OFFLOADING TECHNIQUES IN MOBILE CLOUD COMPUTING: A REVIEW

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Abstract

With advancement in smart phone technology, need of energy and memory is also of great concern with complex mobile applications. Mobile cloud computing brings a solution to this problem. while executing the computational intensive jobs in mobile devices, power system is getting drained very fast. Computational time of application and power consumption in mobile devices are directly proportional. Cloud computing is emerging technology to solve many problems. The computation part of applications and data storage work is handed over to cloud server through internet. This is quite beneficial for mobile devices which otherwise need powerful configuration to handle such extensive computation and storage. Although various benefits are related to this technique, there are also some challenging issues related to it. The right partitioning decision and network failure management are very important issues. The In this paper, various offloading techniques have been reviewed in terms of their advantages and limitations. The another main objective of this paper is to find optimized mapping between offloaded task and cloud resource

Index Terms: Mobile Cloud Computing, Offloading Techniques, Mapping.

I.INTRODUCTION

Nowadays mobile computing usage is increased in very high. In market mobiles are very much used for executing the Cloud applications by end user. That rate is increased more than $10 billion. For everyone, mobile devices are becoming a crucial one. More over developers have intention to deploy their applications on mobile devices. Then only, applications could access by consumers in ubiquitous manner (i.e) anywhere, anything, anytime. One of the pervasive computing devices is mobile device. But the grim snag is resource limitation. If high computation intensive jobs are executed in mobile devices there simultaneously battery consumption is also increased. Finally devices are getting conduit in very fast. Usually mobile devices are very being short of execution, battery detainment, CPU hustle when we compare wired devices.

Cloud Computing has emerged as new interesting research area for researchers due to its seamless applications in this mobile world. The term 'Cloud' refers to the Internet system where on demand computing is performed with the help of shared resources like storage, network, servers, applications and services instead of using local servers and individual devices. Users can use this computing service when required by paying for it and relieve the service easily with minimum management effort and service provider interaction. This internet based computing can help organizations perform tens of trillions of computations per second for various applications and store huge data online.

User can store personal data online, use webmail services like Gmail, Yahoo mail etc., use online applications like Google documents and Adobe Photoshop express, store computer files online and much more. Advantages of using this system lie in its convenience to use and share information and accessing the stored information from any computer. In case, if user's computer fails, user would not lose his information as it is stored online.

II.MOBILE CLOUD COMPUTING

'Mobile Cloud computing' is combination of cloud computing and mobile environment which brings the advantage of using applications on mobile devices that require extensive processing. Mobile devices like laptops, PDAs, smart phones which otherwise require powerful configuration can now send service request to cloud system using web browser and cloud controllers can process these requests to provide services to mobile users. So, mobile through cloud computing applications, the computation work and data storage work can be handed over to the clouds via internet avoiding long execution time.

III. CHALLENGES AND SOLUTION FOR MOBILE CLOUD COMPUTING

A. Challenges Regarding Mobile Communication:

1) *Low Bandwidth Problem:*

In communication network Bandwidth is one of the important thing as the radio resource for wireless networks are transmitted over networks according to the amount of bandwidth is present for transferring the content in the network.

As the bandwidth is limited sharing the limited bandwidth among different mobile users located in the same area or workstation and probably involved in the same content to be transferred. This results in the improvement of the quality and this solution is applied mainly for the case when the users in a certain area are interested in the same contents. It collects user profiles that are using the network periodically and creates decision tables, Based on which the users decide whether or not to help other users download contents that cannot receive by them due to the bandwidth limitation.

2) *Lack of Resource of Mobile Devices:*

Comparing mobile device with older desktop PC shows that how the cost feature of mobility is being achieved. As there is lack of resources makes it hard for the adoption of mobile cloud computing in general conditions.

For overcoming this limitation of mobile devices and there resources, they are added to the cloud infrastructure so that they can be used on anytime on anywhere basis makes it easy for most of advanced applications. As the mobile deviceperformances, and the resource constraints of mobile devices going on increasing and fixed devices will remain and must accounted for the types of application selected for mobile cloud computing [18].

B. *Challenges of Network*

1) Challenges of Wireless Network and Access Control Policies:

Wireless network is base for carrying out cloud computing and it has its own intrinsic nature and constraints. For better performance the consistent network bandwidth is important but actually variable data rates, longer latency and connectivity with gaps in coverage are the main problems associated with network in the MCC. Some uncontrollable factors are also responsible like weather for varying bandwidth capacity and coverage [17]. For implementing MCC, accessing the network with heterogeneous access scenario and different access technologies like WiMAX, WLAN, 4G, and so on, having their own policies and restrictions.

As the wireless network is an important thing to support MCC functioning there should be the proper mechanism for minimizing the latency, increasing the bandwidth and decreasing the connectivity gap. We should keep different access schemes for avoiding connection failure and connection re-establishment. In order to give faster access for mobile devices, most providers are offering 4G/Long Term Evolution (LTE) services.

These services on the basis of data storage capacity, plug and play features, low latency, etc. This provides download peak rates up to 100 Mbps and upload up to 50 Mbps [18].

