

AN ANDROID APPLICATION FOR DIFFERENT LEVELS OF COLLEGE MANAGEMENT

A MINOR PROJECT REPORT

Submitted by

**VIJAY KRISHNA V [Reg No: RA1511003020329]
CHIRAG G SAMTANI [Reg No: RA1511003020375]
SRUSHTI BOMPELLI [Reg No: RA1511003020344]
CHAITANYA BACHHAV [Reg No: RA1511003020383]**

Under the guidance of

Mr M. Prabu

(Asst. Professor , Department of Computer Science & Engineering)

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SRM UNIVERSITY

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SIGNATURE

Mr M. Prabu
GUIDE
Asst. Professor
Dept. of Computer Science & Engineering

Signature of the Internal Examiner

SIGNATURE

Dr. JAGADEESAN, M.Tech., Ph.D
HEAD OF THE DEPARTMENT
Dept. of Computer Science & Engineering

Signature of the External Examiner

ABSTRACT

Technical and scientific development has become one of the most essential changes in every aspect of the modern day to make our work efficient and easier. The proposed Android application has been designed to efficiently process the management system of an institution at their different levels of hierarchy, to reduce the physical work and confusion. Black board is an application specifically for the faculty members and the head of departments. The application will show required content based on who is signing into the app. For instance, if the dean logs into the app, he/she can view the details of all the heads and their staff according to their departments, a HOD will be able to see the details and availability of the faculty members of their own department. The application will be able to display most of the academic information like the timetables, availability of the faculty, location of the classrooms etc. The database of the application can be modified and updated through a web portal by a specific admin. Many future enhancements can be made to the mobile application based on the institutions requirements.

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ABBREVIATIONS

API	Application program interface
HOD	Head of department
JSON	Java Script Object Notation
JVM	Java Virtual Machine
SQL	Standardized Query Language

CHAPTER 1

INTRODUCTION

1.1 Overview

The project is designed for the effective management of a college or an institution according to their different levels of hierarchy present. In today's world it is very important to work efficiently to avoid any confusion and for productive results. In the administration of a college or an institution there exists various levels of hierarchy, the responsibilities and functions differ at each level, in the existing system most of the work done is paper work and it is manually carried out, this may lead to confusion and increase of work load at each level. With increasing technology and tools in each and every aspect of the world, it has become much easier and efficient to carry out any task. Our project intends to give technical development to this particular field of college management. The proposed android application will be able to store and retrieve the academic data and can be accessed accordingly by the different levels of the management structure depending upon their necessities and functionalities.

The project consists of an android application with a web portal and a common database connecting them. The android application will have separate logins for the dean, HOD, class in charge, faculty etc. once they login they will be able to access the information required by them. For instance, if the dean logs into the app, he/she can view the details of all the heads and their staff according to their departments, a HOD will be able to see the details and availability of the faculty members of their own department and other information about their department. The main objective of the application is that all the academic information should be available at one place in an organized manner which can be easily accessible by just a click. The application helps in making tedious tasks like searching for classrooms or staff easier. The application also provides the facility to make calls to the required person from the app. Features like checking the availability of free staff helps in the effective management of time

without free periods being wasted. The data in the application is stored in the database which will be updated from time to time. The application will be very user friendly to avoid any complications and it can be used by all the management members.

A web portal will be designed to update the database from time to time every year or every semester depending upon the college. It is easier to update the information than through the application itself. The web portal will consist of a login page through which the admin can login and update the information; the admin can be any faculty member with a secure login ID and password. The login details of the admin will be checked carefully and secure access will be given. Once the admin logs into the web portal he will be given access to update the all the information like changed time tables, details of the new students, change of classes etc. the website can be designed according to the convenience of the college, it will be user friendly with advanced features for the convenience of the user. The android application and the web portal are connected using a common database. The database contains all the information which is retrieved by the app and updated using the web portal. The data is stored in the database using a private cloud the information can only be accessed through secure login.

The scope and implementation of the project can be increased and developed with changing requirements. The project is designed and implemented using the latest and updated technologies for more efficiency and ease of access.

1.2 Problem Statement

Organized data is easier to work with than manual paper work, The problem in the existing system is that most of the work done by the management is paper work, there is no scope of organized data, each person have to maintain different files to access all the academic information. The main drawbacks of the existing college management system are:

- Manual work for all the teachers regarding attendance, updating and changing the attendance is difficult.
- No way of knowing which teacher is free during which period.
- No provision for rectification of mistakes.

- Dean doesn't have access to everyone's contacts in one place.
- Locating classes is not an easy task.
- Contacting a higher official is difficult.

These drawbacks will be addressed by the project, the android application will facilitate the availability of all the information together, attendance can be updated through the app by the faculty whenever required; there will always be a way to rectify mistakes. The project will be implemented to address all the drawbacks of the existing system and improve the effectiveness of the system.

1.3 Objective

The main objective of the proposed system is to introduce and implement technical advancement in the existing system of college management. The proposed the android application will be able to make the work easier by providing ease of access to the data required. Some of the main objectives of the project will be avoiding manual work for attendance, separate logins for different hierarchy of management, easier access to academic information, all information related to the particular person available in one application, effective management of time tables and free time, each level of management can access information relevant only to them (and not all information) through a secure login which keeps the data secured and avoids any misuse of data, increases overall efficiency of management. The web portal is used update the data in the database, one of the main objective of the web portal is to be user friendly to facilitate the admin to update the details with ease and the updated information should be secure which will be provide through secure login of the admin.

1.4 Organization of the report

There are five chapters in the report of the project android application for different levels of college management. The domain of the project is a common database connecting the android application and web portal. The report gives a comprehensible

overview of the design and implementation details of the project, it helps understand the various technologies used in the project and the effective implementation of these technologies.

Chapter 1

This chapter gives the basic introduction of the project, it gives the basic overview of the entire project and gives the details about the problem statement and the main objective of the project.

Chapter 2

This chapter includes the literature survey which is a survey done on various base papers, it mainly gives the problems and conclusions for the domain of the project. The chapter also gives the description about all the features of the existing system and its drawbacks and the proposed system and its advantages.

Chapter 3

This chapter gives the requirements of the project in detail. It includes the basic purpose of the project, its scope, user requirements of the project. Software and Hardware specifications required by the project are given in detail in this chapter.

