform while the infrastructure is provided by the Amazon Web Service [13]). The users host an environment for their applications. The users control the applications, but do not control the operating system, hardware or network infrastructure, which they are using.
- ***Software as a Service (SaaS):*** where the consumer uses an application, but does not control the operating system, hardware or network infrastructure. In this situation, the user steers applications over the network. Applications that are accessible from various client devices through a thin client interface such as a web browser.

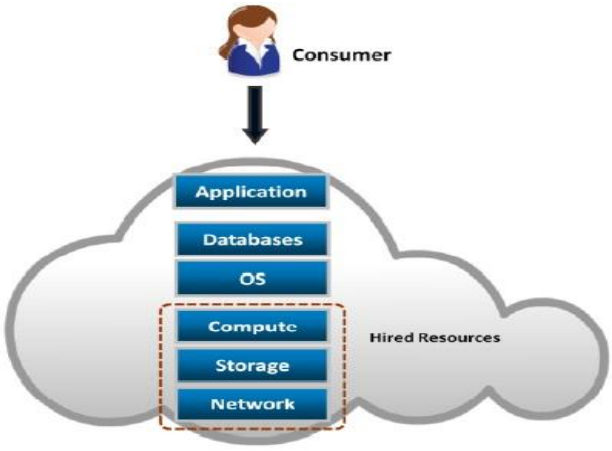

Fig. 2 (a) Infrastructure as a Service (IaaS)

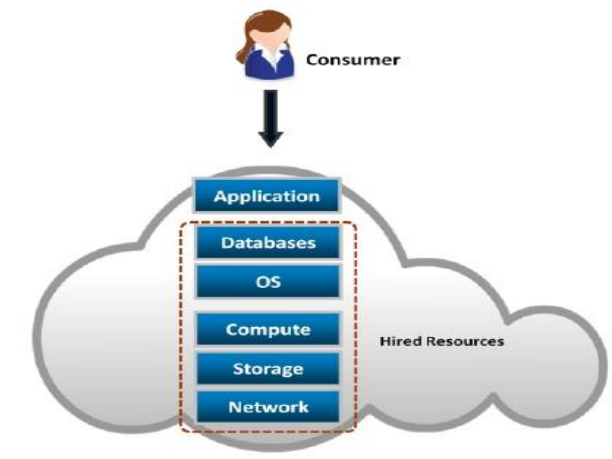

Fig. 2 (b) Platform as a Service (PaaS)

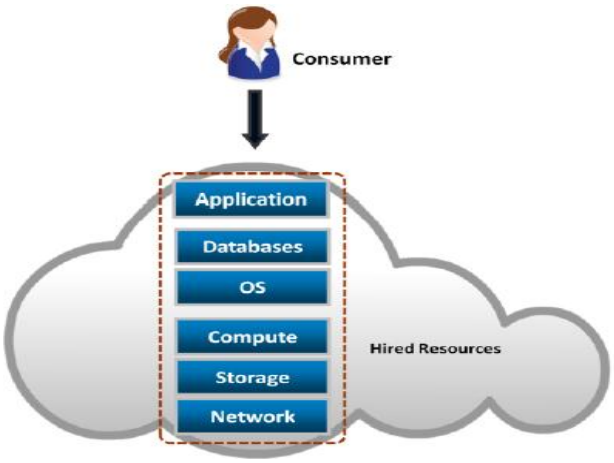

Fig. 2 (c) Software as a Service (SaaS)

Figure. 2: the cloud computing services models

C. Mobile Cloud computing

There are several definitions of mobile cloud computing [16, 17], and different research refers to different concepts of the 'mobile cloud: There are several definitions of mobile cloud computing [14, 15], and different research refers to different concepts of the 'mobile cloud.The term mobile cloud computing means:- The combination of cloud computing and mobile networks to bring benefits for mobile users, network operators, as well as cloud providers. Cloud computing exists when tasks and data are kept on the Internet rather than on individual devices, providing on-demand access. Mobile cloud computing can involve other mobile devices and/or servers accessed via the Internet. A related notion is cloudlets, which has been viewed in different ways.[16][17] Applications are run on a remote server and then sent to the user. Because of the advanced improvement in mobile browsers thanks to Apple, Google, Microsoft and Research in Motion, nearly every mobile should have a suitable browser. This means developers will have a much wider market and they can bypass the restrictions created by mobile operating systems. Mobile cloud computing gives new company chances for mobile network providers. Several operators such as Vodafone,[18] Orange and Verizon have started to offer cloud computing services for companies.

