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Improving Energy Efficiency on Android Using Cloud Based Services

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Abstract: ***Mobile devices of today offload their compute intensive application to Cloud, but also consume huge energy while communicating using mobile network services like 3G/4G. Cloudlets can be used to provide such services with wireless LANs. Worldwide Android becomes the fastest-growing mobile OS. Millions of new Android devices are activated worldwide every single day. Even so, it is the fact that Android smart phones have limited resources, such as battery charge capacity, network bandwidth utilization, storage capacity, and processor performance. These restrictions may be relieved by computation offloading: sending heavy computation to resourceful servers and receiving the results from these servers. Several issues related to offloading have been investigated. The energy consumption of under-utilized resources, particularly in a cloud environment, accounts for a substantial amount of the actual energy use. Inherently, a resource allocation strategy that takes into account resource utilization would lead to better energy efficiency; this, in clouds.***

Keywords: energy efficiency, cloud computing, mobile cloud computing, Android, WLAN

I. INTRODUCTION

An Android phone, is a mobile phone with more advanced computing capability and connectivity than basic feature phones. Modern smartphones include all of those features plus the features of a touch screen computer, including web browsing, Wi-Fi and 3rdpartyapps. Smartphones are now capable of supporting a wide range of applications, many of which demand an ever increasing computational power. The cloud computing technology offers virtually unlimited dynamic resources for computation, storage, and service provision Cloud computing services to mobile devices to overcome the smart phones constraints.

The aim of this project is to investigate if the cloud can be used to execute mobile phone application functions faster by offloading the task to the cloud, in comparison to execute the function on the mobile phone. Cloud computing will also be investigated as well as if different phones models with different network connections are more or less suitable for offloading

A) DATA STORAGE IN CLOUD AND SECURITY

Storage as a Service is [4] generally seen as a good alternative for a small or mid-sized business that lacks the capital budget and/or technical personnel to implement and maintain their own storage infrastructure. SaaS is also being promoted as a way for all businesses to mitigate risks in disaster recovery, provide long-term retention for records and enhance both business continuity and availability. It seems that every software vendor has become a SaaS vendor, and every hardware vendor has begun supporting the cloud. New applications are being offered in the cloud, and businesses are beginning to use cloud infrastructure to run their own custom applications. Companies still think long and hard about moving applications and data to the cloud from traditional, on-premise computing models, and many are hesitating to move applications containing sensitive data. The benefits of cloud computing are significant—economies of scale, potential cost savings, fast deployment and easy scalability. For many businesses, essential questions about security, privacy, compliance, and control of corporate data remain

unanswered. According to the research report, KPMG's 2010 Cloud Computing Survey, 2010, security is the biggest obstacle to cloud adoption followed closely by legal, compliance, and privacy issues.

According to the Goldman Sachs Equity Research Report of 2011, 70% of the CIOs surveyed express major concerns about data security in the cloud. Their concerns include the loss of transparency and control over where business data resides and how it is protected outside the enterprise, in the cloud provider infrastructure. Cloud computing has brought advantages in the form of online storage. In this section, we are referring to Storage-as-a-Service. Data security for such a cloud service encompasses several aspects including secure channels, access controls, and encryption. And, when we consider the security of data in a cloud, we must consider the security triad: confidentiality, integrity, and Authentication. One of the more recent trends in online cloud-based storage is the cloud storage gateway. Several vendors offer such solutions that are generally implemented as an appliance that resides onsite at the customer premises.

B) CLOUD SECURITY

Public and private cloud services, also known as multi-tenant infrastructure, are used increasingly in the enterprise and by government agencies. With their popularity come security issues that are now high priority. A number of TCG technologies and standards, including the Trusted Platform Module (TPM), network security, and self-encrypting drives can be used to provide security for systems, networks, and data. TCG also is addressing how to interface various technical standards to create an end-to-end enterprise solution that is tailored to meet mission and business needs and comply with security policies within public and private cloud networks. TPM (Trusted Platform Module) is a computer chip (microcontroller) that can securely store artifacts used to authenticate the platform (your PC or laptop). These artifacts can include passwords, certificates, or encryption keys. A TPM can also be used to store platform measurements that help ensure that the platform remains trustworthy. Authentication (ensuring that the platform can prove that it is what it claims to be) and attestation (a process helping to prove that a platform is trustworthy and has not been breached) are necessary steps to ensure safer computing in all environments

TPM maintains thrice of all (CIA) properties[3]:

Confidentiality: The nature of hardware-based cryptography ensures that the information stored in hardware is better protected from external software attacks. A variety of applications storing secrets on a TPM can be developed. These applications make it much harder to access information on computing devices without proper authorization.

Authentication: The TPM, a simple, yet revolutionary concept, ensures only authorized users and authorized PCs are on an enterprise network. It also acts as a secure vault for certificates, keys and passwords, negating the need for costly tokens.

Platform Integrity: Measures and reports on the integrity of platform, including the BIOS, disk MBR, boot sector, operating system and application software, to ensure no unauthorized changes have occurred. The TPM, a secure cryptographic integrated circuit (IC), provides a hardware-based approach to manage user authentication, network access, data protection and more that takes security to higher level than software-based security.

