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A Survey On E-Learning Based Mobile Cloud Computing.

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ABSTRACT

Recently, Mobile Cloud Computing (MCC) is emerging as an advanced technology among all the mobile services available and hence the research in MCC is becoming an urgent necessity. This is a simple logic of integration of mobile environment with cloud and so there is a need to overcome the mobile constraints such as power back up, storage unit, heterogeneity, availability as well as bandwidth. In order to match up with these applications, various architectures and frameworks are developed with the view of utilizing cloud on resource constrained devices like mobile. In this paper, a survey is done on application of E-learning under mobile cloud computing environment.

Keywords: survey, E-learning, mobile cloud computing.

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INTRODUCTION

Cloud computing have been endorsed as the computing framework for upcoming generation. It provides its users to use any kind of infrastructure (servers and networks), platform (any operating system) and software (application programs) as per demand. This kind of services is being offered by Google, Amazon, Microsoft, Salesforce at a very cheap cost. This gives flexibility to the customer to use any devices and obtain the maximum utilization via cloud.

Further, applications of mobile can be categorized into two ways. One of them is web-based application andthe other one is native application. The advancement of these applicationsdeveloped into traditional PC application forms as shown in Figure 1. [12]

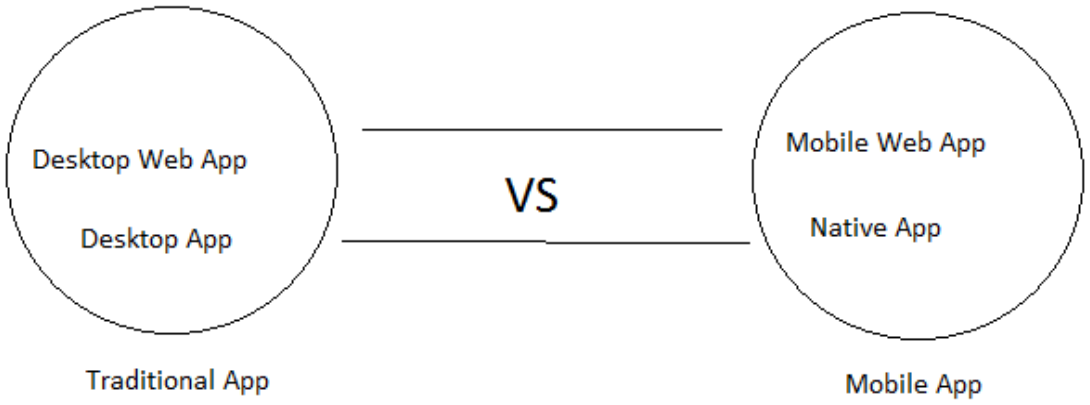

Figure 1: Advancement of PC App to Mobile App

MCC is a combination of cloud computing into the mobile application background. MCC provide proper equipment of integrating new services and to take all benefits of Cloud Computing. This provide simplest infrastructure for both storage of data as well as for computation done in remote servers. Thus the applications of MCC are Mobile healthcare, Mobile gamming, Mobile commerce, Mobile learning etc. In this paper, Mobile learning services in cloud computing is going to be broadly discussed.

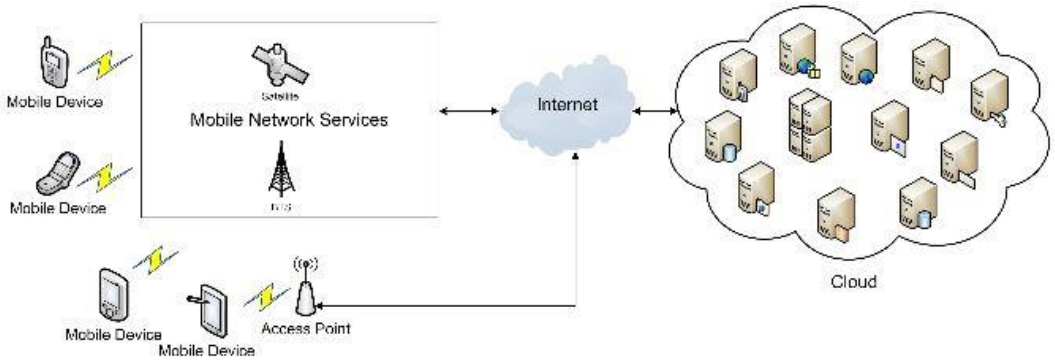

Figure 2: Framework of mobile cloud computing [11]

As in figure 2, in MCC, the user sends request to the cloud via web browsers and as per demand the server allocate the resource for limited time period. As the session begins the monitoring and computational functions is also implemented in order to assure the Quality of Services (QoS) as long as the connection is maintained. This includes various tasks like sending response rapidly, synchronizing and load balancing to ensure that the resources are allocated to the appropriate clients. The architecture of MCC can be further divided into following two manners i.e. via mobile network (also known as telecom network) and via access points, as represented in the Figure 2.