2 Related Work

To give more prospective about the Mobile Cloud Computing, this section discusses the results obtained from other resources. It was shown in [19] executes video games in the cloud and delivers video stream to resource-poor clients without interrupting the game experience. Many other examples where the cloud can augment mobile devices can be envisioned, e.g. virus scan, mobile file system indexing, augmented reality applications. In [20] uses VM migration to offload part of their application workload to a resourceful server through either 3G or WiFi. CloneCloud was tested using Android phones with the clones executing on a Dell desktop running Ubuntu. The system is a flexible application partitioned and execution runtime. It enables unmodified mobile applications to offload part of their execution from mobile devices onto device clones operating in a computational cloud. It was presented in [21] 'Hyrax' for Android smartphone applications which are distributed both in terms of data and computation based on Hadoop ported to the Android platform. Hyrax explores the possibility of using a cluster of mobile phones as resource providers and shows the feasibility of such a mobile cloud. As a sample application, they present 'HyraxTube'; which is a simple distributed mobile multimedia search and sharing program. The objective of HyraxTube is to allow users to search through multimedia files in terms of time, quality, and location.

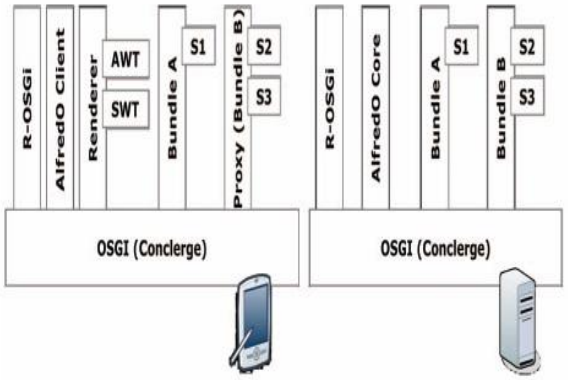

Figure 3: AlfredO Architecture

AlfredO [22] is a middleware platform to automatically distribute different layers of application in smartphones and cloud, respectively, by modeling applications as a consumption graph, and finding the optimal modules. The test result shows that such platform improves the performance of applications in cloud computing effectively. AlfredO system consists of three bundles (the interface encapsulation on Java classes and services): AlfredOClient and Renderer on the client and AlfredO Core on the server (shown in Fig. 5). There are several of researches about Mobile Cloud Computing can be found in [23, 24, 25]

3 Problem Definition and System Model

In this section, we present a model for application execution on the cloud-assisted mobile application platform. Application system architecture as shown in Fig.5, First, we define a mobile application profile. Then, we calculate consuming resources for application execution, including resources consumed for computation on mobile execution and a transmission computation to cloud execution. The following Sequence steps for our framework application as shown in (fig 6) .We use a mobile smartphone SAMSUNG GALAXY GRAND 1.2 GHz Dual Core CPU, and Android 4 Operating Systems in which performance data is collected and tested. In the experiments, the PartotionMigrate2Cloud application smartphone calculate some of GPS calculations such as distance between two points or more till 100 points using different algorithms. For our experiment, we calculate the effects of Sending computation to cloud web service and back with results and studying the Offloading computation to save energy on power consumption for smartphone mobile in case of running all processes of application on mobile or by partition and offloading processes to cloud

In first step: Firstly; Comparison is conducted using two different types of GPS mode (using mobile GPS), and using mobile network .for each type of GPS, we can get latitude and longitude for each point (it can be calculated by mobile GPS satellite or by mobile network).in this research we implement the two mode of operations

In second step: After selecting GPS mode of operations, we have to choose between manual or automatic calculation to get latitude or longitude for each point

- If automatic calculation is selected, we have to enter number of points and system get points every thirty second
- If manual calculation is selected, we have to click to get points