Databases are repositories for information with links within the information that help make the data searchable[2]. A cloud database is a database that typically runs on a cloud computing platform, such as Amazon EC2, GoGrid and Rackspace. There are two common deployment models: users can run databases on the cloud independently, using a virtual machine image, or they can purchase access to a database service, maintained by a cloud database provider. Of the databases available on the cloud, some are SQL-based and some use a No SQL data model. Distributed databases like Amazon's SimpleDB, spread information among physically dispersed hardwae.But to the client, the information seems to be located at one place. The advantages of such a database include the following: Improved Availability: If there is a fault in one database system, it will only affect one fragment of the information, not the entire database. Improved performance: Data is located near the site with the greatest demand and the database systems are parallelized, which allows the load to be balanced among the servers. Price: It is less expensive to create a network of smaller computers with the power of one large one. Flexibility: System can be change

and modified without harm to the entire database. There are disadvantages including: Complexity: Database administrators have extra work to maintain the system. Labour costs: With added complexity comes the need for more workers on the payroll. Security: Database fragments must be secured and so must the sites housing the fragments. Integrity: It may be difficult to maintain the integrity of the database if it is too complex or changes too quickly. Standards: There are currently no standards to convert a centralized database into a cloud solution.

II. LITERATURE SURVEY

There is quite a lot of material on the topic of mobile phones and cloud computing. Much of investigates the possibility to offload mobile phone functions into the cloud to extend battery life, by reducing the computational load of the mobile phone. Miettinen & Nurminen[1] explains that energy efficiency is a fundamental consideration for mobile phones and argues that cloud computing has the potential to save energy through offloading (Miettinen& Nurminen, 2010). The energy cost of the computation must however be greater than the communication transfer cost to the cloud. Another interesting remark is that energy consumption is greater if the data sent is divided into smaller bits than by sending the same data in one large chunk. Miettinen & Nurminen presents a remarkably basic but straightforward formula, Ecloud < Elocal, which states that the energy consumption to send the task to the cloud must be smaller than the local consumption on the mobile phone, for offloading to be beneficial. They have also investigated the difference between 3G and WLAN connections where they state that the 3G connection uses more mobile phone energy the further away from the base station it is and that it takes longer time for the 3G connection to transfer data, in comparison to the WLAN connection, due to the lower bandwidth. To receive data is also less power consuming than to send it.

Palmer et al. [5] has also investigated the importance of mobile phones in collaboration with cloud computing. The computational power of the mobile phone is stated to be the chief limitation of the mobile phone. This constraint makes it desirable to offload computational tasks to the cloud where the resources are “unlimited”. But there are also problems related to the connection between the mobile phone and the cloud in forms of latency, connection interruption and network provider costs that needs to be considered (Palmer et al., 2009).

Carroll &Heiser [6] investigated which parts of mobile phones are consuming most energy by measuring the different parts of a mobile phone while it was operating. The result shows that data transmission, phone calls and the display are the parts that use most energy. To send and receive data from the cloud is therefore a very energy-consuming task in comparison to other mobile phone related functions (Carroll &Heiser, 2010).

Yang, Ou, & Chen [7] has also acknowledged the limitations of mobile devices and argues that the miniature size and portability makes it hard to run applications that require a lot of computational power (Yang, Ou& Chen, 2008). Users want to run the applications that they use on more powerful computers on their mobile phones. Therefore Yang et al. suggests that cloud offloading could be a possible solution. They conducted an experiment where they use a text translate application. The application reads text through a mobile phone camera and translates it into German language. They compared the results of performing the translation task locally on the mobile phone and by offloading it on computers that represented the cloud. The result showed that it is beneficial to offload the task.

III. PROPOSED SYSTEM

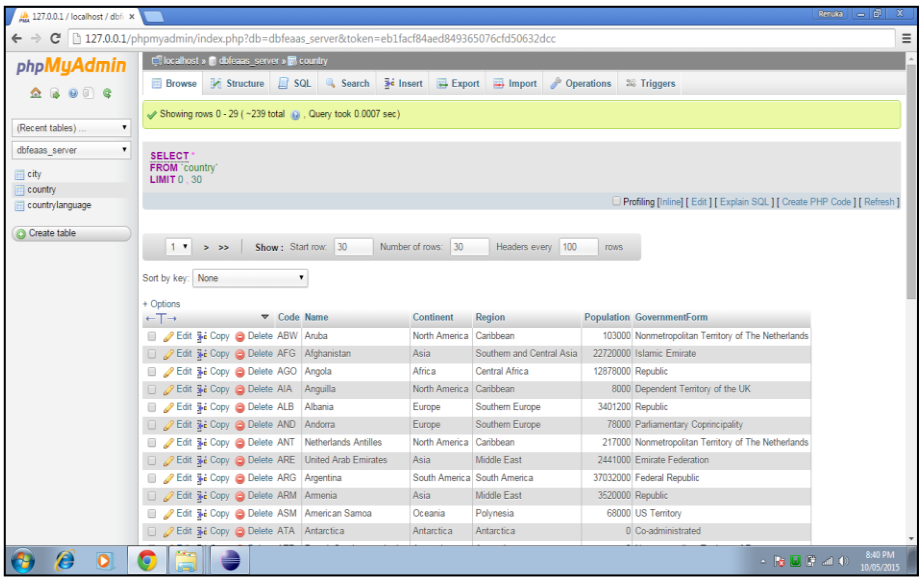
Here we have implemented the Battery consumption service over the cloud to save energy in optimized manner as shown below in the modules.

