# Grade Query System Using Mobile Devices for Students of the Juarez Autonomous University of Tabasco

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*Abstract*—**Mobile devices are changing the traditional way in which people engage in activities such as communication, entertainment, information, connect to the Internet and other services offered by companies and institutions that are more dificult to use. In this context, in the Academic Division of Computer Systems was proposed the development of a mobile application for grades query, which is described in this paper.**

*Index Terms*- **Grades Query System, Mobile Devices, UJAT.**

## I. INTRODUCTION

The University provides a single way to access the grades query, which is through its website, so that students can check their grades only from a computer, this is because the moment the system was designed mobile devices were expensive and not so popular. This unique way can mean a loss of time and money.

Many students have access to this service through the equipment available in the laboratories of the University, but they have to transport there for the sole purpose of accessing the service, which involves time and transportation costs, they can also rent a computer in an internet cafe to check grades, but also need to make an expenditure of time and money.

According to the customer satisfaction survey (August 2012 - January 2013 period) implemented by the Department of School Services, in the question: "If you have a smart phone connected to the Internet, either through a company or the UJAT network (RIUJAT), what brand or operating system do you use?", 57 percent of students answered they use a smart phone (see Figure 1), which represents more than half of 45.000 students attending the university [5]. This indicates that it is necessary to provide to the students' community, other options to access the grading query service from other devices, which will allow them to have the opportunity to choose between different ways of access, according their possibilities.
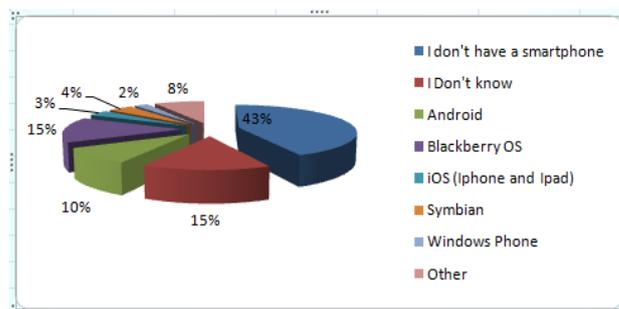


Figure 1: Distribution of mobile platforms most used

According to the current trends in the use of mobile devices by the students' community, society in general and the need of offer to the students, another ways of access to school services, it was proposed in the Academic Division of Computer Systems the development of a mobile application for grading query. This application will allow greater portability and a shortcut to the service without going through the University website, ease of use, timely querying of grades, besides not having the need to go to a specific place, because by means of this application querying of grades would be possible from anywhere where there is access to the Internet.

The application will be integrated with two modules:

Web Service: [6] says that a web service is a software system designed to support interoperable machine-to-machine interaction over a network. It would serve as an intermediary between the School Services System and any authorized application to consume this service, with this is achieved, not only mobile devices to access the service, but

in general any approved application, anticipating any changes in information and communication technologies trends.

Mobile application: to [7] Mobile applications are extensions Handheld Computer. It will be installed on mobile devices of students according to the most used platforms; its development essentially consists in the presentation according to the operating system and the Web Service consumption.

Some background information related to the relationship between Web Services and mobile devices, and the use of Web Services for providing services in organizations are:

[1] Developed a communication architecture that carries the heavy load of messaging systems based on XML (Extensible Markup Language) from mobile clients to an external middleware component. This component acts as a gateway that communicates lightly with the mobile device in a client server on a fast binary protocol and also takes the responsibility of resolving requests for Web Service.

[2] Developed a platform, called EasyWeb, to implement Web Services on mobile devices using the Android framework. This platform implements only a HTTP (Hyper Text Transfer Protocol) subset. EasyWeb has two components: the server, implemented as a server and the GUI (Graphical User Interface) implemented as an activity. This separation of components takes advantage of Android architecture and provides higher efficiency when compared to other platforms.

[3] Proposed a comprehensive system to support administrative activities in educational organizations using Web Services implemented with open source technology.

## II.  2.  METHODOLOGY AND DEVELOPMENT MODEL

### A.  Methodology

Research approach

The research was conducted under the qualitative approach because for this type of method facts, processes and structures can be known, so the researcher maintains narrative records of the phenomena being studied by techniques such as participant observation and unstructured interviews.

Research sources

The primary sources that will be used in the research are: books by recognized authors who are more focused on research and that contain relevant information to the project.

Secondary sources of research documents will be retrieved from the Internet that contain information about the subject as well as articles published in computer conferences.