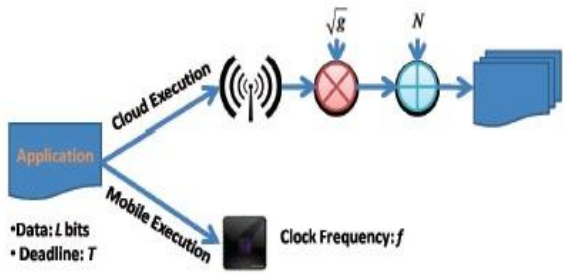

Figure 4: Mobile Application excuted in two alternative modes mobile Excution (lower) and the Cloud excution (upper)

In third step: After selecting method to get points either manually or automatic, we have to choose between calculation way on mobile or by partition and offloading to perform part of calculation on mobile and part on cloud server

a) ***In case calculation on mobile***, calculation is conducted in case of getting points manually or automatic Mobile Application will take GPS reading and perform calculations over certain period of time
1. GPS reading to determine latitude and longitude for each point either by GPS for mobile (smart phone (satellite)) or from mobile network
2. Then calculate the distance between two point or more using different algorithms
3. The Application will perform all calculations on smart phone device and calculate the results and the consuming resources such as Memory consumed, CPU usage, Time consumed for calculation, battery consumed to perform the processes, time consumed for calculations and for getting points

b) ***In case of partition and offloading calculation on cloud and mobile***, We implement cloud clone application that enables the mobile applications developers to take decision of performing all application processes on an android mobile device or to divide the application processes to execute on mobile & cloud
1. GPS reading to determine latitude and longitude for each point either by GPS for mobile (smart phone (satellite)) or from mobile network (this step execute on mobile device)
2. Then data(longitude and latitude for each point) is transmitted to cloud server to perform calculation on cloud
3. the distance between two point or more using different algorithms calculations performed on cloud the distance between two point or more using different algorithms
4. The Application will perform distance calculations on cloud server and calculate the results and the consuming resources such as Memory consumed for sending and receiving results, Memory consumed for distance calculations only, Memory consumed for all process from getting points till receive results, CPU usage, Time consumed for calculation, battery consumed to perform the transmitting data, time consumed for calculations and for getting points

4.1 Mathematical Calculation

4.1.1 Distance using Haversine formula

for our experiment,distance calculations between two point using the 'haversine' formula to calculate the great-circle distance between two points – that is, the shortest distance over the earth's surface .The formula assumes that the earth is a sphere, (we know that it is "ellipse " shaped) – giving an 'as-the-crow-flies' distance between the points (ignoring any hills, of course!).

- ***haversine Formula***

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1).\cos(\varphi_2).\sin^2(\Delta\lambda/2) \quad (1)$$
$$c = 2.\text{atan2}(\sqrt{a}, \sqrt{(1-a)}) \quad (2)$$
$$d = R.c \quad (3)$$

Δφ is latitude difference (lat2− lat1), Δλ is longitude difference (long2− long1), R is earth's radius(mean radius = 6,371km)

4.1.2 Distance using Spherical low of Cosines:

When Sinnott published the haversine formula, computational precision was limited. Nowadays, most modern computers & languages use IEEE 754 64-bit floating-point numbers, which provide 15 significant figures of precision. With this precision, the simple spherical law of cosines formula gives well-conditioned results down to distances as small as around 1 metre

- **spherical law of cosines *formula***

$$d = \text{acos}(\sin(\varphi_1).\sin(\varphi_2) + \cos(\varphi_1).\cos(\varphi_2).\cos(\Delta\lambda)).R \quad (1)$$

4.1.3 Distance using Equirectangular approximation :

If performance is an issue and accuracy less important, for small distances Pythagoras' theorem can be used on anequirectangular projection

•***Formula***

x = Δλ.cos(φ) **(1)**
y = Δφ **(2)**
d= $R.\sqrt{(x^2 + y^2)}$ **(3)**

4.2 Experiment (Automatic Calculations)

4.2.1 Getting Points using GPS satellite

Figures 5(a) and 5(b) show the main interface for all steps of the application in case of getting points automatic using GPS satellite. Table 1 shows resources consumed in case of automatic calculation in case of getting longitude and latitude for each point automatically every 30 second using GPS satellite for execution application on cloud web services and the for different number of points range from two points till ten points [GPS calculation on mobile smartphone and calculation migrated to cloud and return results to mobile)

