Mobile Cloud Application Architecture in Education Institutes

Paduri Veerabhadram *
*Department of Information and Communication
Technology, Vaal University of Technology,,
Private Bag X021, Andries Potgieter
Blvd, Vanderbijlpark 1900,
South Africa,

Abstract: **In this Paper we examine mobile cloud application architecture. The concept of storage, memory and managing data in a Centralized stored through mobile device using web service interface applying Java technology can be accessed from anywhere. Mobile Cloud Computing technology is a new paradigm for mobile application storage data. This proposed architecture implies taking into agreement these factors when implementing a web services interface for mobile devices.In this paper, we design proposed cloud application architecture used in higher education institutes and implementing mobile space management system application use for students and staff.**

Keywords : Java 2 Micro Edition, offloading, cloud web services , SOA, Mobile Computing, Mobile Devices

I. INTRODUCTION

With the development of wireless access technologies, cloud computing is expected to expand to mobile context, where mobile devices and sensors are used as the information collection nodes in the cloud. However, users' concerns about data security are the main obstacles that impede cloud computing from being widely adopted. These concerns originate from the fact that sensitive data resides in public clouds, which are operated by commercial service providers who are not always trusted by the data owner. Thus, new secure service architectures are necessary to address the security concerns of users for using cloud computing techniques. The purpose of mobile phones and into the cloud, bringing applications and mobile computing is not just for smartphone users but for a much broader range of mobile subscribers to use as a service rather than a product. Cloud is a dynamic platform for offloading due to elastic resource provisioning. Offloading refers to availability of files used in cloud systems which are accessed by mobile interface systems[1].Cloud computing is the new technology that has various advantages and it is an adoptable technology in this present scenario. As predicted by Gartner, mobile phones overtook PCs as the most common Web access devices worldwide by 2013 [2]. Thus, mobile devices have become more important and are involved in almost all aspects of our daily life.The main advantage of cloud computing is that it reduces the cost of Hardware, Software and Licensing for all. Now is the ultimate time for the analysis of cloud computing and its implementation across the globe. . The paper focuses on the impact of cloud computing and how the cloud computing influences technology and educates students across a wider spectrum. We believe cloud computing will surely improve the current system of education and improve quality at an affordable cost.

This concept over J2ME enabled mobile device is used as a scope of this work. Traditional architecture slightly changed because of less memory and battery of Java enabled mobile, thus requiring to change proxy architecture which is changed and used by the available web service. In this paper, we highlight the theoretical background mobile computing of the paper in section II, in III Related work we present a scenario for existing systems, in section IV Proposed Architecture System, in section V Methodology, in section VI Research limitations/implications**,** in section VII discussion and result, and in section VIII conclusion.

II. BACKGROUND &LITERATURE REVIEW

In this section a huge amount of work is available related to cloud computing, but not enough work available for mobile devices. If some literature is available for mobile devices , then these works, as for smart phones that are available with higher resources than normal J2ME mobile devices. Thus it is required to design applications for the system or for J2ME mobiles that work for low resources mobile instruments as well as improve the computational ability of mobile application because normal J2ME mobile are not able to store cloud services. There are limited resources for mobile computation thus the computational outsourcing and processing system is required. A generalized system required that not only works on high configuration mobiles, but also

works with simple web enabled mobiles. Saving the memory of the mobile because it works on simple mobile phones, saves energy because of simple mobile phones not having long battery back up[3], this identifies various computing paradigms promising to deliver the vision of computing utilities. Cloud computing provides the architecture for creating market-oriented Clouds by leveraging technologies such as Virtual Machine [4]. Mobile computing is at a fork in the road. After two decades of sustained effort by many researchers, techniques and mechanisms to provide a solid foundation for this still fast-growing area have been developed. Ubiquitous email and Web access are a reality that is experienced by millions of users worldwide through their Blackberries, iPhones, Windows Mobile, and other mobile devices. Continuing on this road, mobile Web based services and location-aware advertising opportunities have begun to appear.