Chapter 4

This chapter the complete information about the system design and the various modules present in the project. The chapter gives the system architecture and its description, it gives the detailed description about the data flow diagram. The module implementation is given in detail with the screen shots from the projects and the diagrams required. Data flow diagram and the process description for each module is separately given for better understanding.

Chapter 5

This chapter deals with entire implementation of the system. The information about the platform of the project is given, the sample coding and the screen shots of the working model with proper description is given this chapter. The project will be done and the summary will be given.

Chapter 6

The system implementation of the project will be given in this chapter. The project also gives an insight about the implementation details, technologies used.

Chapter 7

The conclusion of the project will be given in this chapter.

Chapter 8

The project also gives an insight about the future work which can be implemented through the project.

CHAPTER 2

LITERATURE SURVEY

2.1 Introduction

In this section we're going to talk about the various papers we have looked at which are related to our project.

2.2 Existing System

As mentioned in the paper 'Web Based Faculty Information Management System' by S.R.Bharamagoudar, Geeta R.B., S.G.Totad (International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 6, June 2013) S.R.Bharamagoudar and S.G.Totad (2013) provides the system using the web based technology, but it requires the high speed internet connection which is a further disadvantage of it. Instead of using the application provides the stand alone environment so that can be easy to use on the slow internet connection also.. It can be easily modified using the administration portal. If any requirement of the students or feedback can also be taken using the application by individual student. It will also be easy for the teachers to maintain their routine and make best use of the time which will help in advancement of curriculum. The teaching plan is maintained and can be reported to the HOD of the department. The app basically provides the platform for the teachers so that they can have ease of their work as well as reducing the paper work will help to save the environment. This application stated also provides standalone application platform to provide the various notices for the faculties.

Furthermore the paper 'Faculty Management System' by Shendkar Akshay, Lahor Ankit, Kendre Anjali (International Journal of Advance Research and Innovative Ideas in Education Volume-2, Issue-2, 2016).Shendkar Akshay (2016) The idea of the application is to allow the management to interact and communicate with the faculty with

ease. This can be done by means of using the internet connectivity for each and every staff-member. Thus the application can help the faculty to manage and maintain the record digitally. All information fetched from the database server and maintained by administrator. The application has a section for login of Faculty. When the faculty logs in to the smartphone application then data fetches from the database and on faculty interface, similarly when admin logs in the portal he/she can edit the data.

Another such paper 'JIIT-Edu: An Android Application for College Faculty', by Upanya Singh, Nadini Srivastava (Contemporary Computing (IC3), 2016 Ninth International Conference) Â aimed at minimizing the time consumption in tasks like taking attendance, pushing papers from one level to another. The automated college management system was developed to increase the productivity and technical growth of educational systems. The android app automates certain tasks which when done manually take up a lot of time and energy. The app implements Bluetooth and android technology for the making non-academic tasks paper-less and fast. The app also improves student teacher interaction and communication via chat rooms. The app will store profiles of every faculty member who can login through the interface. The app implements Bluetooth to ensure each student is using their individual tag so as to prevent proxies. The app also provides a platform for sharing study material. The user can download the material posted by other users.

Each of the above mentioned papers present systems which enable fast and paperless administration. These systems also provide a brilliant interface between user and data and enable communication between users. These systems were developed with the aim of reducing manual work and enabling faster execution of necessary but non-academic activities. This project exhibits similar attributes and can be considered as a better and more reliable system as it overcomes the flaws present in the above systems as mentioned in the following pages.

2.3 Issues in Existing System

Now-a- days faculty deals with the papers and all the management regarding issue of making and maintaining the all documents and records related the students and their

daily conductance. It helps to make sure that paper work is reduced to an efficient management model using the remote mobile application.

2.3.1 Web Based Faculty Information Management System

The above system provides faculty information through a web application. There is no provision of an interface for faculty through which they can login. Also this system consists of a standalone website with no mobility at all. The site is not responsive which makes it inaccessible for mobile devices like i-pad, smartphones, etc. Also there are no security measures to ensure data privacy. The system doesn't implement login modules which kind of makes it redundant and irregular since there is no separation between independent modules as all the info is accessible to everyone due absence of abstraction.

2.3.2 Faculty Management System

This system consists of an android application which implements digital record maintenance. The data-base is accessible through the app but making any changes to the stored data is tedious as it involves editing the source-code of the application. This makes it difficult to edit the database and thus the effectiveness of the system is in question. Also maintenance of the data becomes tedious as admin user interface is not efficient. The system has unique login credentials for every user but all the data present in the database is visible to everyone, some part of this data may be irrelevant for certain users.

2.3.3 JIIT- Edu: An Android App for college faculty

Above system proposes an android application which provides a platform for faculty to share study material, communicate and interact with other users through chat groups. The users can upload and download documents through the chat groups, but there is no admin portal to manage the application. There is no provision for handling direct access to database as the app lacks implementation of hierarchical management.

2.4 Summary of Literature Survey

2.4.1 Proposed system

Black-Board App

This project consists of a web-portal and an android app for maintaining and accessing data. The web- portal provides is an API for managing the database, this portal can be accessed by the admin only thereby ensuring data security. The admin privileges allow him/her to edit the data quite efficiently. The data-entry can be commenced when an authorized login attempt is made to the admin app. The API is built using Django which is one the best frameworks that are available. The app will have login interface through which the users can access data relevant to their tasks i.e. useless information will not be visible, which is made possible by abstraction. Not all users can access every data, the access will be restricted if the user does not login with proper credentials required. This will ensure data-security. The HOD can view daily-schedules of every faculty who teaches in his/her department along with their contact details. Dean login will allow access to details of all HODs and other relevant data. Once the app makes a request the portal verifies the authentication details and sends data accordingly. The portal interface allows for smooth transmission of data from data-base to the application. This overcomes the problems mentioned in paper A & paper B. Also the restricted access ensures privacy and is safer than the system mentioned in paper C.

CHAPTER 3

SPECIFICATIONS

3.1 Introduction

In this chapter, the specifications of this project are going to be discussed in detail. Topics like purpose, project scope and much more is also included.

3.1.1 Purpose

Teachers should do exactly what the name suggests, teach. The current education system does not allow them to do just that. Unfortunately, as the teachers have no other choice, they follow the system. Doing all the manual work of attendance and calculation of marks and all that itself takes up half their time. Valuable time that could have been spent on imparting knowledge to the students. This is where comes the purpose of our project. To decrease manual work for the teachers in colleges so that they can concentrate on imparting their knowledge to students.