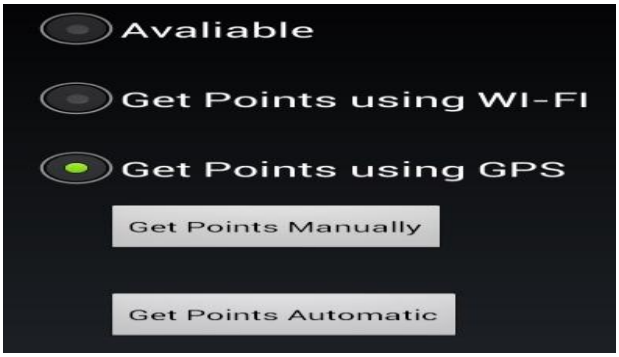

Fig 5 (a) Getting points (latitude and Longitude) using Mobile GPS Satellite

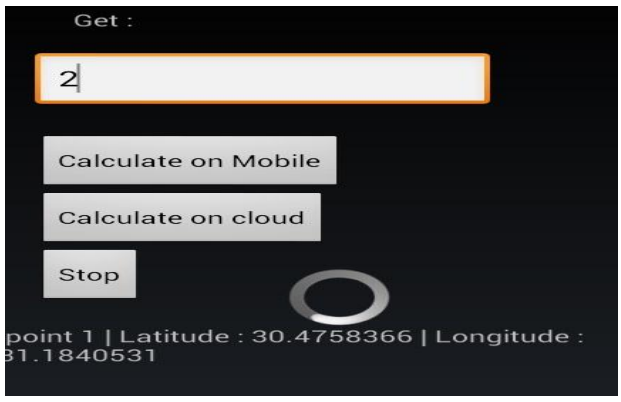

Fig 5. (b)Getting Points Automatic(every 30 Sec)

