IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No 3, July 2012
ISSN (Online): 1694-0814
www.IJCSI.org

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# A Mobile Portal Architecture for Higher Educational Institutions

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## Abstract

Educational portals are all around us**.** However, users don't always find it easy to access these portals especially due to power failure. With the increasing use of mobile phones, these phones can be used as an access point to Higher Educational portals.

In this paper, we propose a mobile portal architecture that would enable portal application to be used on mobile phones. The system was developed using MySql as the backend and the front comprising of a mobile device that must be Wireless Application Protocol (WAP) enabled. The WAP gateway acts as the middleware and the web server on which Hypertext Pre-processor (PHP) would run. The system is divided into two modules: the mobile front-end module and the application server and database module.

The proposed system would assist students of educational institutions, especially, higher institutions in developing countries to do on-line registration and payments of fees on their mobile phones.

*Keywords: Educational portals, mobile phones, wireless application protocol*.

## 1. Introduction

A portal is a gate, a door or an entrance [2]. An electronic portal (e-portal) is a website hosted on a web server. It has a large knowledge base that offers services such as site documents server, search facility, e-mail server and user registration. It serves as a gateway between the user and available millions of information. Portals are being developed in a variety of organizations and especially in higher educational institutions.

A mobile portal (m-portal) is a portal accessible on mobile phones. It extends the potential of personalization, permission and specification in e-portals.

Most developing countries higher educational institutions have introduced on-line registration of courses and payment of fees via their e-portals. This is an admirable innovation with the intent of making the whole process easier, faster and fascinating to both staff and students. However, due to insufficient provision of internet services, students face a lot of problems during registration period.

In fact, the few available cyber cafes are usually crowded with students both day and night. In spite of this, many students would not have access to the net until the closing date of registration. Hence, this paper addresses these problems by proposing a mobile portal that both the students and the members of staff of higher educational institutions can access on their mobile phones. The proposed portal provides effective and efficient delivery of services rendered on most web portals.

The objective of this paper is to design a content-rich Wireless Application Protocol system for higher educational institutions. This remaining part of this paper is divided as follows. Section 2 describes existing mobile portal applications while section 3 gives the description of the proposed m-portal system. Section 4 concludes the paper.

## 2. Related Works

A portal is an application of information technology that facilitates complex business interactions by presenting them in an easy-to-use web based interface. Most of the Higher Educational Institutions portals are provided by different vendors, which include Blackboard, Campus Pipeline and PeopleSoft Portal.

Portals are being developed in a variety of organizations but especially in Higher Education Institutions and are increasingly being seen as a "must-have" enterprise tool. Some of the main characteristics of portals are:

- they act as the framework in which applications, either new or existing, can be presented and accessed as "channels" or "portlets".

- they provide security features and personalization – both for the user in that they can choose which channels they do or do not see, and for portal administrators who can assign roles to users and therefore control what they access.

- they provide the ability to personalize also enables the portal to foster a sense of community by allowing users

to identify other members of their community and to communicate with them using online communication tools such as email and discussion boards. This is the function of portals that encourages users to keep returning to the portal.

The demand for portal technology has evolved initially out of the need to help consumers in finding information on the Internet. With time, the same requirement appeared inside organizations, as intranets took hold, and employee sought a means of organizing internal information.

Special variants of the e-portal models had appeared in this chronological order: consumer-portals, portals special to a line of business, intranet-portals and enterprise-information-portals (EIP).

- **Consumer-portals:** They are also called horizontal portals (hortals) are sites that attract general Internet audience like www.msn.com and 'Yahoo!'. They are highly used start pages into the web with services like search engines, directories, unified messaging, news from many areas, shopping and auctions.

- **Vertical portals (vortals):** These are portals, which are special to a line of business and they develop a high expertise in the area. They are extended homepages that pulled in content from multiple sources. Vertical portal sites therefore attract a more specialized audience with a particular interest.

- **Intranet-portals:** These support employees through information and services specialized for the company.

- **Enterprise-information-portals (EIP):** These join the functionalities of intranet-portals and the outward representation and communication of an organization.

## 2.1 Functional Categories of Enterprise Information Portal (EIP)

Enterprise portals, which University portal is an example, can be categorized as follows:

- **Knowledge Management Portal**: This is the type of EIP that organizes and enhances the knowledge to be distributed throughout an enterprise so that it is accessible to all. It involves information gathering, contextualization, organization, classification, access, presentation and distribution.

- **Electronic Commerce Portal:** The purpose of this type of EIP is to consolidate the e-commerce websites in the enterprise into a single portal with customizable access to all e-commerce in the enterprise.