3.1.2 Project Scope

The scope of this project is huge. We plan to first implement this only in our college but as soon as that happens, we plan to approach various colleges where this problem of manual work persists and implement it there. After colleges, we can move on to schools and other institutions. The scope is endless.

3.2 Overall Description

In overall description we're going to discuss about how the project is implemented. Description of what was done, the features, the user characteristics, operating environ-

ment, implementation constraints and much more.

3.2.1 Product Features

The various feature in our application and web interface will include the following:

- Separate logins for different hierarchy of management.
- Easier access to academic information.
- All information related to the particular person available in one application.
- Effective management of timetables.
- Each level of management can access information relevant only to them (and not all information).
- Increases overall efficiency of management.
- Locations of classes in the campus can be found in the application.
- Academic information of all the students can be found under the separate class teacher's login.
- The dean can access the contact information of every teacher on the campus.
- The dean can call any teacher he wishes to from the application itself.
- The Head of department (HOD) of each department can view the performance of students of his/ her department.
- Free periods of teachers can be seen through the application which will help in allocating them to classes where teachers are absent.

3.2.2 User classes and characteristics

The various user classes and their characteristics are given below:

Login

The login class takes the login information from the user and authenticates it. If the information matches with that of the database, it directs it to another page based on whether the user is a teacher, dean or a HOD of a department.

Menu

The menu is where the user can select what functionality he/she wants to use. The various menu items include:

- Class time tables
- Teacher time tables
- Available Staff
- Class Location

Class Time Tables

This is where the user can select the particular class he/she wants the time table to and can view the time table of the same in the application itself.

Available Staff

This is where the senior staff can view the free periods of the teachers so that he/she can assign the teacher another class in case there is a class without a teacher at that point.

Class Location

This is where the user can enter the class he/she wants to go to and the result will be the location of the class in the campus. We later plan to add a student login where this feature will also be available.

Call Staff

This is where the dean will be able to browse through all the teachers and HODs and will be able to call any one of them from the application itself.

Teacher Time Tables

This is where the HOD can select the teacher from his/her department and view the time table of the same in the application itself.

3.2.3 Operating environment

The Android SDK includes a virtual mobile device emulator that runs on your computer. The emulator lets you prototype, develop and test Android applications without using a physical device. The Android Emulator simulates a device and displays it on your development computer. It lets you prototype, develop, and test Android apps without using a hardware device. You can launch an app on the emulator when you run your project, or you can drag an APK file onto the emulator to install it. As with a hardware device, after you install an app on a virtual device, it remains until you uninstall or replace it. If needed, you can test how multiple apps, such as your own or system apps, work with each other. You interact with the emulator just as you would with a hardware device, but using your mouse and keyboard, and emulator buttons and controls. The emulator supports virtual hardware buttons and touchscreens, including two-finger operations, as well as directional pads (D-pads), trackballs, wheels, and various sensors. You can dynamically resize the emulator window as needed, zoom in and out, change the orientation, and even take a screenshot.

When your app is running on the emulator, it can use the services of the Android platform to invoke other apps, access the network, play audio and video, accept audio input, store and retrieve data, notify the user, and render graphical transitions and themes. The emulator has controls that let you easily send incoming phone calls and text messages, specify the location of the device, simulate fingerprint scans, specify network speed and status, and simulate battery properties. The emulator can simulate an SD card and internal data storage; you can drag a file, such as a graphics or data file, onto the emulator to store it.

3.2.4 Design and Implementation Constraints, Assumptions and dependencies

The one dependency that this project has is that the data has to be fed into the web portal every semester and this responsibility has to be taken up by one individual.

Material Design is a design language developed by Google. Material design is a comprehensive guide for visual, motion, and interaction design across platforms and devices. A single underlying system that allows for a unified experience across platforms and device sizes.

3.3 External Interface Requirements

In this part, we're going to discuss about the external interface requirements like the user interface, hardware and software interface:

3.3.1 User Interface

We've used xml for making the user interface of the android application. And HTML, CSS for the user interface of the web portal. This is a very important part of the project as without a proper UI, the user wouldn't be able to navigate through the application properly and in the end, that is of no use.

3.3.2 Hardware Interface

There is no physical database where all the data is stored, it's all stored in the cloud. The other physical component required will be the smartphone itself which every user will undoubtedly have.

3.3.3 Software Interface

The various components of the software interface are given below:

Login Interface

The login class takes the login information from the user and authenticates it. If the information matches with that of the database, it directs it to another page based on whether the user is a teacher, dean or a HOD of a department.

Menu Interface

The menu is where the user can select what functionality he/she wants to use. The various menu items include:

- Class time tables
- Teacher time tables
- Available Staff
- Class Location

Class Time Tables Interface

This is where the user can select the particular class he/she wants the time table to and can view the time table of the same in the application itself.

Available Staff Interface

This is where the senior staff can view the free periods of the teachers so that he/she can assign the teacher another class in case there is a class without a teacher at that point.

Class Location Interface

This is where the user can enter the class he/she wants to go to and the result will be the location of the class in the campus. We later plan to add a student login where this feature will also be available.

Call Staff Interface

This is where the dean will be able to browse through all the teachers and HODs and will be able to call any one of them from the application itself.

Teacher Time Tables Interface

This is where the HOD can select the teacher from his/her department and view the time table of the same in the application itself.

3.3.4 Communication Interface

There are three levels of communications happening at a given moment in the app's lifecycle. They are mentioned below:

- Web-portal to database
- Database to web-portal
- Application to database

Note that the web-portal and the application do not communicate at all. The data is fed through the web portal and is stored in the database which is then accessed by the application to display it to the users.

3.4 Other non-functional Requirements

In this section, we're going to discuss about the other non-functional requirements like performance and security requirements.

3.4.1 Performance Requirements

Other than a smartphone and an internet connection, nothing will be required to run this application with the highest performance.

3.4.2 Security Requirement

The app automatically encrypts the password of the user and hence the passwords are kept safe. In case the user forgets his/ her password, extra steps will be taken to make sure that the user is identified first. And hence, security is taken care of.