Fig. 5. Snapshot of elastic GPS application on Samsung Galaxy Grand

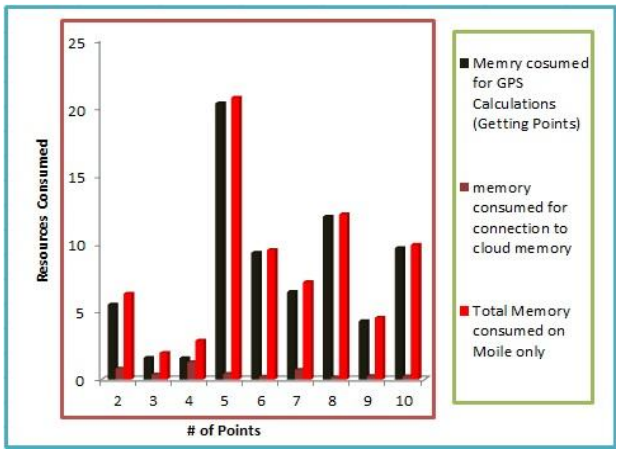

Fig 6 (a) Resources consumed for execution app on Cloud

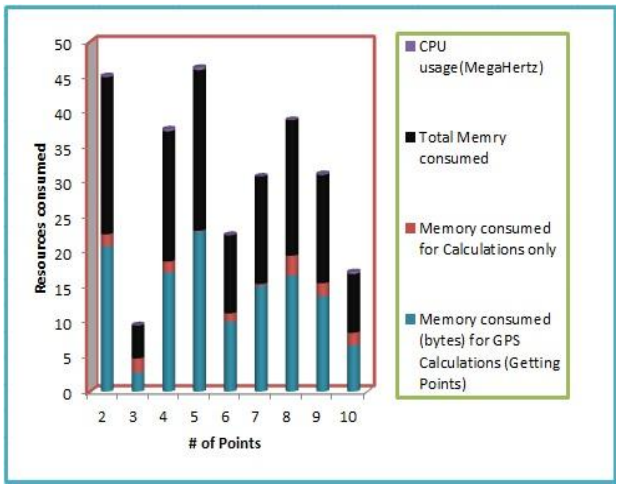

Fig 6. (b)Resources consumed for execution app on mobile

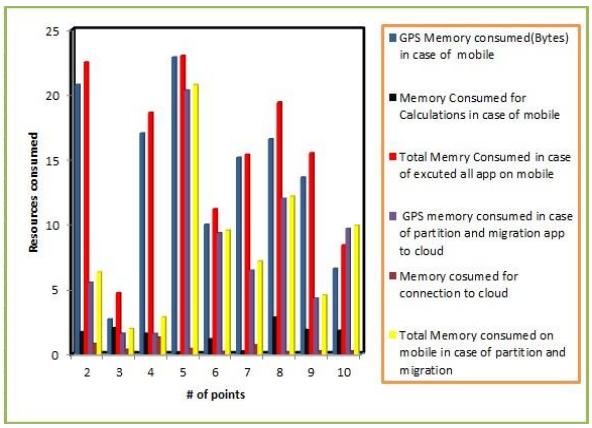

Fig 6. (c) Memory consumed for execution application on mobile and cloud (b)Getting Points Automatic(every 30 Sec)

Fig. 6. Resources consumed for automatic calculation for Getting Points using GPS satellite Snapshot of elastic GPS application on Samsung Galaxy Grand

Figures 6(a), 6(b), and 6(c) show the experimental results for different data calculations using automatic method for getting longitude and latitude for each point rang from calculating distance between two points till ten points in case of distance range from approximately 50 meter till 200 meter in case of all calculation done on mobile device or application is partitioned and offloading on cloud to perform distance calculation on cloud. Table .1 and Fig.6 (b) shows the results of execute all application processes on mobile smartphone only. The results include the following matrices

- Memory consumed for GPS calculation only (getting longitude and latitude for each point)
- Memory consumed for calculating distances between points
- Total Memory consumed to execute app
- Time consumed and CPU usage for calculations

Fig.6 (a) shows the results of partitioned and migrate activities to web services. The results include the following matrices

- Memory consumed on mobile for getting longitude and latitude for each point
- Memory consumed on cloud (bytes) for calculating distances between points on cloud
- Memory consumed for send points longitudes and latitudes to web services or receive results from web services to mobile smart phone
- Total memory consumed on mobile smartphone for calculations memory consumed for execution all application on mobile smartphones. The memory unit is bytes.

The performance of execute application on mobile or cloud in terms of memory consumed using different distance and number of points are shown in Fig 6(c).the total memory consumed on mobile in the case of cloud or in the case of executed all the application on mobile only. According to partition and migrate app to cloud, most of resources consumed on mobile smartphone will decrease approximately to the half as shown in fig 6(c). In case of partition and offloading application most of resources consumed on cloud and minimize the resources consumed in mobile smartphone results are shown in(Fig 7),(Fig 8), and (Fig 9) for different data calculations using manual method for getting longitude and latitude for each point rang from calculating distance between two points till ten points in case of distance range from approximately 100 meter till 16 kilo meter in case of all calculation done on mobile device or application is partitioned and offloading on cloud to perform distance calculation on cloud. (Fig. 7) shows the results of portioned and offloading application and getting latitude and longitude for each point on mobile smart phone and executes distance calculations on cloud. The results include the following matrices

- Memory consumed on mobile (bytes) for GPS calculation only (getting longitude and latitude for each point)
- Memory consumed on cloud (bytes) for calculating distances between points on cloud
- Memory consumed for send points longitudes and latitudes to web services or receive results from web services to mobile smart phone
- Total memory consumed on mobile smartphone for calculations

4.2.2 Getting Points using Network GPS

Figures 7(a) and 5(b) show the main interface for all steps of the application in case of getting points automatic using network GPS.