2) Seamless Connection Handover:

Currently executing application is terminated or it returns error message when one move from one access point of network to another point or one move from Wi-Fi network to 3G-based cellular network. Because this creates the situation of communication failure and connection reestablishment.So, for providing data communication using cellular network mobile operators are trying to set up WiFiAps on street. This system is helpful to offload traffic of Wi-Fi systems can be reduced, and is to provide seamless in reduced cellular traffic congestion.

C. *Challenges Related To Mobile Applications*

1) *Interoperability:*

There are lots of mobile devices running on different platform including iPhone, Android phones, BlackBerry and others also. This variety of devices are used by people in the same organization or a group of people sharing single network. And in such situation interoperability issue becomes a major challenge in pulling/ pushing data across multiple devices.

An application that are run on mobile cloud infrastructure should be supported by certain mobile cloud infrastructure that can easily be judged possibly on the basis of its requirements against the cloud infrastructure characteristics. Along with the device, network bandwidth and latency vectors should perform computation intensity, network bandwidth, and network latency properly.

2) *Mobile Cloud Convergence:*

Data distribution is an important issue for achieving advantage of mobility by making integration with cloud computing with mobile world. As for using this cloud computing application services with mobile devices there some issues with computation of data, battery life and performance of this devices in distributed platform.

Mobile cloud convergence is the technique that provides performance improvement and solution to the computation power problem. For this there is a partition of application takes place such that parts that need

more computation run on the cloud and run on the mobile device. Wireless technologies, advanced electronics and internet are important to achieve pervasive and ubiquitous computing.

D. *Challenges Regarding Security*

1) Information Security Devices Privacy:

As cloud computing basically deals with providing all type of services, data storage and processing. As all this is done remotely, so security is an important concern for all who are using these services. We are concerning here with Mobile Cloud Computing hence its necessary to check the security related to mobile devices along with cloud computing platform, which is the key concern in this area. This is because there is possibility of device stolen or misplaced, which leads to crucial data to be compromised.

Now days as various security threats are born, cloud platforms also offers many robust built-in security measures like SSL and digital certificates provides as to enable external security [18].data from stolen/ misplaced mobile devices can be avoided by wiping of these mobile device remotely. For detecting security threats on any mobile device is done by installing and running security software's programmers called "Antiviruses" which are readily available in the market.

2) Security Attacks and Hacking:

All networking activates are susceptible to one or other type of malicious attacks. As there is more use of Web sites that are sometimes accessing malicious code sites, for accessing the network and operational data of that particular person or organization. There are some event at that time after implementing best measures for providing the best security policies to data and information trained attackers with best surfing may creates incidents that normally inescapable as:

 There are various policies and schemes are now days available such as Fair Information Practice Principles (FIPP) which require rigorous controls and procedures to protect the privacy of individual persons data as well as organizations information.

 Encryption is technique that is best for providing most effective way to maintain integrity and confidentiality of information.

 Along with other internal servers Web 2.0 servers may further mitigate the threat of unauthorized accessing of information through social media, Web sites and other internetsources.this as the usage of internet is also increases very much the data storage is shifted in the cloud environment that leads to the development of MCC. As all the transaction is on the mobile network with the use of internet the chances of different kinds of threats are increasing, we have mention some of the challenges that Mobile Cloud Computing has to suffer.

3) *Privacy and confidentiality:* This is very important to maintain consumer's trust. Various encryption schemes or cloud based mobile digital rights management schemes can be adopted to retain security.

4) *Malicious Attacks:* Various potential attacks on network are Denial of service (DoS) attacks,Side channel attacks, authentication attacks etc. Security control methods must be adopted to unauthorized access through websites or social media tools. 4) Network monitoring: Network performance monitoring is important issue which needs to be considered in mobile cloud computing.

These challenges in mobile computing can be resolved using cloud platform for storage and processing backup in mobile cloud computing. Security problems for data exchange, malicious attacks and possible solutions have been discussed. The limitation of this paper is that problem of managing different states of application processing on mobile device and cloud when there is network downtime was not considered and there was no an experiment performed to support the authenticity of the solutions as well. Various cloud service models and deployment models for implementation of mobile cloud computing have been discussed in [2].Another important challenge discussed for mobile cloud computing is absence of open standards which leads to problems like limited scalability, unreliable availability of a service, service provider lock in etc. However, none of the techniques have been discussed in this paper for adapting or scaling MCC based applications throughout the models.