CHAPTER 4

SYSTEM DESIGN

4.1 Introduction

This chapter gives detailed information about the system design of the project, system design includes the requirements of the system, the entire flow of the process of the system. Understanding the design of the system helps in the better implementation of the system. This chapter includes the system architecture, in the system architecture the relationship and the process flow among the components is given. The data flow diagram gives the detailed process flow between the various modules of the system; a module is a separate unit of software or hardware. Typical characteristics of modular components include portability, which allows them to be used in a variety of systems, and interoperability, which allows them to function with the components of other systems. The software and hardware requirements includes all data, functional and behavioral requirements of the software under production or development it also includes the hardware specifications required by the project. The software and hardware requirements of the system help in analyzing the basic architecture of the system.

The architecture diagram for the project android application for different levels of college management gives the basic process flow between the android and the web portal and some of the modules. The data flow diagram includes the process between the modules like login page, time table display page etc.

4.2 System Architecture

The architecture of a system is a model to describe or analyze a system. The system architecture basically consists various structures present in them and the relationship between them. The design and architecture of the system can be represented and modeled

using an architecture diagram and the data flow diagram. The architecture diagram will consist of basic components and modules. The data flow diagram describes about every module and the process flow, the pictorial representation of these helps in analyzing the design of the system.

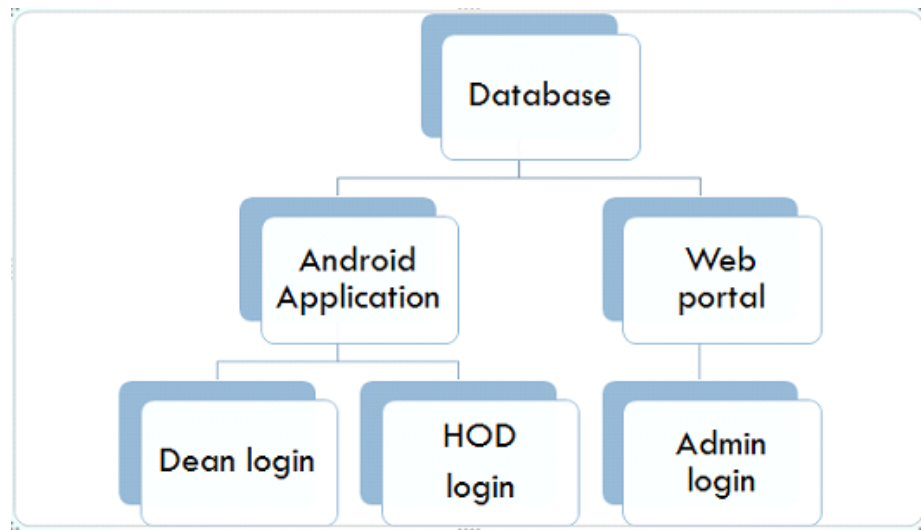


Figure 4.1: System Architecture

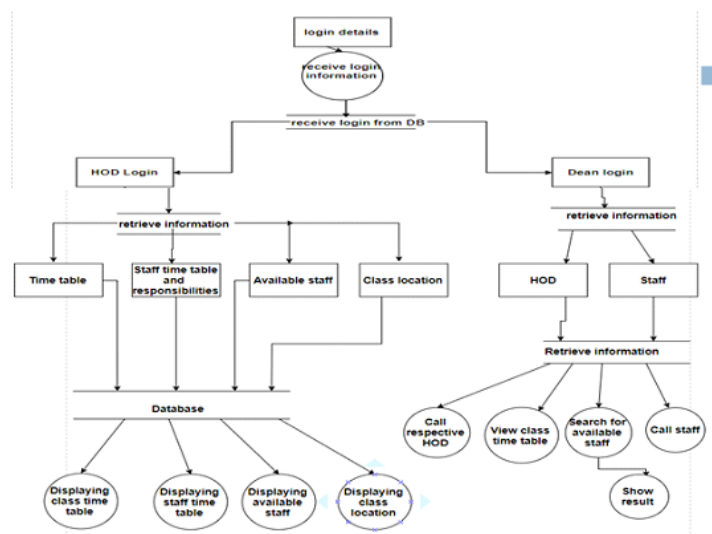


Figure 4.2: DataFlow Diagram

4.3 Description

The architecture diagram includes the main components the android application, database and the web portal. The diagram shows that the database is the back end of

the system, it connects the android application and the web portal, the data updated through the web portal is retrieved by the database and accessed by the android application. The dean login, the HOD login and the admin login are the main modules of the system. Through a secure login the user will be able to access the functionalities of these modules.

In the data flow diagram the various modules and the process flow between these modules is comprehensively described. The symbols used in the data flow diagram are described in the below figure: The data flow diagram shows the step by step process of

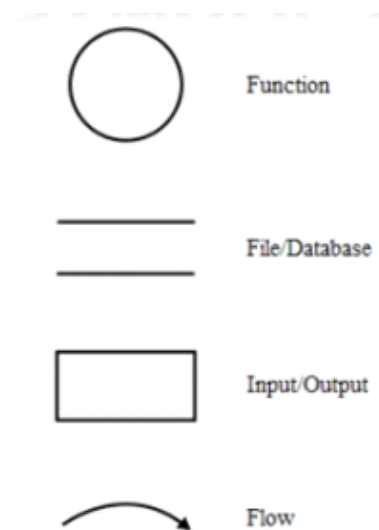


Figure 4.3: Symbol used in the DataFlow Diagram

the android application. First there will be a login page to take the input login of the user, once the user enters the login information the data will be retrieved by the database and acted upon. The next functional page depending on the login will be shown, if it is a HOD login options like time table, available staff, staff time tables and responsibilities, location of the classes will be given, the user has to choose one and the given input will be retrieved by the database and the respective information like displaying the location of the class which has been entered, displaying the information about available staff etc. can be accessed or viewed. If it is a dean login options like HOD or staff will be given, once the input is received by the database the next respective module like displaying the details of the HOD of a particular department, contacting a HOD, checking for staff etc. will be accessed.

4.4 System Requirements

4.4.1 Software specifications

The software specifications required to build the software of the system are:

Android Studio

Django framework

python

JDK

web browser

GIT

4.4.2 Hardware specifications

The hardware specifications required by the system are:

Dual-core 64-bit processor

8 GB of memory

Up to 24 GB of internal storage

4-4 GB RAM

Hard disk capacity 40GB

4.5 Summary

Thus the system design has been analyzed and a detailed description about the design of this system has been given in this chapter. The analysis of the design of the system gives the detailed overview about the project, in this chapter detailed description of each and every module is given which briefs the user about the various features and advantages of the project. This chapter has also given information about the available features and options in the project. The requirements of the system also have been given for the better understanding of the technology used in the project.