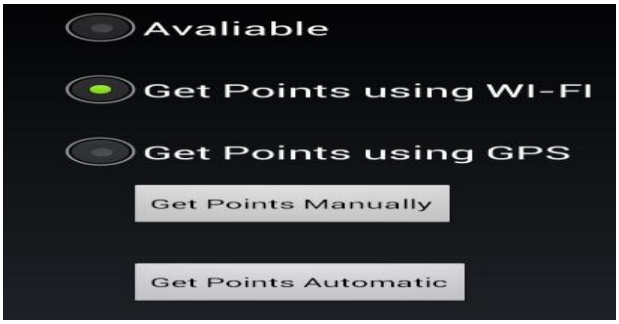

Fig 7 (a) Getting points (latitude and Longitude) using Mobile Network GPS

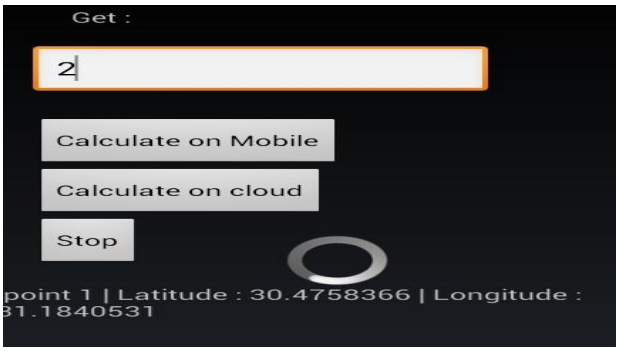

Fig 7.(b)Getting Points Automatic(every 30 Sec)

Fig. 7. Snapshot of elastic GPS application on Samsung Galaxy Grand

Figures 8(a), 8(b), and 8(c) show the experimental results for different data calculations using automatic method for getting longitude and latitude for each point rang from calculating distance between two points till ten points in case of distance range from approximately 50 meter till 200 meter in case of all calculation done on mobile device or application is partitioned and offloading on cloud to perform distance calculation on cloud.

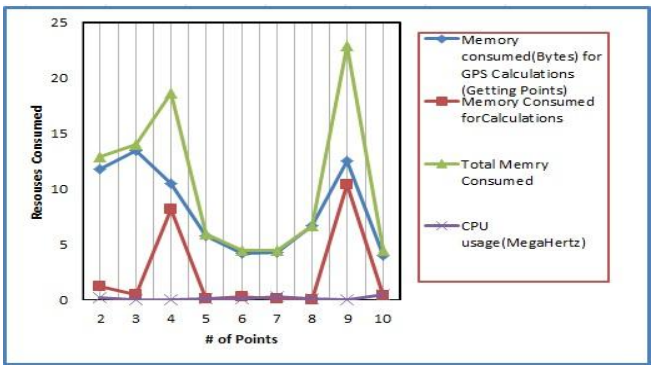

FIG. 8.(A) RESOURCES CONSUMED FOR EXECUTION APP ON MOBILE

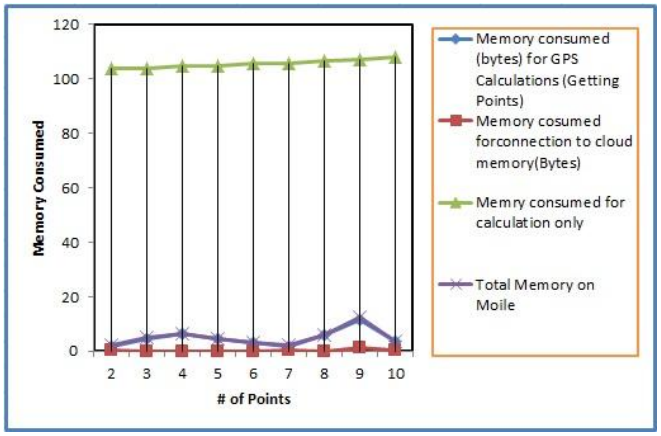

FIG.8.(B) MEMORY CONSUMED FOR EXECUTION APPLICATION ON MOBILE (BYTES)

