

# MOBILE CLOUD BASED LEARNING MATERIAL REPOSITORY USING ANDROID AND GOOGLE DRIVE APPLICATION

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## ABSTRACT

With the increase of people mobility in the globalization era, learning activity is tending to be more ubiquitous. To expand the communication between the teachers and the learners further than in class activity, mobile learning has been implemented in many learning system in the world in the recent days. Nevertheless, m-learning applications have some drawbacks, mainly in term of limited storage that driven limited resources to provide in education processes. To solve the problem, cloud enabled m-learning applications are proposed.

This paper presents the existing applications of cloud based mobile learning applications, explores the advantages of using cloud enabled m-learning and design a low cost and low complexity cloud based m-learning application architecture. We deploy Google Drive API in android application that allows users to access teaching learning materials in the cloud.

## KEYWORDS

Cloud based mobile learning, android, Google drive, cloud storage

## 1 INTRODUCTION

During this booming information and communication technology era, learning activities is taking place not only in classical approach, otherwise, they tends to be more ubiquitous. The progressive development of broadband communication technology and mobile devices drive the implementation of mobile technology in educational activity. Mobile learning system have some advantages that allow students to learn everywhere instead of in the specific place, such as classroom or library. Nevertheless, this system retains some

essential drawbacks, such as, storage and power limitation issue. This weak points lead to the limited educational material that can be accessed by the scholars using the mobile devices.

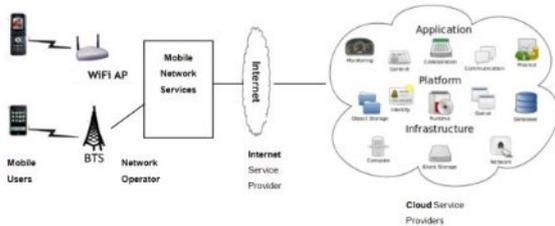
The lack of storage in mobile computing application can be solved by store the data used in it to the *cloud*. This style of computing is extremely scalable and some IT-enabled resources are provided as a service to external users via internet technologies. This is imply that user hardware, application and/or data are stored in a central location on internet and accessed using an internet browser [1]. Cloud computing implementation also allows users to utilize resources flexibly according to their demand . Therefore, mobile application can be integrated with cloud computing for various types of services and facilities to obtain full benefits of cloud computing. This condition introduces Mobile Cloud Computing to support learning activity and provides larger storage capacity, powerful processing ability, richer services in term of data size, faster processing speed and longer battery life [2].

Cloud based Mobile learning has implemented and studied over the last few year . Some of the works is described in this section. Zhao,et.al [3] presented education platform based on mobile communication and cloud computing technology with smartphone software based on open source JavaME UI framework an open source instant message protocol as a client. Rao, et.al, discuss the influence of cloud computing through mobile learning [4].

## 2 ARCHITECTURE OF CLOUD BASED MOBILE LEARNING

A cloud computing providers usually let customers to lease storage and computation such that they can store and run instances of their cloud applications as virtual machine at

the provider's cloud of servers [2]. The common architecture of mobile cloud computing describe in figure 1.



**Figure 1.** The Common Architecture of Mobile Computing

The cloud based mobile learning proposed in this paper provides educational contents cloud based storage that can be accessed via mobile application. The main components of this system is described in figure 2

The system has three major components that are designed to achieve the advantages of cloud based m learning. The first one is a web based learning information sharing system that is built by a department blog integrated with campus domain email account. The second is android native mobile application that can run a drive application that can store and accesses educational documents, image and videos in the cloud. The third is a cloud storage provider utilized by Google Drive cloud service. The Google Drive cloud service is one of the low cost cloud service provider since the services is free.

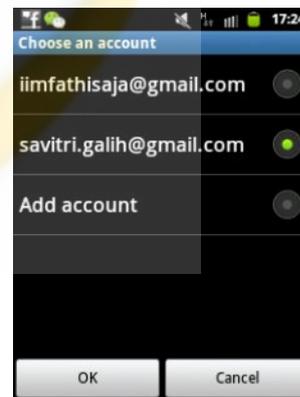


**Figure 2.** The Main Components of Cloud Based Mobile Repository for Learning

### 3 IMPLEMENTATION OF M-LEARNING DRIVE APPLICATION FOR ANDROID

Using Drive API and Android Development Kit, we can integrate an Android mobile app with Google Drive on the cloud. By incorporating with the Android Drive App, lecturers and students can count on the recommended per-file Drive scope for access to educational contents files. This is the safest and the most efficient way to allow a mobile application to list or access the files in a users' Drive [5].

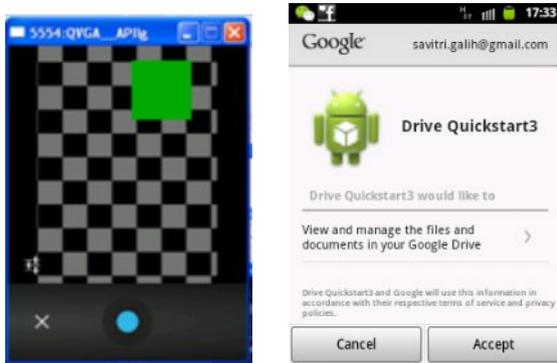
In the proposed system, Google Drive for Android and Android devices (cell phone or tablet) are deployed as a platform for student (learner) achieves the more accessible and available learning objectives. We choose to use Google Drive for cloud based storage due to some considerations. First reason, it is free Cloud Service Provider. Google Drive has been used widely and more suitable with educational contents in compare with other free cloud service such as DropBox [6]. They can directly access lecture materials from their android gadgets. Figure 3 shows the android screen for choose an account. In this screen we can add account for using the application.