CHAPTER 5

MODULE DESCRIPTION

5.1 Introduction

In this section, we're going to talk about the various modules in this project. We have divided the whole project into many sub sections and the three main modules of the project will be discussed below. Apart from discussing about it, the work flow diagram of each module is going to be provided to provide a clear idea of what the module is going to be and in-turn how the whole project is going to be.

5.2 Login Module

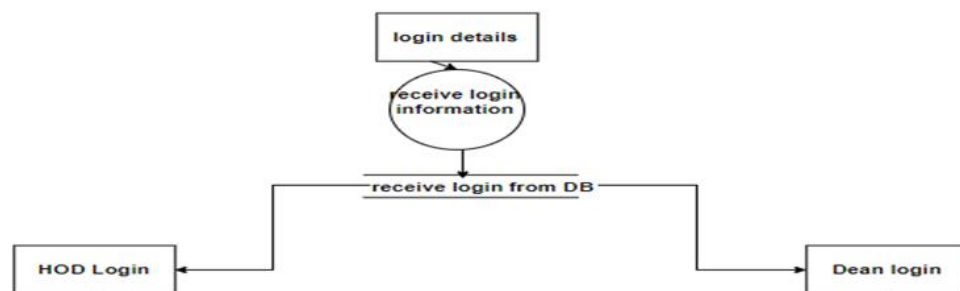


Figure 5.1: Work flow diagram for Login Module

Description The log in is the most important part of the application as it segregates the teachers from the deans and hods and provides a layer of security to the app. The user will enter the email and password and based on the suffix of the email, the app will first authenticate the user and then redirect to the main teacher or hod activity.

5.3 HOD Module

Description This is the HOD module where all the information that the HOD of each department of the college can view is here. The various sub modules include:

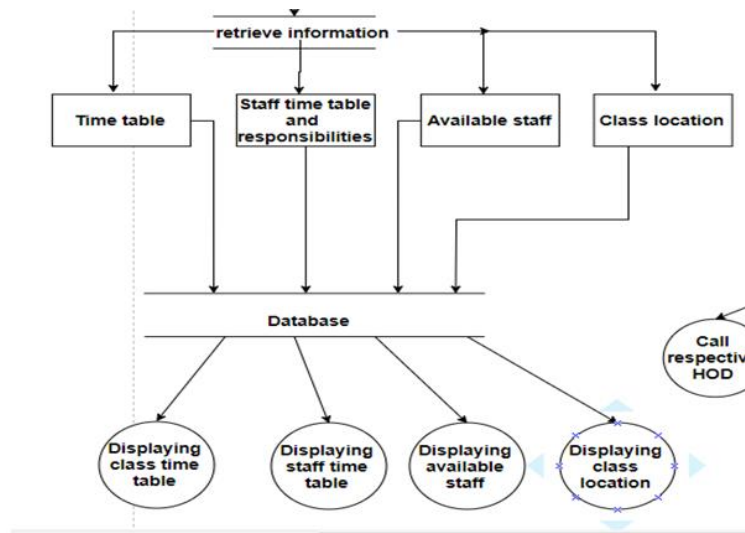


Figure 5.2: Work flow diagram for HOD Module

- Class Location
- Available Staff
- Staff Time Tables
- Class Time Tables

All this information is stored in the database and is accessed only once and will be stored offline so that the HODs can view the information without internet too.

5.4 Dean Module

Description This is the Dean module where all the information that the Dean of the college can view is here. The various sub modules include:

- Head of Departments
- Staff

All this information is stored in the database and is accessed only once and will be stored offline so that the Dean can view the information without internet too.

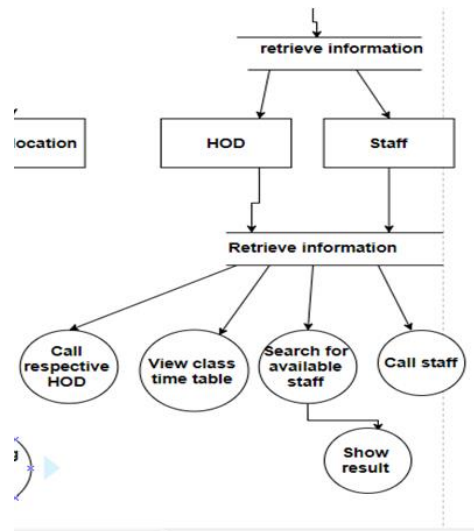


Figure 5.3: Work flow diagram for Dean Module

5.5 Summary

As has been shown above, the project has been divided into 3 major modules and they have been explained in detail. The login module being the one that handles the security and the other two modules are the ones that display information to the dean and HODs.

CHAPTER 6

SYSTEM IMPLEMENTATION

6.1 Overview of the Platform

6.1.1 Java

The Java language is a key pillar in Android, an open source mobile operating system. Although Android, built on the Linux kernel, is written largely in C, the Android SDK uses the Java language as the basis for Android applications.

Java is a general-purpose computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA), meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to bytecode that can run on any Java virtual machine (Java Virtual Machine (JVM)) regardless of computer architecture.

6.1.2 Kotlin

Kotlin is a Concise, Simple, Safe and Statically typed programming language focused on Interoperability with Java.

One can Avoid entire classes of errors such as null pointer exceptions. Improves code readability as it Drastically reduces the amount of boilerplate code. While the syntax is not compatible with Java, Kotlin is reliant on Java code from the existing Java Class Library, such as the collections framework. Kotlin is a fully supported programming language on Android.

6.1.3 Django(Web Framework)

Django is a free and open-source web framework, written in Python, which follows the model-view-template (MVT) architectural pattern.

Django's primary goal is to ease the creation of complex, database-driven websites. Django emphasizes reusability and "pluggability" of components, rapid development, and the principle of don't repeat yourself. Python is used throughout, even for settings files and data models. Django also provides an optional administrative create, read, update and delete interface that is generated dynamically through introspection and configured via admin models.

6.1.4 Git

Git is a version control system for tracking changes in computer files and coordinating work on those files among multiple people. It is primarily used for source code management in software development, but it can be used to keep track of changes in any set of files. As a distributed revision control system it is aimed at speed, data integrity, and support for distributed, non-linear workflows.