Large investments are being made in anticipation of major profits towards technological growth. The mobile device typically functions as a thin client with respect to the service. A cloudlet is a trusted, resource-rich computer or cluster of computers that is well-connected to the Internet and is available for use by nearby mobile devices[5].Mobile cloud computing is an emerging cloud service model following the trend to extend the cloud to the edge of networks. It includes numerous mobile devices that are closely associated with their users.

They will be directly involved in many cloud activities that extend the cloud boundaries into the entire cyber physical system. Thus, mobile devices will become more important and will be involved in almost all aspects of our daily lives. In this article we describe what mobile cloud computing is including its scope, current developments, and research challenges. Our discussion is based on a mobile cloud computing platform that is currently being developed at Arizona State University [6].Applications rely on mobile cloud computing and finally, have good prospects [7].

Together with an explosive growth of the mobile applications and emergence of cloud computing, mobile cloud computing (MCC) has been introduced to be a potential technology for mobile services. MCC integrates the cloud computing into the mobile environment which overcomes obstacles related to the performance (e.g. battery life, storage, and bandwidth) and security (e.g. reliability and privacy) as discussed in mobile computing. This paper gives a survey of MCC, which helps in having an overview of the MCC including the definition, architecture and applications.

The issues, existing solutions, and approaches are presented [8].The capabilities of mobile devices have been improving very rapidly in terms of computing power, storage, feature support and developed applications.

However, these mobile applications are still intrinsically limited by a relative lack of bandwidth, computing power and energy compared to their tethered counterparts.

Cloud computing offers abundant computing power that can be tapped easily. Apple iCloud and Amazon Silk browser are two recent mobile applications that leverage the cloud example. In this paper, we systematically explore the fundamental issues when combining mobile and cloud computing.

III. Related Work

According to [9],mobile cloud computing aims at improving the performance of mobile applications and at enhancing the resource utilization of service providers. In this paper, we have shown previous work from figures 1&2.There are three components at the cloud end: **the proxy**, **code repository** and **server**. The proxy provides a gateway between the mobile device and the cloud backend. In some cases, the proxy could be replicated in the cloud for scalability, and in others, the proxy could be local to the device and outside the cloud.

The proxies are configured to have access to a code repository which contains popular code components that may be launched on a cloud server. Each mobile server is used to hold services for some mobile devices. The mobile proxy can start the mobile server dynamically when new requests are received.

The mobile proxy has the information of mobile servers that it manages. It can make a decision on where to start the server, to start a new server or deploy the service on a running server. Since the mobile devices and the mobile server may run different versions of code, it is necessary to have the code repository to store the source code of popular service components for the mobile server. The code repository can be located either in or out of the cloud. For optimization purposes, it can be set within the cloud close to the mobile servers to decrease the access time of the source code.