**Figure 3.** Android Emulator for Choose an Account and Add Account

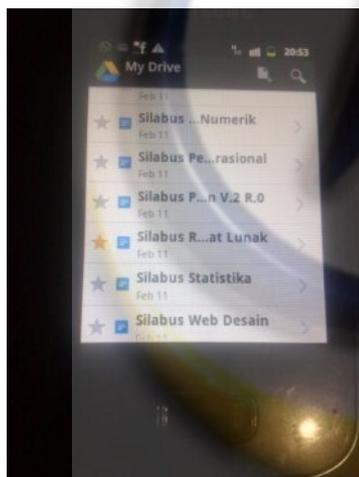
The application can take picture and directly save it to the Google drive. This feature can help learner to instantly 'take a note' from lecture's note at white board and save it to cloud, instead of writing it in their books. Figure 4 shows the emulator screen during camera capture process. As soon as the check mark is clicked after pushing camera button,

the image will be directly stored at Google drive.



**Figure 4.** Camera Capture Android Emulation Screen

Figure 5 show the lecture materials stored at Google drive that can be accessed by the application.



**Figure 5.** Lecture Materials at GoogleDrive

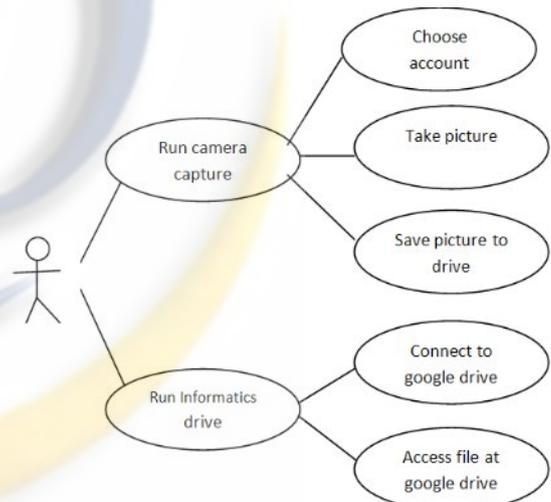
#### 4 PERFORMANCE EVALUATION

Performance is crucial for the accomplishment of a software application and system. In this work, we software performance

engineering approach [8] to model the performance of the proposed architecture and high-level design. Responsiveness one of the key dimensions to software performance. Responsiveness is the capability of a system to meet its goals for response time or throughput. In other words, responsiveness measure how fast the system responds to an event or the number of events that can be computed in a given time.

SPE is a model-based method that exploit software processing models to discover problems with the system architecture, design , or implementation and provide feedback on whether the software application meet performance objectives.

To build the performance models, we have to understand the details of the process performed during the execution of scenario based modelling. Figure 6 below shows use case diagram of the proposed application



**Figure 6.** Use Case Diagram for Proposed Application

From the scenario based modelling , we actually have two performance scenario : integrate camera with Google drive and integrate android app with Google drive app. For profiling the android application performance we use measure response time of the scenario in the execution graph. Below is the overall response timing

Scenario	Response Time (sec)	Remarks
Choose Account	4.928	
Take Picture	2.513	
Save and upload to Google Drive	22.033	For image 84.5 kB
Connect to Google Drive	1.105	
Access and open file at Google Drive	17.526	For image 84.5 kB

**Table 1.** Scenario Based Response Time of proposed application

The performance table shows that the critical response time is experienced by Save and upload image to Google drive (22.033 s) and access/open file at Google drive . The response time is affected by the communication channel bandwidth and the file size, consequently, they can not used as a performance measurement for mobile application. For years, the most commonly quoted standard was the so-called "8-second rule." This was based on some research Nielsen Media conducted in the late 1990s, which concluded that most Internet users wouldn't give up on the task they were trying to accomplish as long as the Web site responded in 8 seconds or fewer [9]. Hence, the proposed application performance clearly meet the 8 second criteria.

## 5 CONCLUSION AND FUTURE WORKS

In this paper we proposed an application for supporting cloud based mobile learning system. The application provide cloud storage for teaching/learning materials that can be accessed using android device anytime and anywhere. This scheme will drive a wider education distributions across the learning institution building. There are some consideration for finding the best cloud computing provider, depends on the requirements,i.e. for education purpose. An assessment need to be conducted to measure the effectivity of cloud based mobile computing application.

For the future works, the system can be improved with interactive tool for exam,

exercise, assignment and hardware virtualization.

## 6 REFERENCES

1. Blain, J : Learning and Development in The Cloud-Opportunities and Watch Outs,www.cegos.com, 2012.
2. Dinh, H.T., Lee, C., Niyato, D., Wang, P : A Survey of Mobile Computing : Architecture, Applications, and Approaches, Wireless Communications and Mobile Computing (WCMC), 2011.
3. Zhao, W : Improving Computer Basic Teaching through Mobile Communication and Cloud Computing Technology, International Conference on Advanced Computer Theory and Engineering (ICACTE), 2010
4. Rao, N.M., Sasidhar, C., Kumar, V.S : Cloud Computing Through Mobile Learning, International Journal of Advanced Computer Science and Applications, Vol.1, No. 6,pp 42-46, December 2010.
5. <https://developers.google.com/drive/integrate-android-ui>
6. <http://webtrends.about.com/od/office20/tp/Free-Cloud-Storage-Providers-Services.htm>
7. <https://developers.google.com/drive/quickstart-android>
8. Smith ,C.U : Performance and Scalability of Distributed Software Architectures : An SPE Approach, Journal Parallel and Distributed Computing Practices, 2002.
9. <http://searchsoftwarequality.techtarget.com/tip/Acceptable-application-response-times-vs-industry-standard>