6.1.5 RESTful API

Representational state transfer (REST) or RESTful web services is a way of providing interoperability between computer systems on the Internet. REST-compliant Web services allow requesting systems to access and manipulate textual representations of Web resources using a uniform and predefined set of stateless operations.

An API for a website is code that allows two software programs to communicate with each another. A RESTful API explicitly takes advantage of HTTP methodologies. They use GET to retrieve a resource; PUT to change the state of or update a resource, which can be an object, file or block; POST to create that resource; and DELETE to remove it.

6.1.6 JSON

JavaScript Object Notation or JSON is an open-standard file format that uses human-readable text to transmit data objects consisting of attribute-value pairs and array data types (or any other serializable value). It is a very common data format used for asynchronous browser-server communication.

JSON is built on two structures: A collection of name/value pairs. In various languages, this is realized as an object, record, struct, dictionary, hash table, keyed list, or associative array. An ordered list of values. In most languages, this is realized as an array, vector, list, or sequence.

6.1.7 Android

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices such as smartphones and tablets.

Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input.

6.1.8 Android Studio

The Official IDE for Android. Android Studio provides the fastest tools for building apps on every type of Android device.

World-class code editing, debugging, performance tooling, a flexible build system, and an instant build/deploy system all allow you to focus on building unique and high quality apps.

6.1.9 SQLite

SQLite is an in-process library that implements a self-contained, serverless, zero-configuration, transactional Standardized Query Language (SQL) database engine. The code for SQLite is in the public domain and is thus free for use for any purpose, commercial or private.

SQLite is an embedded SQL database engine. Unlike most other SQL databases, SQLite does not have a separate server process. SQLite is a compact library. With all features enabled, the library size can be less than 500KiB. SQLite a popular database engine choice on memory constrained gadgets such as cellphones, PDAs, and MP3 players. Performance is usually quite good even in low-memory environments.

6.1.10 Open Source Libraries for Android

Glide Glide is a fast and efficient open source media management and image loading framework for Android that wraps media decoding, memory and disk caching, and resource pooling into a simple and easy to use interface.

Retrofit A type-safe HTTP client for Android and Java. This library provides a powerful framework for authenticating and interacting with APIs and sending network requests with OkHttp network. This library makes downloading JSON or XML data from a web API fairly straightforward. Once the data is downloaded then it is parsed into a Plain Old Java Object (POJO).

Stetho Stetho is a sophisticated debug bridge for Android applications developed by facebook. When enabled, developers have access to the Chrome Developer Tools feature natively part of the Chrome desktop browser. Network inspection is possible with the full spectrum of Chrome Developer Tools features, including image preview, JSON response helpers. SQLite databases can be visualized and interactively explored with full read/write capabilities.

ProGuard ProGuard is the most popular optimizer for Java bytecode. It makes your Java and Android applications up to 90% smaller and up to 20% faster. ProGuard also provides minimal protection against reverse engineering by obfuscating the names of classes, fields and methods.

6.2 Implementation Details

6.2.1 Simulation Parameters

The Android SDK includes a virtual mobile device emulator that runs on your computer. The emulator lets you prototype, develop and test Android applications without using a physical device.

Unit Testing

This is the first level of testing. In this different modules are tested against the specifications produced during the design of the module. During this testing the number of the arguments is compared to input parameters, matching of parameter and arguments etc. All five modules are checked separately, each test case is given to each unit and it is checked. The result is checked to see if the actual outcome is same as the expected outcome. A unit test is also called a module test because it tests the individual units of code that comprise the application. Each test validates a single module that was built to perform a certain task with the expectation that it will behave in a specific way. During this testing the number of the arguments is compared to input parameters, matching of parameter and arguments etc. All five modules are checked separately, each test case is given to each unit and it is checked. The result is checked to see if the actual outcome is same as the expected outcome. A unit test is also called a module test because it tests the individual units of code that comprise the application. Each test validates a single module that was built to perform a certain task with the expectation that it will behave in a specific way.

Integration testing

Integration testing is a process where all the separate modules are combined together and its working is checked. There are two approaches to this : bottom-up and top-down integration. At first the branch, semester and grade selection modules are integrated and checked. Top-down approach is being used in this software testing.

User acceptance testing

User acceptance of a system is the factor for the success of any system. The system under consideration is tested for the user acceptance by constantly keeping in touch with the prospective system user at the time of developing wherever required.

- Input screen design.
- Output screen design.
- Online message to guide the user.
- Format of the reports and other outputs

Functional Testing

Functional testing ensures that the application is working as per the requirements. Most of the test conducted for this is driven by the user interface and call flow

Performance Testing

This testing process is undertaken to check the performance and behavior of the application under certain conditions such as low battery, bad network coverage, low available memory, simultaneous access to application's server by several users and other conditions. Performance of an application can be affected from two sides: application's server side and client's side. Performance testing is carried out to check both.

Memory Leakage Testing

Memory leakage happens when a computer program or application is unable to manage the memory it is allocated resulting in poor performance of the application and the overall slowdown of the system. As mobile devices have significant constraints of available memory, memory leakage testing is crucial for the proper functioning of an application

Interrupt Testing

An application while functioning may face several interruptions like incoming calls or network coverage outage and recovery. The different types of interruptions are:

- Incoming and Outgoing SMS and MMS
- Incoming and Outgoing calls
- Incoming Notifications
- Battery Removal
- Cable Insertion and Removal for data transfer
- Network outage and recovery
- Media Player on/off

An application should be able to handle these interruptions by going into a suspended state and resuming afterwards.

Usability testing

Usability testing is carried out to verify if the application is achieving its goals and getting a favorable response from users. This is important as the usability of an application is its key to commercial success (it is nothing but user friendliness). Another important part of usability testing is to make sure that the user experience is uniform across all devices. This section of testing hopes to address the key challenges of the variety of mobile devices and the diversity in mobile platforms/OS, which is also called device fragmentation. One key portion of this type of usability testing is to be sure that

there are no major errors in the functionality, placement, or sizing of the user interface on different devices.

Installation testing

Certain mobile applications come pre-installed on the device whereas others have to be installed from the store. Installation testing verifies that the installation process goes smoothly without the user having to face any difficulty. This testing process covers installation, updating and uninstalling of an application

Security Testing

Security Testing: To check for vulnerabilities to hacking, authentication and authorization policies, data security, session management and other security standards.