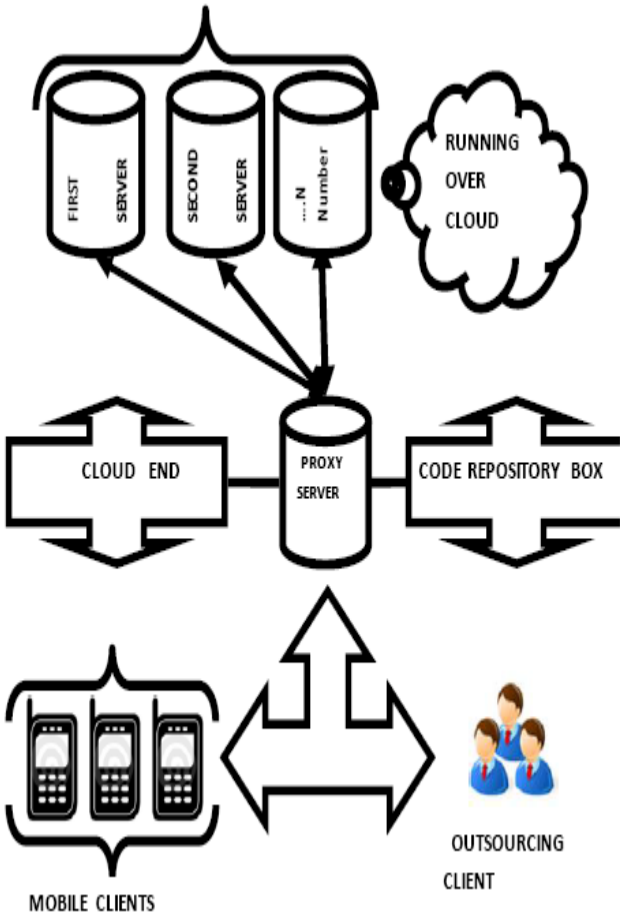

Figure 1. Existing present architecture[10]

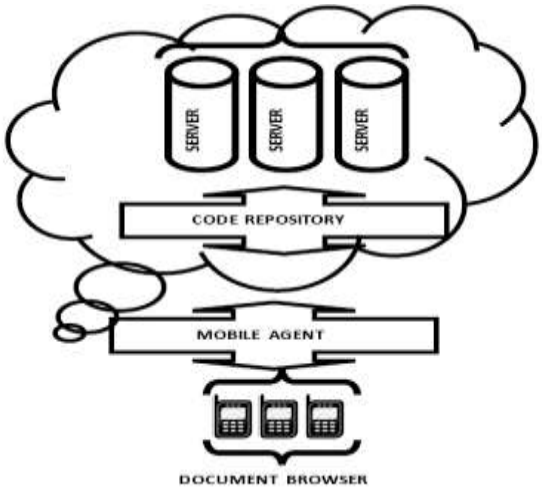

Figure 2. Current Existing architecture[10]

IV. PROPOSED ARCHITECTURE SYSTEM

A. *Mobile Web Services Architecture and Implementation:*

Mobile Web services offer new possibilities and extraordinary rewards for the mobile telecommunications market. Service-oriented architectures (SOAs) implemented with Web services are fundamentally changing business processes supported by distributed computing. These technologies bring forward the promise of services available at any time, in any place, and on any platform. Through mobile Web services, operators can offer new value-added services for their users, explore new business opportunities and increase revenue and customer retention. *Mobile Web Services* is a comprehensive, up-to-date and practical guide to adapting mobile Web services-based applications. The expert author team from Nokia explain in depth the software architecture and application development interfaces needed to develop solutions for these technologies.

According to [11] Mobile Cloud Application Design Process Model for Education believe cloud computing will surely improve the current system of education and improve quality at an affordable cost.Mobile cloud computing application helps to increase the storage space in the cloud service. There are more applications for teaching and learning as opposed to a single platform, independent tools and scalable data storage:

- Provides a complete and authoritative text on implementing mobile Web services.
- Describes the mobile Service-Oriented Architecture (SOA) concept.
- Covers the discovery, description and security of Web services.
- Explains how to use Simple Object Access Protocol (SOAP) in Web service messaging.
- Discusses the challenges and possibilities of mobile Web services, and gives case studies to illustrate the application of the technology.
- Presents the Nokia Mobile Web Services platform.
- Offers material on developing mobile Web service clients using C++ and Java.

This text is essential reading for wireless Web architects, mobile application developers and programmers, software developers, technical officers and consultants, as well as advanced students in Computer Science and Electrical