Related work:

Authors Hong-qing and Yan-jie Zhai[3]proposed the hadoop concept and its functional modules for Mobile learning .They are also analysed each and every functional modules of the concept. Also MapReduce API of Hadoop framework is used to process the mobile learning. Authors conclude that mobile and cloud is more beneficial for the learners.

Luo,Zhong [4]discussed the salient features and key procedures of 3G mobile learning based on services of cloud. They proposed to engage cloud computing into mobile learning and build primary framework and imitation application for 3G mobile learning based on services of cloud. And also they used open source to establish services in cloud environment for mobility purpose through web browser. This follows the discussion about the Information resources Integration method and personalized learning model which is the key feature of realization and personalization of E-learning.

Another research done by S.Mohana Saranya and Dr.M.Vijayalakshmidiscuss about the Mobile Live Vidoe Learning System in cloud based interface. They developed an experimental and cost-efficient solution of their methodology .In future they have a plan to promote the evolution of mobile learning via cloud services.[5]

Vincent Tamproposed a framework of cloud-based online learning games that can be accessed via 3G cell phones.In this paper author explain only the designing of the system but not implemented practically though in future they planned to implement it further.[6]

Jae Dong Lee and Jong-Hyuk Parkdiscussed about model for mobile cloud learning system and its applications. In this system, it has three layers namely system layer, application layer and user layer. The functionality ofeach and every layer of system is broadly discussed in their paper.[7]

Another researcher proposed Teamwork as a Service (TaaS), that is a service-oriented and a modern collaborative learning context based on cloud learning management systems (LMSs). Later, they concluded that with the use of mobile devices and learners may able to sharpen their interpreting of purpose of learning with a team, and hence they participate as team player in competition and can also supervise other teams in order to avoid delays and guarantee efficiency.[8]

Researcher Jian LI briefly discussed about the features and framework of traditional mobile learning and points out the superiority of developing mobile learning model in the cloud environment. And concluded it as a combination of cloud computing and mobile learning has speed up the learning process with effective cost of mobile communication, and also resources of mobile learning still improving in communication technology.[9]

Researcher Wang examines mobile cloud-education and deduced it as an area of perceptive learning, based on the designing, development and testing of cloud e-learning system. This system can provide smart learning anytime of day and from any part of world that is customised for everyindividual, and also delivered to personal portables devices.[10]

E- Learning under mobile cloud computing

Cloud Computing is the most promisingmethod for providing tremendous opportunity to mobile learning system as it not only have the delivery computation but also have the storage resources. Cloud server provide a secure as well as data warehouse to the great range of educational resources, hence cloud cover up the drawbacks of mobile devices (i.e. low storage capacity and less computation powers). CC also focuses on infrastructure and multiple platforms with unlimited power of computation toits users, hence under cloud mode mobile devices only need the browser. Thus, a regular mobile is enough to meet this requirement of browser and so users do not need to install any other software applications. Just a strong internet connection and a browser is enough to learn anything. This process of e-learning can be further categorized into two methods:

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(i) Acceptance based mobile learning method
(ii) Autonomous based mobile learning method

Acceptance-based learning:

Acceptance-based mobile learning model is basically are of one process interaction for the learners where teachers gather their knowledge in the cloud. Here, various learning resources are assembled at the cloud centre which makes learning more flexible with added advantages of mobile.