1. Development of Cloud database
2. Implementation of Database Processing on Device
3. Implementation of Database Processing on Cloud

4. Comparing the performance by processing records and getting results on local db and on cloud

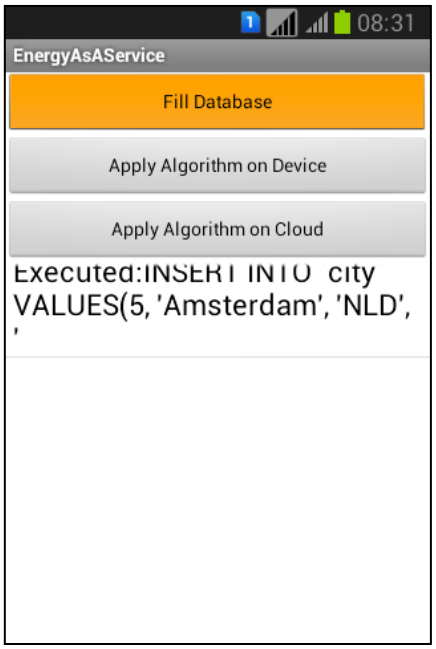
5. Evaluating and analysing the results as energy efficiency E2 < E1.

Module 1 - Development of Cloud database: This is the first module where various tables are created for maintaining Worlds database, Here a MySQL Database based on the cloud is developed so that we can store records of the world. Database dbfeaas_server which have three tables city, country and countrylanguage. First table city, it contains ID, Name, CountryCode, District and Population. Second table country, it contains Code,Name,Continent, Region, Population,GovernmentForm and Last table countrylanguage, it contains Countrycode, Language, isOfficial, Percentage.



Snapshot 1. Worlds Database in phpadmin

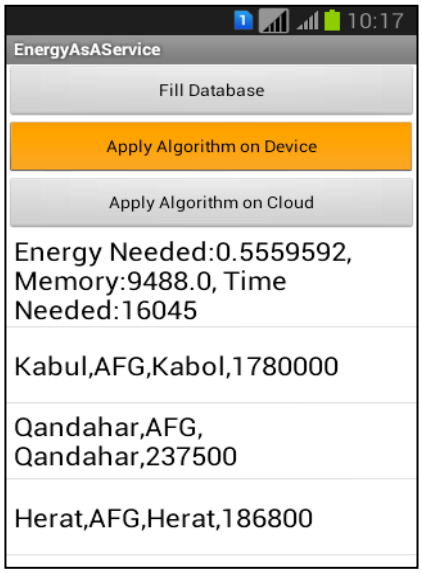
Module 2 - Implementation of Database Processing on Device : This is the second module, here the tab Fill Database on application, when it is click, it will fill the local SQLite database with the records on the device.



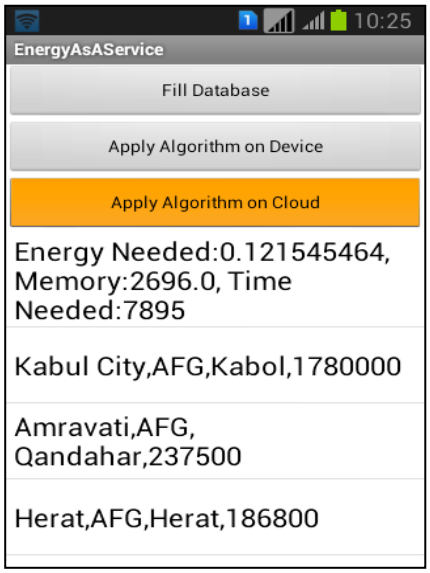
Snapshot 2. Filling the SQLite database with records

Module 3 - Implementation of Database Processing on Cloud : This is the third module. Tab Apply Algorithm on Cloud, it will fetch the SQL based records from the Cloud

Module 4 - Comparing the performance by processing records and getting results on local db and on cloud : In this Module ,database processing on Device and Database processing over cloud ,its Energy Needed ,Memory Needed and Time Needed it been display.



Snapshot 3.Database Processing on Device



Snapshot 4. Database Processing on Cloud

IV. CONCLUSION

In this paper we gave an overview the previous investigated procedure and we have optimized it by using the battery consumption parameter, and analyzed it and it improves the efficiency. To conclude, this paper can also help all the people those are using Android phones are and interested in the cloud computing area to consider research on the energy . In Future we can save energy for internet using purpose.

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