Engineering

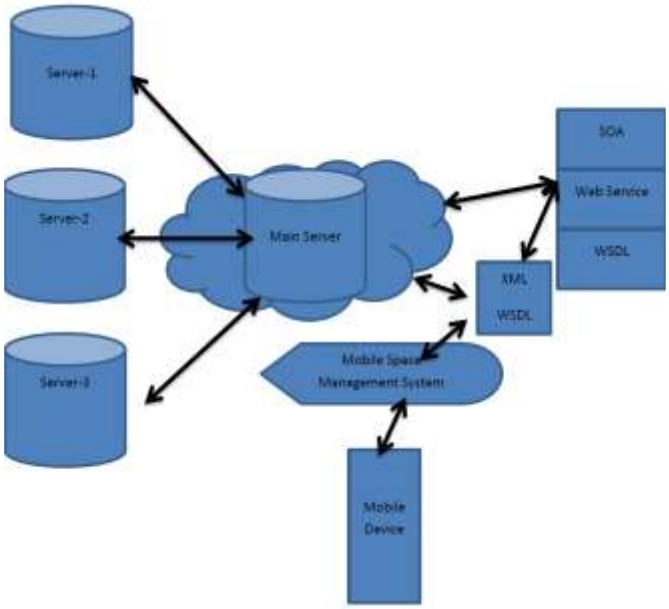

Figure 3. Mobile Space Management System

B. Problem Domain

The main problem is that there are limited resources of mobile devices, such as memory for execution a long application and the battery of the mobile phones. If memory is increased like the traditional system and battery backup, then the mobility of the system is affected. Thus it requires a new system by which the constraints related to memory and battery are solved.

C. Solution Domain

To overcome these limitations, we propose the use of a cloud as a backend to outsource mobile computations. A public cloud, such as GOOGLE DOCs can provide elastic and "unlimited" computation. Thus, it can adjust the amount of resources according to the service requests and provide large-scale deployment easily. It can also enable easy data and compute sharing among multiple devices interacting with each other or through the same application. However, a cloud may be limited by its connectivity to the mobile devices and its benefit is likely to be highly dependent on the computation-communication trade-off in an application.

D. Google Drive

Formerly called Google Docs, Google Drive is cloud-based file storage and syncing solution that also includes content creation and collaboration features. Google Drive on the iPad certainly has some limitations compared to the full desktop version, but it is an excellent tool for creating and sharing simple docs and spreadsheets and accessing files of all types. Every FUSD staff member and student has a Google Drive (a.k.a. Google Apps a.k.a. Google Docs) account available to him or her, with usernames and passwords to match the Active Directory (computer) logins. http://drive.google.com. Designed according to the architecture, we simply make the request for the processing of our document. Service gets the required parameters to execute the request. After the request has been executed it will return a web document that will be viewed on the local web browser on the mobile. Hence the design of the two modules.

E. Client Side Mobile Application:

This application helps the user by providing an interface that will be used to select a document to view and to connect to the cloud service..

F. Server Side Document Execution:

This application accepts the user request and processes the request for mobile clients.

V. METHODOLOGY

This is an explanatory conceptual paper, based on literature review, related existing work and exploring potential user cases, focused on the use of mobile cloud for service, application, design platform or infrastructure access. The author includes the future discussion of the traditional cloud concept in back office processes of telecom operators, educational institutes and service providers.

VI. RESEARCH LIMITATIONS/IMPLICATIONS

The value of Mobile Cloud Application Architecture through a J2ME application using Web services., application solutions is not yet explicit, but needs further attention. Research should focus on the relation between mobile cloud computing, platforms and web services. From a user perspective the willingness to share pooled resources needs further attention

A quantitative research approach is usually used in studies intended to measure lecturer and student attitude towards mobile learning, specifically based on the Architecture through a J2ME application using Web services. Additionally, if the research problem is identifying factors that influence an outcome, the impact of an intervention, or to understanding the best predictors of outcomes, a quantitative approach is preferable. This study examines the factors that influence the adoption of mobile technology for educational purposes among the students of the Vaal University of Technology.

A survey instrument was developed with five questions that addressed various aspects of Mobil Cloud Application Architecture through a J2ME application using Web services in the educational sector (see Table 1).

P=Mobile Cloud Computing Design application: is it useful for education.
Q=Mobile cloud application platform: is it significant enhancing learning tool for education.
R= is any effective revolution mobile cloud computing in higher education.
S=Mobile cloud Application tool platform: is it effective academically with Social networking.
T=Do you believe in the Mobile Cloud application platform in Future trends.
U=Do you believe Mobile cloud technology can change into Higher Education Landscape.