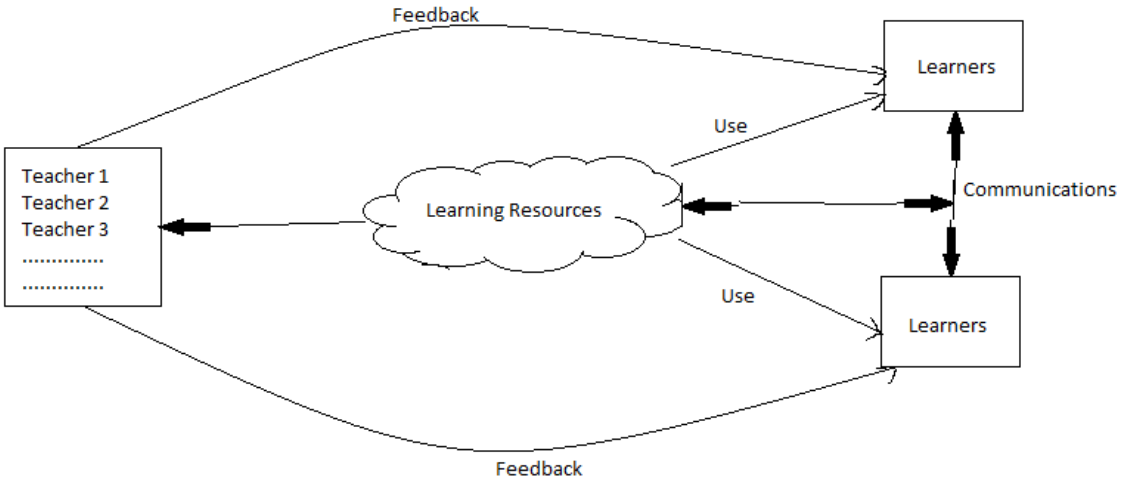

Figure 3: Framework of Acceptance-based learning

From figure 3, it is evident that cloud is an important participant for wide spreading information among learners with the help of the teachers. An extent of teachers are being a part of e learning and are responsible for supplying learning materials, continuous monitoring, solving student's problems and generating reports of learner's activities. And the students are timely notified with course and knowledge oriented information. The feedback is another major part of this mobile learning which helps to evaluate this learning system via cloud and also helps the developer to improve the learning process.[1]

This acceptance based learning mode can be further classified into synchronous mode and asynchronous mode. In Synchronous mode learning, the method of communication between teaching and learning is done simultaneously. Here, students simply listen to the teachers whereas the teachers can only interact with the student. Example of such learning can be done via video broadcast in mobile environment where students came to know whatever happens in the classroom. But, the real form of acceptance learning is Asynchronous based learning. Here, teaching and learning both are asynchronous. Simulation experiment and research based learning and even group discussion based learning is possible with cloud computing platform in a general phone with browser. Here, learners can do their assignments together and can solve more problems. Teachers just post the notice and learning materials and students discuss any encountered problem, not only with the teachers but also the fellow learners. Hence, this feature makes the learning system more interactive. With cloud based services and abundant storage capacity, CC offers enough software and hardware security for asynchronous learning mode. The major advantage of this mode is effective communication system between learner and preachers in a high speed network transmission medium.[1]

Autonomous based mobile learning mode:

Autonomous based mobile learning mode refers when the learners collects variety of e-learning materials and put self effort to complete certain learning task. In this scenario, learner himself/herself plans about the direction of learning. The ability of having self evaluation and self discipline of learner is very important for autonomous learning. The learner himself or herself have to select a suitable environment to

achieve the best from his/her continuous effort .This mode of learning is also known as humanistic learning theory.

As this mode is more focus on self learning, the learning is the main body of learning. In this mode, the learner can set self goals of learning and also communicate with other learners and also with the teachers. Thus, here also the source of storage of learning resources and communication network among the learners and the teachers is the cloud. Here, the responsibility of the teachers is to help the learners, to provide information base for the students, to manage software resources. Though this provide the learners with self space study but the learner should have independent learning ability and so effective interaction become more important in this mode of learning[2]