- **Collaboration Portal**: This contains tools that allow user communities, project teams, virtual meeting room scheduling etc. Portals in this category are for improving communication and reducing miscommunication and misfires which are often present in enterprises.

- **Staff Management Portal**: They are portals whose main aim is to improve staff communication and to streamline the Human Resource and Benefits Management functions. They are to provide customized employee information from any location.

- **Business Process Improvement Portal**: They include tools or applications to follow a specific business process and increase the quality of service within an enterprise. They model a complex process within an enterprise, the model can be controlled with fewer mistakes and more complete processes.

Portals often combine features and functionality from more than one portal type [3]. The size and complexity of a portal project will depend on several factors including the number of functions, size and locations of the end-user population and the number of systems that must be integrated into the portal.

## 2.2 E-Portal and M-portal

Figure 1 clearly reveals the distinction between e-portal and the proposed mobile system. The differences between the two are:

- **Location:** The services of the system can only be accessed at points where they have internet linked to the computers.

- **Personalization:** Personalization is about creating services that tailor the end-user experience to fit needs of the individual subscriber. Although both e-portal and m-portal provide this but personalization is achieved more in m-portals because people rarely share the same phone as they usually share computers.

## 3. Proposed System

This section focuses on the design and implementation of the proposed mobile portal. It also includes a description of the methods and procedure employed in the system development and simulation.
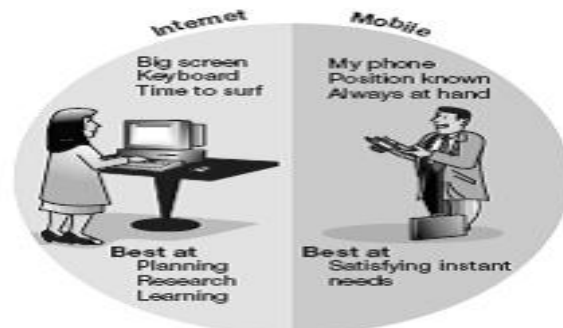


**Figure 1 Distinction between e-portal and m-portal (Andy *et al., 2001*)**

## 3.1 System Requirements

The system requirements for the mobile portal can be divided into:
- ✓ Hardware Requirements
- ✓ Software Requirements

### Hardware Requirements
The mobile portal for a university is a mobile application designed to work on mobile devices, most especially, the PDA and the GSM cell phone. This choice was made because these devices are readily available and affordable.
The portal is designed to support a range of PDAs and phones, which typically have the following characteristics:
- ✓ Phones with text displays of 4 to 10 lines.
- ✓ Limited memory (1500 bytes - 2MB) and CPU size.
- ✓ PDAs of a display resolution of 100 X 100 pixels (or better).
- ✓ Low bandwidth, high-latency wireless connectivity.
- ✓ Support for user input through numeric and function keypads.

Input is through the device's key pads and the output is through the device's screen.

### Software Requirements
A WAP browser is required on the mobile device that will implement the mobile portal.

Unlike HTML browsers in which an HTML document is displayed almost in the same way, mobile browsers display the same document in different ways. It is therefore essential that a mobile application designed with WML be tested on various browsers.
The major cell phone browsers used in the implementation of the mobile portal fall into the following categories:
- • Openwave Browsers (3.x.x , 4.0.x and 4.1.x)
- • Ericsson Browsers
- • Nokia WAP Browsers (1.1 and 1.2)
- • Mitsubishi Browser
- • Motorola Browser

These WAP browsers were chosen because they are readily available and have a large installed user base all over the world.
WAP can be integrated with many operating systems; however, a mobile operating system that supports user-friendly interfaces will be preferable.