(Main questions in survey instrument)

N=24

S.No	Question	Agree	Disagree	Strongly Agree	Strongly Disagree
1	P	12	0	11	0
2	Q	9	1	13	2
3	R	5	0	17	0
4	S	5	0	2	2
5	T	6	1	15	2
6	U	11	0	11	3
		48±3.09	2±0.51	69±5.20	9±1.22

Table 1.: Mobile Cloud Application Architecture in Educational Institutes.

The questions were designed to collect the students' impressions of the ease of use of the BlackBerry, comfort with the device and its usefulness to them. A six-point Likert Scale (i.e. "strongly agree" to "strongly disagree") was used. A pilot study was conducted to ensure the survey questions were easily and correctly understood. The sampling frame was all students in Diploma/BTech IT/MTech who own a mobile phone (we have done experiments with five mobile devices). All participants were asked to complete a questionnaire which measured students' attitudes towards the topic, the perceived usefulness as a learning tool , subjective norm, perceived ease, perceived financial impact and prior use of technology for educational purposes.

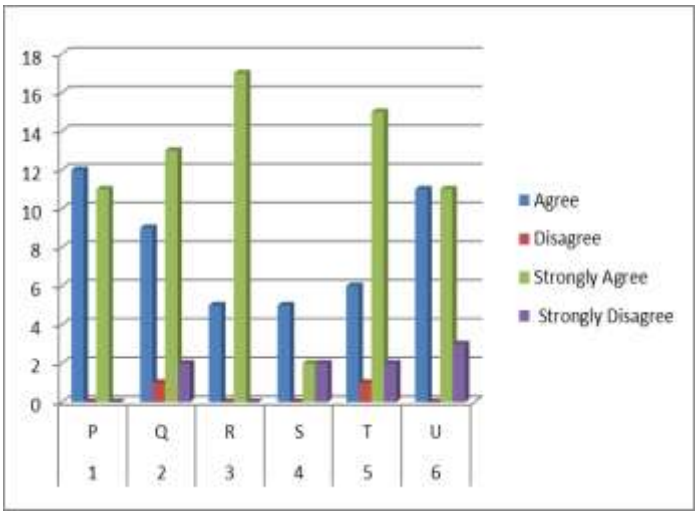

Figure 5: Mobile Cloud Application Architecture in Educational Institutes

VII. Result and Discussion

The purpose of this study was to determine the key factors influencing the behavioral intention for adoption of BlackBerry Technology among Vaal University of Technology students' learning. Mobile Web Services is a comprehensive, up-to-date and practical guide to adapting mobile Web services-based applications. The expert author team from Nokia explain in depth the software architecture and application development interfaces needed to develop solutions for these technologies.The data (Fig. 3), showed that most students consider mobile learning as beneficial to their studies. Uploading of video lessons is considered most beneficial. Also noteworthy is the use of mobile devices to prepare, which had unexpected results. Since this study is still continuing, more relevant and practical, applicable results are expected. This study examines the factors that influence the adoption of Mobile Cloud Application Architecture in educational institutes' application using Web services., and application technology for educational purposes among the students of the Vaal University of Technology. A survey instrument was developed with six questions that addressed various aspects of Mobile Cloud Application Architecture used in educational institutes.Web services and architecture proposed Mobile Cloud application design models with Software Tool application used for Universities in Class rooms(see Figure 2).

Mobile Cloud design-based education can facilitate the learners, teachers, staff, trainers, establishments and conjointly the scholars to a really high extent and primarily students from rural components of the globe can get a chance to urge the data shared by the Lecturer on others.. Even universities and governments will take initiatives to implement. The planned framework fills in an exceedingly massive gap in

mobile cloud computing analysis caused by the dearth of getting a comprehensive and easy-to-use framework, additionally to the restricted handiness and also the high prices of conducting experiments in real cloud computing environments..An experimental situation is additionally introduced during this article to demonstrate the capabilities of the planned Mobile Cloud design framework.This system can be implemented in faculties and universities in future and we believe that this may happen presently