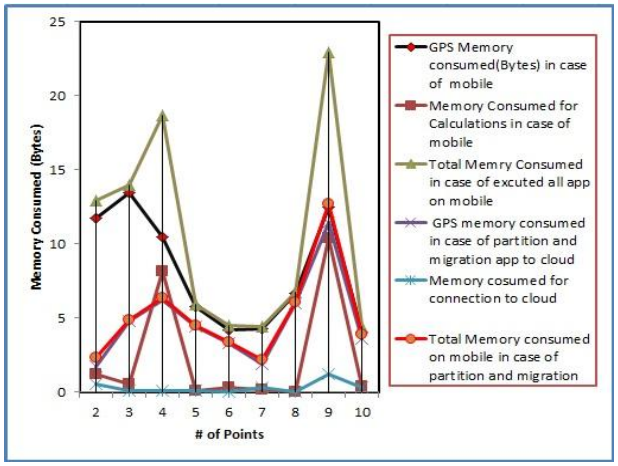

FIG.8. (C) MEMORY CONSUMED FOR EXECUTION PPLICATION ON MOBILE AND CLOUD

Fig. 8. Resources consumed for automatic calculation for Getting Points using Network GPS

Fig. 8(a) shows the results of execute all application processes on mobile smartphone only. The results include as the same as in case of getting point using GPS Satellite such as memory consumed for getting points only, memory consumed for calculations only, CPU usage for calculation,and Time consumed Fig. 8(b) shows the results of partitioned and offloading application on cloud. The results include as the same as in case of getting point using GPS Satellite Fig b(c) shows The performance of execute application on mobile or cloud in terms of memory consumed using different distance and number of points .According to partition algorithm, most of resources consumed on mobile smartphone will decrease approximately to the half. In case of partition and offloading application most of resources consumed on cloud and minimize the resources consumed in mobile smartphone

5. CONCLUSION AND FUTURE WORK

In this paper, we proposed the elastic partition algorithm and partition cost module. Partition and migrate activities and method from mobile smartphone to cloud web services is a good idea and may reduce resources on mobile. Thus, cloud comput¬ing can save energy for mobile users through computation offloading. Cloud computing can used for extending battery lifetime (Computation offloading migrates large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds)).Remote application execution can save energy significantly. Also CC can help in Improving data storage capacity and processing power(MCC enables mobile users to store/access large data on the cloud, it can helps in reduce the running cost for computation intensive applications. Those results by mobile applications are not constrained by storage capacity on the devices because their data now is stored on the cloud. in future word we will consider smartphone devices as thin clients and migrate all app automatically to cloud web services .that can help in Improving reliability and availability (Keeping data and application in the clouds reduces the chance of lost on the mobile devices).also CC can increase Scalability(Mobile applications can be performed and scaled to meet the unpredictable user demands,Service providers can easily add and expand a service)

ACKNOWLEDGMENT

This study was supported by Faculty of Computers and Informatics (Menofyia University, Banha University), Egypt

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TABLE 1. RESOURCES CONSUMED FOR EXECUTION APPLICATION ON MOBILE SMARTPHONE AND CLOUD WEB SERVICES (GETTING POINTS USING GPS SATELLITE)

Automatic calculation for Getting Points using GPS Satellite																		
	Mobile Calculations							Cloud Calculations										
	Memory Consumed(bytes)			Time(sec)		Battery(percent)	CPU		Memory Consumed(bytes)				Time(sec)		Battery(percent)		
# points	GPS Calculations (Getting Points)	Calculations	Total Memory	GPS Calculations (Getting Points)	Calculations	Battery used for Calculations	Total Battery consumed	CPU usage(Megaherz)	# of points	GPS Calculations (Getting Points)	connection to cloud memory	Memory consumed for calculation only	Total Memory on Mobile	GPS Calculations (Getting Points)	Connection to Cloud	GPS Calculations (Getting Points)	Connection to Cloud	Total Battery
2	20.769531	1.71875	22.488281	30	1	0.0%	0.0%	0.184741	2	5.511718	0.804687	104.2187	6.316406	30	2	0.0%	0.0%	0.0%
3	2.703125	2.03125	4.734375	60	1	0.0%	0.0%	0.083333	3	1.589843	0.367187	103.2287	1.957031	60	1	0.0%	0.0%	0.0%
4	17.01953	1.589843	18.60937	90	1	0.0%	1.0%	0.337266	4	1.574218	1.285156	105.0625	2.859375	90	5	1.0%	0.0%	1.0%
5	22.875	0.113281	22.98828	120	1	0.0%	0.0%	0.378784	5	20.33203	0.421875	105.0859	20.75390	120	1	0.0%	0.0%	0.0%
6	10	1.1825	11.18255	150	1	0.0%	0.0%	0.09859155	6	9.33593	0.20312	105.91406	9.53907	150	1	0.0%	0.0%	0.0%
7	15.15625	0.230468	15.38671	180	1	0.0%	1.0%	0.034909904	7	6.45803	0.70312	105.91406	7.16506	180	1	1.0%	0.0%	1.0%
8	16.57031	2.8425	19.41281	210	1	0.0%	1.0%	0.07042256	8	11.99218	0.17187	106.7656	12.16406	180	1	1.0%	0.0%	1.0%
9	13.62109	1.87595	15.49704	240	1	0.0%	2.0%	0.17223034	9	14.30078	0.24609	106.7656	4.546875	240	2	2.0%	0.0%	2.0%
10	6.597656	1.816406	8.414062	300	1	0.0%	1.0%	0.305555	10	9.675781	0.238281	107.6171	9.914062	300	1	1.0%	0.0%	1.0%