## 3.2 System Architecture

The overall architecture of the mobile portal system allows the application to be separated into separate logical layers so that changes can be made to each layer without affecting other layers. This is further illustrated in Figure 2.
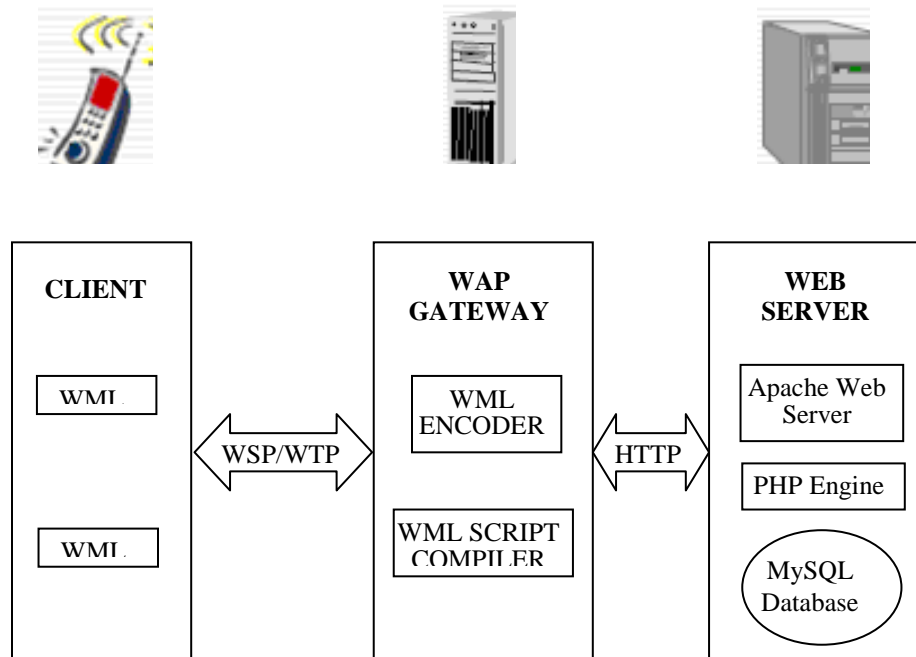


**Figure 2. Proposed Mobile Portal System**

### 3.2.1 The Client

The client is a mobile device that hosts a WML browser and makes an encoded request to the gateway using WAP's Wireless Session Protocol (WSP). This request is analogous to web browser sending an HTTP request that specifies a URL (Uniform Resource Locator).WML and WML Script which is a scripting language that extends WML to provide more programmable functionality, are client side languages that are executed by the mobile browser. They are however encoded into byte codes prior to transmission to the client.

### 3.2.2 WAP Gateway

The WAP gateway is the mediator between the client and the web server. The gateway translates between the WAP and web protocols and communicates with the web server on behalf of the WAP client. It translates the client's request into a standard HTTP post or Get, which is sent to the resource named by the URL. This resource satisfies the request by supplying WML content, which is returned to the gateway, as it would be in the case of a normal web request. The gateway encodes the response's content and headers and returns this, using the layered WAP protocol to the client where it is decoded and displayed.

### 3.2.3 Web Server

For the University mobile portal, Apache web server configured to serve WAP content is used. Within the Apache, the PHP engine and MySQL database programs run to handle the data received from the gateway. The programs process the received data and make necessary retrieval, storage, update or deletion to database. Then the necessary details are sent as response or results back to the WAP gateway.

## 4. System Design and Implementation

Unified Modeling Language was used to design the system. Figure 3 gives the class diagram of the proposed portal.

Table 1 shows a list of pages in the mobile portal. In the design of the system, the following specifications are provided.

i.  A front end of the system comprises a mobile device, which must be WAP enabled.
ii.  The WAP gateway acts as the middleware.
iii.  The web server on which PHP will run.

iv.  The database that holds the information of students and staff of the University.

In order to achieve the design specification of the mobile portal, the system is broken down into the mobile front-end module, and the Application server and Database module.

The mobile front-end module of the University mobile portal can be divided into:

- Staff and Students Administration (modAdmin)
- Information Access (modInfo )
- Library and Bookshop  Access (modLibBookshp)

The following are the modules under the Students administration:

✓  modLogin: This module authenticates the right of the user to use the portal. It also personalizes the portal to users.
✓  modCourseReg: This module presents to the student the available courses to register and closes registration at the due time.