VIII. CONCLUSION

Using existing definitions of cloud computing, mobile cloud computing was defined as a way to obtain cloud computing resource, i.e. storage, processing power, development and software for mobile value services accessible via a combination of mobile and/or wireless networks, using resources available in the platform within the networks and/or combined with a shared pool of computing resources available on mobile devices.This model can be incorporated with the existing scenario of cloud based mobile environment although light weight mobile applications can be easily accessible via mobile agents. The Mobile agent can be used as a middleway to code repository & mobile browser. Files which are not supported in J2ME application can easily be viewed using this application. Power and Memory resource consumption is reduced. Response time is increasing as the size of the file is increased. Memory uses on server and client side increase according to the file size. Cloud can be used as library services and other architecture for processing large data in cloud for data mining, web mining and other applications. The above suitable application future work have wide prospects, however our work is concerned with smart devices which are favourable as hand held devices, such as iPads, tablets, etc.

ACKNOWLEDGMENT

The author wishes to thank Christa van Wyk, Mr. Itumeleng Matshego, Ms. Edith Terblanche, Mr. Roger Baxter and Mrs. Antoinette Lombard (HoD). This work was supported in part by a grant from ICT Department.

REFERENCES

[1] N.Mallikharjuna Rao, C.Sasidhar, V. Satyendra Kumar," Cloud Computing Through Mobile-Learning, Cloud Computing Through Mobile-Learning", (IJACSA) International Journal of Advanced Computer Science and Applications, ISSN: 2158-107X,Vol. 1, No. 6, December 2010.

[2] Mark Walsh. Gartner: Mobile To Outpace Desktop Web By 2013. Online Media Daily, January 13, 2010.

[3] R Buyya, CS Yeo, S Venugopal, "Market-Oriented Cloud Computing: Vision, Hype, and Reality for Delivering IT Services as Computing Utilities", Proceedings of the 10th IEEE International Conference on High Performance Computing and Communications. 978-0-7695-3352-0, Vol.00, pp, 5-13, 2008.

[4] Mahadev Satyanarayanan, Paramvir Bahl, Ramon Caceres, Nigel Davies," The Case for VM-based Cloudlets in Mobile Computing", Pervasive Computing, IEEE, ISSN:1536-1268, Volume 8 Issue 4, Pages 14-23, October 2009.

[5] Dijiang Huang," Mobile Cloud Computing," IEEE COMSOC MMTC E-Letter, Arizona State University, Arizona, USA,Release 4,version 4.3 April,2011.

[6] Zehua Zhang and Xuejie Zhang," Realization of Open Cloud Computing Federation Based on Mobile Agent", IEEE, 978-1-4244-4738-1/09 ©2009.

[7] Hoang T. Dinh, Chonho Lee, Dusit Niyato, and Ping Wang," A survey of mobile cloud computing: architecture, applications, and approaches", Published online in Wiley Online Library (wileyonlinelibrary.com), Online ISSN: 1530-8677, DOI: 10.1002/wcm.1203, 11 OCT 2011.

[8] Paramvir Bahl‡ Richard Y. Han† Li Erran Li? Mahadev Satyanarayanan," Advancing the State of Mobile Cloud Computing", MCS'12, Low Wood Bay, Lake District, UK, Copyright 2012 ACM 978-1-4503-1319-3/12/06, June 25, 2012.

[9] Dusit Niyato, Ping Wang, Ekram Hossain, Walid Saad, and Zhu Han," Game Theoretic Modeling of Cooperation among Service Providers in Mobile Cloud Computing Environments",2012 IEEE Wireless Commonications and Networking Conference: Services, Application and Business, 978-1-4673-5/12,2012.

[10] Bharat Prajapat and Dr.Manish Shrivastava "Mobile Cloud Computing through J2ME application Cloud Enabled Web Services"International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970) Volume-2 Number-4 Issue-6 December-2012.

[11] Paduri Veerabhadram, P Conradie. (2013). "Mobile Cloud Application Design Process Model for Education" from Acta Engineering &Aufau Periodicals, India, Acta En 2013, 1 (1), 7-17, Article AE13204303. http://chesci.com/downloads/acta-engg- downloads/AE13204303.pdf. Pp 7-17