TABLE 2. RESOURCES CONSUMED FOR EXECUTION APPLICATION ON MOBILE SMARTPHONE AND CLOUD WEB SERVICES (GETTING POINTS USING GPS SATELLITE)

Automatic calculation for Getting Points using Network GPS — Mobile Calculations

	Memory Consumed(bytes)			Time(sec)		Battery(percent)		CPU
# points	GPS Calculations (Getting Points)	Calculations	Total Memory	GPS Calculations (Getting Points)	Calculations	Battery used for Calculations	Total Battery consumed	CPU usage(Megahertz)
2	11.7503125	1.1914063	12.9417188	30	1	0.0%	1.0%	0.22927971
3	13.464844	0.53125	13.996094	60	1	0.0%	0.0%	0.04198918
4	10.5078125	8.167969	18.6757815	90	1	1.0%	1.0%	0.029733963
5	5.78906 25	0.121093 75	5.910156 25	120	1	0.0%	0.0%	0.0833334
6	4.2109375	0.292968 75	4.503906 25	150	1	0.0%	1.0%	0.103295 09
7	4.273437 5	0.15625	4.429687 5	180	1	0.0%	1.0%	0.280928 82
8	6.675781 3	0.03125	6.707031 3	210	1	0.0%	1.0%	0.097793 005
9	12.5117188	10.40625	22.9179688	240	1	0.0%	1.0%	0.054054 06
10	4.0429688	0.390625	4.4335938	270	1	0.0%	2.0%	0.490802 35

Automatic calculation for Getting Points using Network GPS — Cloud Calculations

	Memory Consumed(bytes)				Time(sec)		Battery(percent)		
# of points	GPS Calculations (Getting Points)	connection to cloud memory	Memory consumed for calculation	Total Memory on Mobile	GPS Calculations (Getting Points)	Connection to Cloud	GPS Calculations (Getting Points)	Connection to Cloud	Total Battery
2	1.7539063	0.5742187	103.8984375	2.328125	30	3	1.0%	0.0%	1.0%
3	4.78215	0.08203215	103.8984375	4.86418215	60	3	0.0%	0.0%	0.0%
4	6.234375	0.1328215	104.8515625	6.3671965	90	1	1.0%	0.0%	1.0%
5	4.421875	0.072206275	104.8515625	4.493393775	120	1	0.0%	0.0%	0.0%
6	3.316406	0.05859037	105.828125	3.37499 97	150	1	1.0%	0.0%	1.0%
7	1.890625	0.332031 25	105.727315	2.222656 25	180	1	1.0%	0.0%	1.0%
8	5.980469	0.054687 5	106.796875	6.035156 5	180	1	1.0%	0.0%	1.0%
9	11.453125	1.234375	107.2578125	12.6875	240	3	1.0%	0.0%	1.0%
10	3.5703125	0.3046875	108.25	3.875	270	1	2.0%	0.0%	2.0%