**Table 1  List of Pages in the Proposed System**

| Page | Purpose |
| --- | --- |
| index | The startup page of the site Figure 4 |
| Login | Personalization and authentication page i.e. page that allows access Figure 5 |
| registrationform | For adding dropping and choosing courses Figure 6 |
| Biodata | For changing personal data (home/ address/next of kin) |
| Transcript | Request for official documentation of results |
| Notices | Students alerted to deadline of exams etc |
| Directory | Finding people on the campus |
| Courseform | View personal course listing |
| News | Passing across important occurrences on the campus. |
| Timetable | Exam and lecture time tables |
| Teachingmaterials | List the teaching materials for each course |
| Booklist | List of books available at the book shop |
| Librarybooks | List of books in the library |
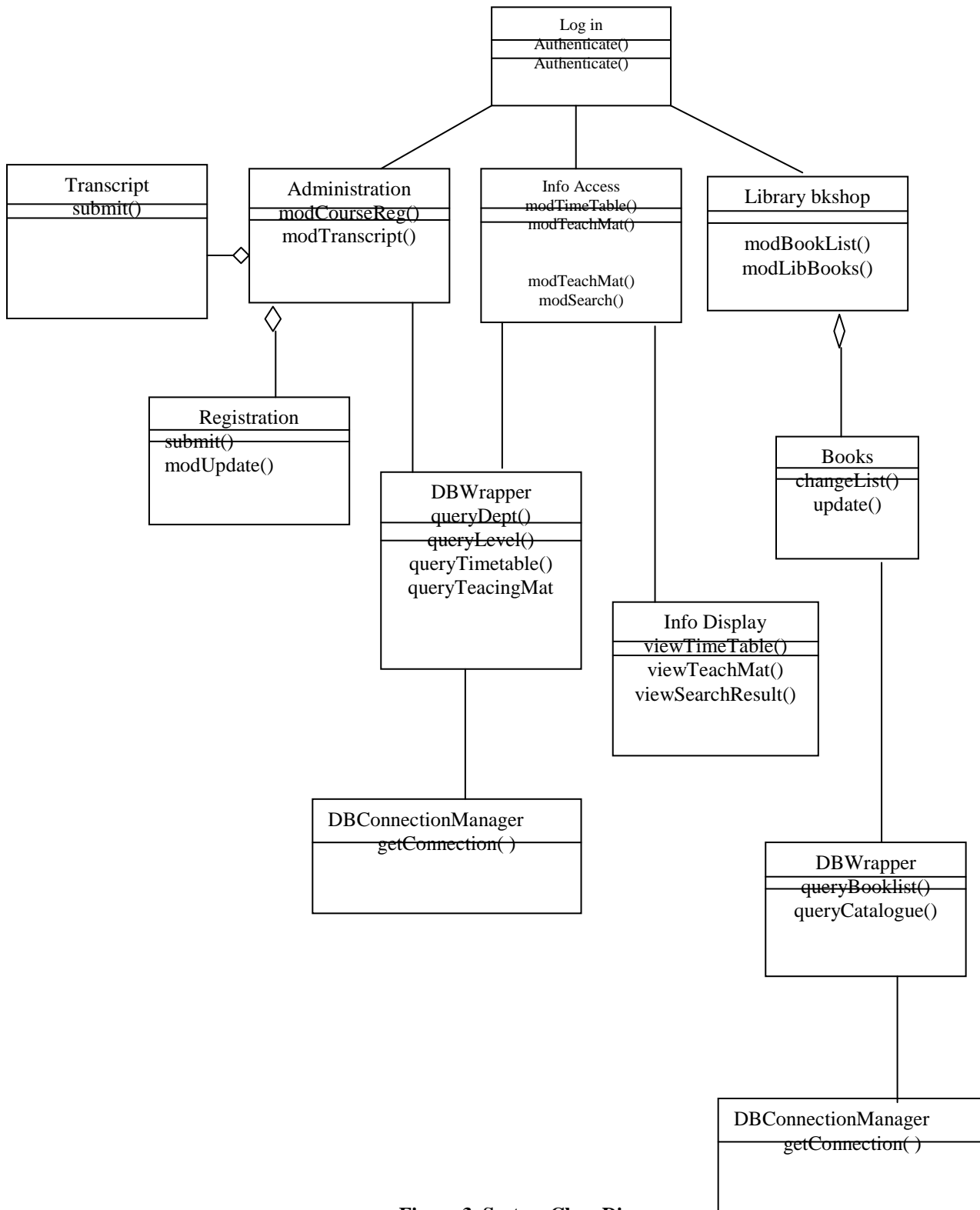
**Figure 3. System Class Diagram**

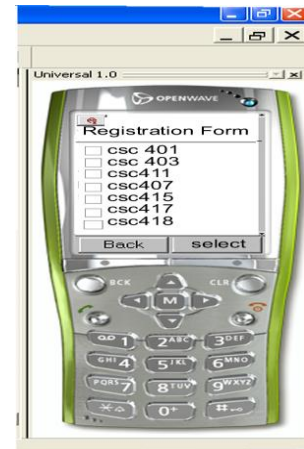Figure 4 Log in page as displayed in Openwave WML Simulator



Figure 6 Registration page displayed in Openwave WML Simulator



Figure 5 Welcome Page as in Openwave WML Simulator

✓ modBiodata: This module keeps and updates the biodata information of the staff and students.
✓ modTranscript: This module allows for transcript application for students and it gives the level of transcript processing to students.

The Application Server and Database Module contains the staff database, students' database, and books database stored in MySQL Relational Database Management System (RDBMS). This allows for easy creation, retrieval, updating and deletion of data.

## 5. Conclusion

The proposed system would enable students to use their WAP phones to register for courses on-line, check results and view transcripts with their WAP-enabled phones. They can also access lectures and examination time tables. The system would enable lecturers to pass information to the students through Short Message Services (SMS).

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