### B.  Types of Programming

Object Oriented Programming (OOP) and methodologies applicable to OOP

[4] Says that Object Oriented Programming (OOP) is a programming paradigm that uses objects and their interactions to design applications and computer programs. It is based on various techniques, including inheritance, modularity, polymorphism, and encapsulation. Its use became popular in the early 1990s. Currently there are many programming languages that support object orientation. It has three basic characteristics: it must be based on objects, based on classes and able to have class inheritance.

### C.  Development Model

For developing the Web Service, SOHDM methodology has been selected (Hypermedia Design Methodology Based on Object-Oriented Scenario) which was created by H. Lee, C. Lee and C. Yoo [8]. This methodology involves a cyclical process in the sense that, in a certain stage a return to any of the previous stages can be made to refine and adapt it to the needs that arise. This methodology consists of six phases and is quite similar to its predecessors RMM, OOHDM and EORM. However, there are two things that make this different from the previous methodology.

- Based on scenarios for system development.
- The previous methodologies only focus in the design phase; SOHDM also encompasses the analysis stage.

The stages in which SOHDM methodology is divided are:

- Analysis
- Objects modeling
- View design
- Navigation design
- Implementation design
  - Page design
  - Interface design
  - Data base design
- Construction

Each stage of this methodology is described in brief below.

Stage 1-Analysis

Here the scenarios are developed to capture the functional requirements of the system and serve as the basis for the rest of the process. In the analysis phase a study of the needs of the application, the work environment and the actors should be conducted. The main purpose of this phase is to obtain the scenarios of activities that can take place in the system. To do this you first need to develop what is called event list. To make this list, it is necessary to detect the external entities that communicate with the system, and the events that trigger the communication.

Stage 2-Objects modeling

The scenarios represented by SACs are used to achieve the objects of the system model. In the object modeling phase, the stage will be transformed into objects as proposed by the CRC. Class, Responsibility and Collaboration (CRC) technique created by Kent Beck and Ward Cunningham (2006), helps to perform analysis or object-oriented design and serves to introduce students to object-oriented thinking.

Stage 3-View design

In view design phase, the objects are rearranged in navigation units. A navigation unit represents a view of system objects. The view is a grouping of information presented to the user grouped under a certain criterion.

Stage 4-Navigation design

Hyperlinks between different views are defined. Here the views defined in the previous phase are related through access structures. The first thing to do is to define what is known as Access Structures Nodes (ASNs). These are special nodes as dictionaries, menus, etc. that serve as a starting point for navigation. After defining the ASN, these and the views defined in the previous phase, are connected by arrows indicating the direction of navigation. This yields a graph which represents how to navigate from an information point (view or ASN) to another. This model is called the navigation links.

Stage 5-Implementation design

This phase will generate pages schemes that will represent information points defined in the previous phase within a given environment. For each scheme must be indicated: its name, title, encompassing views, a brief description of its meaning and a list of its links. After defining these items of information, a design of the user interface is made. The last step after defining the layout and user interface is the design of the database.

Stage 6- Construction

In the construction phase, a hypermedia application executable depending on the screens and pages defined in the previous phase is implemented. The development of the physical database to support the application is performed as well.

## III. RESULTS

Before to develop a full system, a prototype was developed in a test environment in Java; it is based only in the functionality of the application. The design, security, usability will be covered after. The prototype has two parts:

*Database*: It uses an Oracle database with two tables (see Figure 2) to represent all data available in the queries of the prototype, it is worth mentioning that Oracle is employed because it is the currently standard database manager in the university, this would help in the implementation of this service in the future with the real data of the students. Tables

are not normalized because the objective is not to model the school control system database, but in an implementation to be an external service, to [9] a view is a virtual table that support at least the select sentence to query data, then the tables presented here can be replaced by views for accessing data.
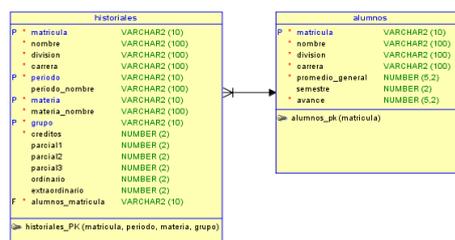


Figure 2: Database model

*Web Service*: is the intermediary between the mobile application and the data source of students with their grades (see Figures 3, 4 and 5), mobile applications should make requests to the Web Service that verify, processes and returns the results. The Web Service specifies what data will be consulted and how will be requested and returned.