Results

Testing Parameters	Expected Output	Actual Output	Result
Authentication	Authenticate user by validating credentials from API	User is Authenticated	Pass
Fetch Faculty Timetable	Fetch faculty time-table from the API	Time-table fetched and stored locally	Pass
Fetch Class Timetable	Fetch class time-table from the API	Time-table fetched and stored locally	Pass
Fetch Class Location	Fetch class location from the API	class location displayed	Pass
Check Faculty Availability	fetch available faculty from the database	displayed available faculty	Pass
Admin Portal Authentication	Authenticate Admin	Credentials Validated	Pass
Admin Portal-Update/modify Database	Changes should reflect in the app	Data Changed	Pass

Table 6.1: Test-Cases

Name of Test	API Level	Test Result
Unit testing	Lollipop , Nougat	Pass
Integration testing	Lollipop , Nougat	Pass
User Acceptance testing	Lollipop , Nougat	Pass
Functional testing	Lollipop , Nougat	Pass
Usability testing	KitKat , Nougat	Pass
Memory Leakage testing	Marshmallow , Nougat	Pass
Performance testing	KitKat , Nougat	Pass
Interrupt testing	Marshmallow , Nougat	Pass
Installation tests	Lollipop , Nougat	Pass
Security Testing	Lollipop , Nougat	Pass

Table 6.2: Test-Results

6.2.2 Sample coding

Listing 6.1: Retrofit Interface

```

1 package com.notadeveloper.app.blackboard
2
3 import com.facebook.stetho.okhttp3.StethoInterceptor
4 import io.reactivex.Observable
5 import okhttp3.OkHttpClient
6 import retrofit2.Retrofit
7 import retrofit2.adapter.rxjava2.RxJava2CallAdapterFactory
8 import retrofit2.converter.moshi.MoshiConverterFactory
9 import retrofit2.http.Field
10 import retrofit2.http.FormUrlEncoded
11 import retrofit2.http.POST
12
13 interface RetrofitInterface {
14     @FormUrlEncoded
15     @POST("login")
16     fun authUser(@Field("user") user: String, @Field("pass") pass: String): Observable<
        Faculty>
17
18     @FormUrlEncoded
19     @POST("getfacultytimetable")
20     fun getfacultytimetable(@Field("user") user: String, @Field("pass") pass: String,
        @Field("id") id: String): Observable<timetable>
21
22     @FormUrlEncoded
23     @POST("getclasstimetable")
24     fun getclasstimetable(@Field("user") user: String, @Field("pass") pass: String, @Field(
        "class") class: String): Observable<timetable>
25
26     @FormUrlEncoded
27     @POST("getavailablestaff")

```

```

28 fun getavailablestaff(@Field("user") user: String, @Field("pass") pass: String, @Field
    ("day") day: String, @Field("hour") hour: String): Observable<List<String>>
29
30 companion object Factory {
31 fun create(): RetrofitInterface {
32 val retrofit = Retrofit.Builder()
33 .addCallAdapterFactory(RxJava2CallAdapterFactory.create())
34 .addConverterFactory(MoshiConverterFactory.create().asLenient())
35 .client(OkHttpClient.Builder().addNetworkInterceptor(StethoInterceptor()).build())
36 .baseUrl("http://blackboard.xyz/")
37 .build()
38 }
39 }
40 }

```

Listing 6.2: Faculty Dashboard

```

1 <?xml version="1.0" encoding="utf-8"?>
2 <RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"
3 xmlns:app="http://schemas.android.com/apk/res-auto"
4 xmlns:tools="http://schemas.android.com/tools"
5 android:id="@+id/activity_main"
6 android:layout_width="match_parent"
7 android:layout_height="match_parent"
8 android:paddingBottom="@dimen/activity_vertical_margin"
9 android:paddingLeft="@dimen/activity_horizontal_margin"
10 android:paddingRight="@dimen/activity_horizontal_margin"
11 android:paddingTop="@dimen/activity_vertical_margin"
12 tools:context="com.example.lenovo.bb.HodActivity">
13
14 <Button
15 android:text="Available staff"
16 android:layout_width="match_parent"
17 android:layout_height="wrap_content"
18 android:layout_below="@+id/button"
19 android:theme="@style/button"
20 android:id="@+id/button2" />
21
22 <Button
23 android:text="class location"
24 android:layout_width="match_parent"
25 android:layout_height="wrap_content"
26 android:layout_below="@+id/button2"
27 android:theme="@style/button"
28 android:id="@+id/button3"
29 />
30
31 <Button
32 android:text="class time table"

```

```

33 android:layout_width="match_parent"
34 android:layout_height="wrap_content"
35 android:id="@+id/button4"
36 android:layout_below="@+id/imageView2"
37 android:theme="@style/button"
38 android:layout_centerHorizontal="true"
39 />
40
41 <ImageView
42 android:layout_width="wrap_content"
43 android:layout_height="wrap_content"
44 android:src="@drawable/blckbrdcover"
45 android:id="@+id/imageView2"
46 android:adjustViewBounds="true"
47 android:scaleType="fitXY"
48 android:layout_alignParentTop="true"
49 android:layout_alignParentLeft="true"
50 />
51
52 <Button
53 android:text="Staff time table and responsibilities"
54 android:layout_width="match_parent"
55 android:layout_height="wrap_content"
56 android:id="@+id/button"
57 android:theme="@style/button"
58 android:layout_below="@+id/button4"
59 android:layout_alignParentLeft="true"
60 android:layout_alignParentStart="true" />
61 </RelativeLayout>

```

6.2.3 Screen Shots

Faculty Login (fig6.1)

Every faculty whomsoever install the application will have to provide its email-id, password and phone number during its one time registration process. These informations are first matched with the online database and then stored in mobile database.

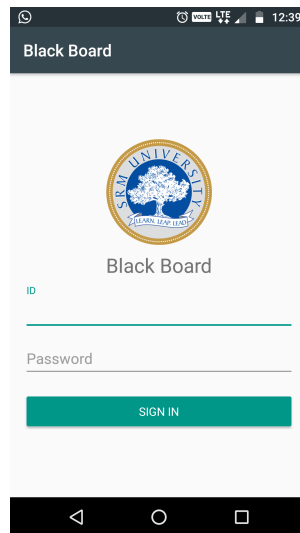


Figure 6.1: Faculty Login

Faculty Dashboard (fig6.2)

All information related to the particular person available in one application. Faculty can check his/her timetable, class location, class timetable with the click of a button.