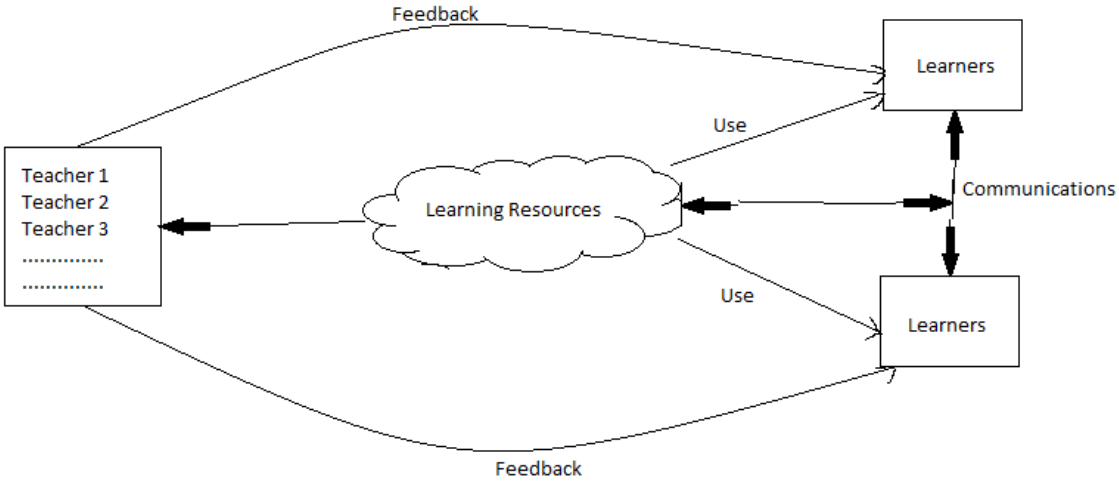

Figure 4: Framework of Autonomous mobile learning mode

Design Mobile Learning System:

System Architecture Design of e-learning:

Cloud-based e- learning architecture design composed of 4 levels: cloud computing platform layer,cloud computing infrastructure layer,service access layer service access layer andservice access layer.[2]

Layer	Content		
Service access layer	User Interface, API, User Interaction Service		
	Service by Cloud Computing:Iaas,Paas,SaaS		
Business application layer	Learning	System administration	Academic management
	Communication	Evaluation	Etc
Cloud computing platform layer	Application Service	Database Service	Development Service
	System monitor service	Data storage and recovery service	Etc
Cloud computing Infrastructure layer	Infrastructure Virtualization: Computing capacity, Data storage Capacity, Network communication capacity		

Figure 5: Layers for Framework of E-Learning System

Cloud computing Infrastructure layer:

Integration of storage devices, network cables, distributed servers and other hardware devices into virtual technology is done in this layer. This layer of CC also provides challengingand progressive services such as resource management, load balancing and security management etc.

Cloud computing platform layer

Messaging services, access control, authentications are all the examples of platform layer services. It also provide data exchanging and also software development kit (SDK) with application programming interface (API) in order to build an environment for developing and platform for application deployment respectively.

Business application layer

This layer provides a combination of application software for different users, including for studying, instructing, conveyance, assessment, academic management and also for administration purpose of applications.

i. Learning module: This is a significant module for mobile learning system. It maintains a self-learning service for managing the system. Even, this module allows teachers to record student's progress reports.
ii. Teaching module: This module is for the instructors; they can initiate new courses or publish new study materials and can also report student's behaviours.
iii. System administration module: This module provision configuration services, for exampleuser's management, access control, etc.
iv. Communication module: This module provides useful conveyance websites for teachers and students, like blog, forum, etc.

Service access layer

This layer isa user friendly application layer for instructors and learners; the 3G mobile device provide opportunity to access cloud fromany part of world at any instance of time. The new business model of cloud computing is combination Infrastructure as a Service, Platformas aService, Storageas aService, which can be implemented at any levels to meet the teaching mode, learning environment and managerial requirements. [2]

Security Approaches of Mobile Cloud Computing

The steps to be followed to secure mobile cloud computing for applications from cloud to mobile are as follows:

1. Authentication: Smart devices like mobiles, notebooks etc are required to be authenticated before establishing connection with any other platforms of cloud. For the devices having limited resources, this authorization can be implemented as a protocol with superficial cryptographic algorithm.
2. Encryption: Even while using secure channel for transmission, data must be encrypted.
3. Privacy: Protecting the privacy of users is the primary factor in Cloud computing. Thus, privacy management with IoT, mobile devices and Cloud computing is considered to be a serious issue for convergence.

Various protocols can be taken into consideration to follow the above specification for securing mobile cloud computing.

CONCLUSION

With a specific end goal to consolidate the upsides of modern technology as well as advanced E-learning education concept, this paper represents the outline of functional design and system architecture framework of the e-learning system depending on cloud computing. This concept facilitates learning or revision in anytime and anywhere and also stores huge amount of data. In future, the security issue of the e-learning mobile computing based on cloud computing can be more broadly clarified with wide range of protocols.

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