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About a Platform Independent Client for Mobile Quizzes in Moodle

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Abstract: This paper describes a system which allows platform independent access to quizzes of the popular learning platform Moodle. The main focus is on the software architecture which is implemented on the base of platform independent technology like Web Services, HTML5 and JavaScript. Another aspect is the user interface which was developed with the goal to run on a broad range of mobile devices from small mobile phones up to large tablets.

Keywords: Mobile learning, Moodle, Web Services, JavaScript, user interface, HTML5

Introduction

The number of students with smart phones and tablets is steadily increasing, as described in [1]. Bringing content from eLearning platforms to these devices allows integrating interactive material into the classes and allows for learning in informal settings [2]. Since there is not yet a single operating system that dominates the market of mobile devices [3] a platform independent approach for the development of mobile learning applications seems to be necessary in order to avoid the reimplementation of the same application for several mobile operating systems. Therefore, we propose the combination of HTML5 and JavaScript to provide a way of platform independent software development for mobile devices. The system presented in this paper makes use of these platform independent technologies and together with Web Services this allows for an easy adoption of a wide range of mobile devices. Besides the technical compatibility the user interface needs to be defined in a way that it works on a wide range of display sizes and resolutions.

1. Scenario

Within the standard implementation the web based Moodle eLearning platform offers quizzes to reinforce the topics of a lesson. Therefore, the mobile devices of the students would be a convenient platform in order to increase interactivity. The access to the questions should be fast and the system easy to use. The teacher directly receives the results from a PC at the lectern and give additional explanations or exercises where required.
Beside this classroom based scenario, the developed application can be used in location independent mobile scenarios, e.g. a learner sitting in a bus on his/her way to school or university. Furthermore, contextualized quizzes for a certain topic are possible in the, e.g. a field trip [4] could be enriched by quizzes related to the topic of the field trip.

2. Architecture

We developed an architecture that utilizes HTML5 and JavaScript in order to access the quizzes of a Moodle system and to provide a platform independent application to the learners. Additionally we also used Web Services in order to provide access to the Moodle system. Figure 1 shows the overall architecture.

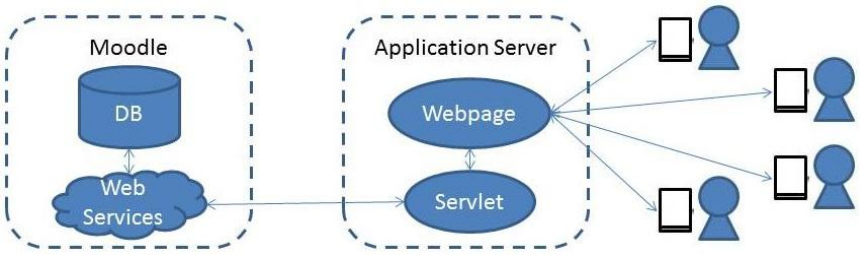

Figure 1: Architecture of the presented approach

On the left part the Moodle system is shown. This system provides Web Services that allow accessing the quizzes stored in its database. The Web Services are called by a servlet that runs within the application server together with the developed application. The learners can access a webpage that presents a modified version of the Moodle quizzes.

The presented architecture implements an additional layer, the application server, where the application runs on. This layer allows for a platform independent application, but increases the complexity of the architecture. A possible drawback might be a lower performance of the application due to the more complex network communication. A test scenario was implemented in order to investigate whether the architecture provides a lower performance in comparison to an application that directly performs Web Service calls. The Web Services consist of five different methods. Within the test we called these five methods, each 100 times, both with the presented approach and via direct Web Service calls. The test was performed either on a mobile device simulator running on a usual PC (to decrease latency) and on a test device. For these two scenarios we measured the round trip times of the corresponding calls as shown in Table 1.

Table 1: Testresults

Method	#	simulator (in ms)		device (in ms)	
		approach	Web Service	approach	Web Service
authenticateUser	100	191	95	128	69
getCoursesForUser	100	58	88	90	142
getQuestionsForCourse	100	77	87	89	71
getAnswersForQuestion	100	68	99	88	54
registerAttempt	100	89	116	138	65

The tests running in the simulator show for the presented approach slightly better performance in comparison to directly method calls. This is probably due to the fact that the SOAP protocol provides a large overhead in comparison to the protocol used in the other approach. Therefore, in the scenario where we decreased latency, the performance can be slightly increased by our approach. The results that we received within the test on the real device where not significant in order to answer the question which of the approaches provide a better performance since some of the method calls perform better with the direct Web Service calls while others perform better within the presented architecture. The different results for the round trip times obviously depend on complexity of the corresponding return values. Nevertheless the results show that the actual performance is not dramatically worse with our approach compared to a scenario with direct service calls.

3. Example Application

The example application was developed to prove the concept and show that the architecture is capable to deliver the content independently of the client.

In comparison to [5], it was not the design intent to offer full access to the Moodle content. Instead our goal was to give quick access to the available quizzes and display questions and

related answers in a clearly arranged screen layout which works for resolutions from a low cost smart phone with 2.8" display up to 10.1" displays.
The user interface was tested during development in Firefox web browser with different window sizes. To demonstrate the real application two different mobile platforms, an Android based phone and an Apple iPhone, were used.
Figure 2, a) and b) shows the implemented screens of the user interface as displayed on the iPhone. The representation of the question screen as it appears on an Android phone is presented in part c).

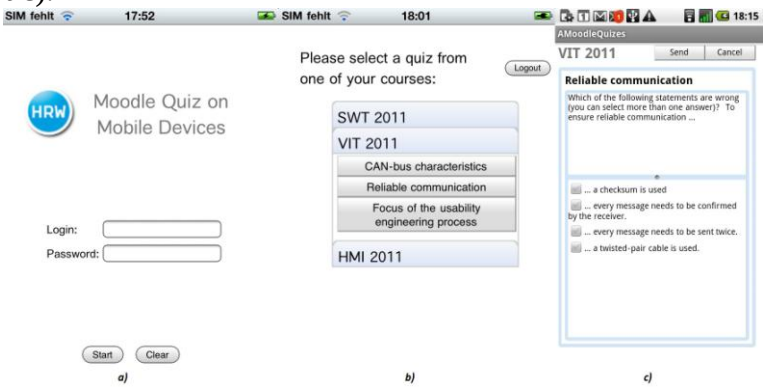

Figure 2: Screenshots from iPhone and Android based phone

As seen on the picture only three steps are required to start with a test. On screen a) the login and password for the Moodle system shall be entered. Screen b) shows the courses which the user is enrolled for in a stack panel. If one of the courses is selected, the related quizzes are shown directly below on the same screen.
Finally the last screen shows the question itself. As the length of the question and number and length of answers may vary from this area is designed flexible and user adoptable. On the one hand the fraction used for question text and answer text can be adjusted and on the other hand scrollbars are automatically added if a text does not fit into the available space.

4. Conclusion and Outlook

The developed system shows that a platform independent access to the quizzes in Moodle can be realized, that provides almost the same performance as a stand-alone application, by the presented approach. The user interface can be defined in a way that it works on small and large displays. With the reduction of the feature content to the required minimum to support a quiz it is possible to design a clear user interface.
The next steps in this project will be the support of additional question types like numerical, matching or gap fill. The ease of use and usefulness will be validated with usability test methods based on the technology acceptance model [6]. Results will be used to improve the system furthermore.

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