Need of mobile cloud computing, general purpose mobile cloud computing (GPMCC) and Mobile cloud computing with application specific (MCCAS) has been discussed in [3].The barriers in implementation of MCC that hinder its success are listed but the solutions are not explained in detail. In [4], author discuss about Mobile Cloud computing, its architecture and programming concepts, typical services needed by client and mobile cloud server, challenges and possible solutions in mobile cloud computing but does not discuss adequate safety measures required. With growth of Smart phones today, need of energy is primary limitation with these devices. Remote execution is the popular technique where code execution is delegated to remote servers. This uses two approaches; one is portioning the program and send the right part for

remote execution whereas in second approach individual applications send their code automatically to remote infrastructure. First approach relies on programmer for partition decisions whereas second approach doesn't put much burden on programmer. MAUI [5] uses benefits of both approaches. In this technique, the decision whether the particular method should be offloaded to remote server or not is taken at run time by considering the cost of offloading it in terms of Energy saving and number of CPU cycles saved. Code offload decisions are made by MAUI solver and implemented by two proxies generated by MAUI by handling the control and data transfer based on this decision. This technique shows good results in terms of energy saving and performance while providing fine grained code offload. The ability to offload portions of a single application is the key advantage of this technique compared to techniques that move entire OS and all its running applications. However, this technique does not takes into consideration the problem of sscaling of execution in cloud. In [6], author represented Clone Cloud system that is a flexible partitioner. The right part of the execution of unmodified mobile applications is offloaded from mobile devices to clones working in the computational cloud. It can be said that single machine computation (smart phone computation) is transformed in to distributed computation (smart phone and cloud computation).The system is made flexible enough to move threads from device to cloud at runtime. Dynamic profiler and Optimizer is used to decide threads to be moved from mobile to clone in the cloud.Thus, Elastic system using clone in cloud is a good implementation in terms of saving energy and resources and other advantage is that the Dynamic profiling leverages the elasticity to move threads among local and cloud node making more efficient decisions at runtime. This technique is successful and worth paying if and only if execution on the cloud takes significant less time compared to execution on the mobile device. The limitation with this technique is that applications with native code have to carry overhead of saving all native context for transfer if migration is taking place at a point where a thread is executing the native code. So, Clone Cloud is not able to migratenative state and to export unique native resources remotely. Another problem with this technique is that it does not provide virtual access to native resources like GPS, Camera which are not virtualized already and not available on the clone. In [7] represents an approach that reduces power consumption through server offloading without partitioning as opposite to, MAUI, a partition based approach and also keep mobile applications resilient in case of network outages. Proposed technique uses the byte code enhancement instead of partitioning and uses checkpoints to synchronize the state between mobile device and the cloud. When the network goes off during offloading process, the remote execution is redirected back to the mobile device from latest checkpoint. Proposed method has a good EOI (Execution offloading index) improvement; a metric used for evaluation and also handles exceptions well. This approach is not applicable to every application due to design constraints. Also, It does not recognize the cost of offloading in terms of bandwidth/latency due to its underlying middleware and does not switch to local execution if required.

IV. CONCLUSION

Mobile cloud computing has become the need for today's smart phones and their complex applications. Remote execution on cloud brings challenges like network Failure, partitioning technique and scalability issues which need to be handled carefully. Every technique has few limitations which need to be taken in consideration by researchers.Mobile Cloud Computing is gaining its momentum and is encouraging the users to leverage the benefits that Cloud provides in order to ease the burden on resource constraint mobile devices. Offloading can become beneficial for computational intensive and mathematical applications, provided entities impacting the offloading are understood and analyzed thoroughly. Future research work is needed in developing efficient Offloading frameworks and optimal partitioning schemes which are portable across all the mobile execution platforms.

REFERENCES

[1]. DeeptiSahu, Shipra Sharma, VandanaDubey, AlpikaTripathi," Cloud Computing in Mobile Applications", International Journal of Scientific and Research Publications, Volume 2, Issue 8, August 2012

[2]. PragyaGuptSa, Sudha Gupta, "Mobile Cloud Computing: The Future of Cloud", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 1, Issue 3, September 2012

[3] Ahmed DheyaaBasha, IrfanNaufal Umar, and Merza Abbas," Mobile Applications as Cloud Computing: Implementation and Challenge", International Journal of Information and Electronics Engineering, Vol. 4, No. 1, January 2014

[4]. Swarnpreet Singh , RituBagga, Devinder Singh, TarunJangwal," Architecture Of Mobile Application, Security Issues And Services Involved In Mobile Cloud Computing Environment",International Journal of Computer and Electronics Research,Vol. 1, Issue 2, August 2012

[5]. Eduardo Cuervo, ArunaBalasubramanian, Dae-kiCho,Alec Wolman, Stefan Saroiu, Ranveer Chandra, ParamvirBahl," MAUI: Making Smartphones Last Longer with Code Offload", MobiSys'10, June 15–18, 2010, San Francisco, California, USA.

[6]. Byung-Gon Chun, SunghwanIhm, PetrosManiatis, MayurNaik, Ashwin Patti," CloneCloud: Elastic Execution between Mobile Device and Cloud", EuroSys'11, April 10–13, 2011, Salzburg, Austria.

[7]. Young-Woo Kwon , Eli Tilevich," Power-Efficient and Fault-Tolerant Distributed Mobile Execution", International conference on Distributed Computing Systems (ICDCS), 18 – 21 June, 2012.

[8]. SokolKosta, AndriusAucinas, Pan Hui, Richard Mortier, Xinwen Zhang," ThinkAir: Dynamic resource allocation and paralleexecution in cloud for mobile code offloading", in INFOCOM 2012, 25-30 March 2012.

[9]. Andreas Pamboris,PeterPietzuch," CRAM: Breaking Mobile Device Memory Barriers Using the Cloud", IEEE Transactions on Mobile Computing.