Figure 3: Web Services C# functions to query the database and validate registration and password.



Figure 4: Java method to test the Web Service.

```
<?xml version="1.0" encoding="UTF-8"?>
<DataSet xmlns="http://localhost/tesis">
  <xs:schema xmlns="" xmlns:msdata="urn:schemas-microsoft-com:xml-msdata" xmlns:xs="http://www.w3.org/2001/XMLSchema" id="NewDataSet">
    <xs:element msdata:UseCurrentLocale="true" msdata:IsDataSet="true" name="NewDataSet">
      <xs:complexType>
        <xs:choice maxOccurs="unbounded" minOccurs="0">
          <xs:element name="Alumno">
            <xs:complexType>
              <xs:sequence>
                <xs:element name="MATRICULA" minOccurs="0" type="xs:string"/>
                <xs:element name="CONTRASEÑA" minOccurs="0" type="xs:string"/>
              </xs:sequence>
            </xs:complexType>
          </xs:element>
        </xs:choice>
      </xs:complexType>
    </xs:element>
  </xs:schema>
  <diffgr:diffgram xmlns:msdata="urn:schemas-microsoft-com:xml-msdata" xmlns:diffgr="urn:schemas-microsoft-com:xml-diffgram-v1">
    <NewDataSet xmlns="">
      <Alumno diffgr:id="Alumno1" msdata:rowOrder="0">
        <MATRICULA>071H4031</MATRICULA>
        <CONTRASEÑA>11111111</CONTRASEÑA>
      </Alumno>
    </NewDataSet>
  </diffgr:diffgram>
</DataSet>
```

Figure 5: Test result in XML

Mobile device: It is application that will be developed and implemented in the mobile device platform. It consists of the development to make use of Web Service and the input and output according to the mobile device employed (see figures 6, 7 and 8).



Figure 6: Initial screen
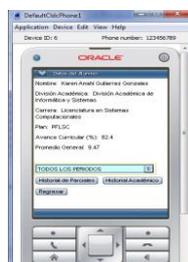


Figure 7: Initial screen and options menu
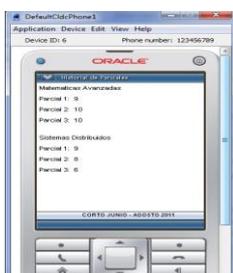


Figure 8: Partial exams consult.

## IV. CONCLUSION

With the development of the prototype here presented it may be concluded that it is feasible to develop applications for mobile devices to consult the grades of the students of the Juarez Autonomous University of Tabasco and that using Web Service for application development for different brands of mobile devices is relatively simple. This work may

lay the foundation for the development of new applications in other media and to offer more services for the university community such as books selection, registration, payment of exams, among other services.

## REFERENCES

[1] A. Cobârzan (2012, May, 4) Consuming Web Services on Mobile Platforms: http://revistaie.ase.ro/content/55/1008%20-%20Cobarzan.pdf.

[2] A. Radovici, G. Dragoi, Web Services Engine for the Android Platform In Annals of DAAAM for 2010 & Proceedings of the 21st International DAAAM Simposium, 21(1). DAAAM International: Viena, Austria, 2010.

[3] C. Carreto, R. Menchaca, E. Larios (2012, May, 4). Desarrollo de un Sistema Integral Colaborativo para Organizaciones Educativas Basado en Servicios Web: http://docente.ucol.mx/juancont/documentos/cap01/15.pdf

[4] L. Joyanes, Fundamentos de programación: Algoritmos, estructuras de datos y objetos. Madrid – McGraw-Hill. 2008.

[5] Universidad Juárez Autónoma de Tabasco. Tercer Informe de Actividades 2010. Villahermosa Tabasco. Universidad Juárez autónoma de Tabasco. 2011.

[6] W3C (2012, May, 15), Web Services Glossary: http://www.w3.org/TR/ws-gloss/.

[7] International Telecommunication Union (2012, May, 18), El boom del software concebido para los teléfonos móviles: http://www.itu.int/net/itunews/issues/2009/06/04-es.aspx.

[8] Lee, H., Lee, C., Yoo, C. (1998). A scenario-based object-oriented methodology for developing hypermedia information systems. Proc. of 31st Annual Conference on Systems Science, Eds. Sprague R.

[9] C. Lopez. Oracle 10g: Administración y Análisis de Bases de Datos. México D.F. Alfaomega. 2008.