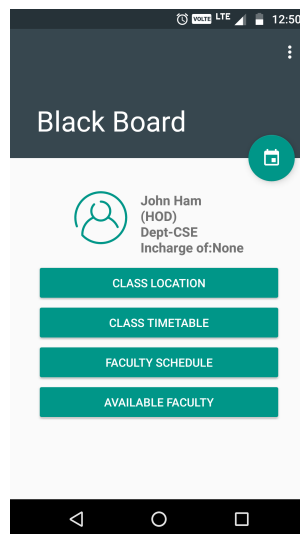


Figure 6.2: Faculty Dashboard

Check available faculty (fig6.3)

Hod can easily check the available faculty by selecting the day and hour.



Figure 6.3: Check Available Faculty

Faculty Timetable (fig6.4)

The Hod can check the timetable of a particular faculty by querying the database.



Figure 6.4: Faculty Timetable

Check Class Timetable (fig6.5)

The faculty can check the timetable of a particular class by selecting the year, section of the class.

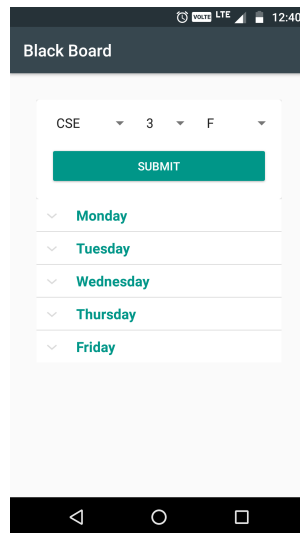


Figure 6.5: Class Timetable

Class Location (fig6.6)

The faculty can check the location of a particular class by selecting the dept, year, section of the class

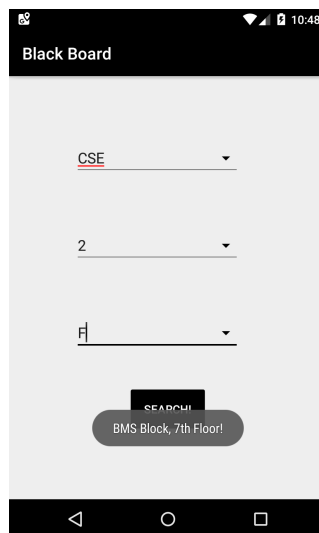


Figure 6.6: Class Location

Admin Login (fig6.7)

Login page for the Webportal where admin can login to change data.

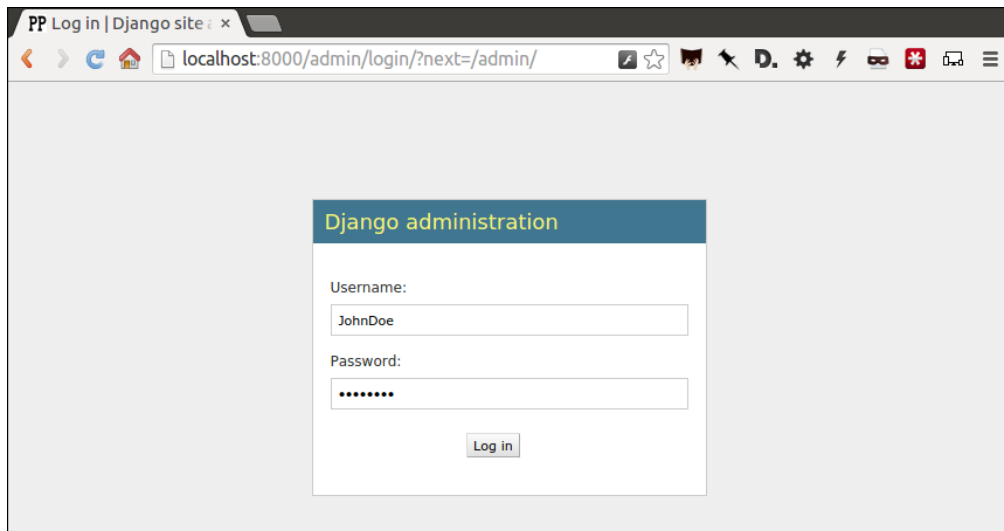


Figure 6.7: BlackBoard Admin Login

Admin Dashboard (fig6.11)

Dashboard for the admin Webportal where database can be modified/updated/added/deleted.

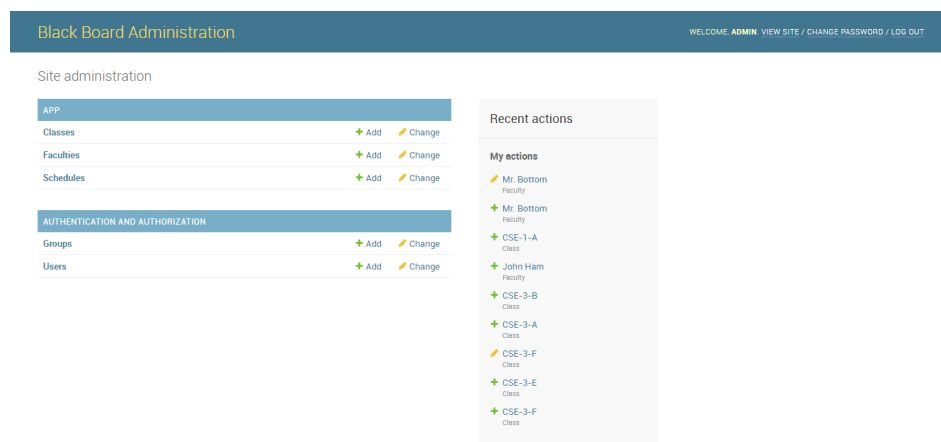


Figure 6.8: BlackBoard Admin Dashboard

Black Board Administration

WELCOME, ADMIN / VIEW SITE / CHANGE PASSWORD / LOG OUT

Home / App / Classes / Add class

Add class

Location:

101

Choose Class Location

Dept:

CSE

Choose Department of the Class

Year:

2

Choose Year Of The Class

Section:

B

Choose Section Of The Class

Save and add another

Save and continue editing

SAVE

Figure 6.9: BlackBoard Admin- Add Class

Black Board Administration

WELCOME, ADMIN / VIEW SITE / CHANGE PASSWORD / LOG OUT

Home / App / Faculties / Add faculty

Add faculty

Faculty id:

Enter Faculty's College ID Number

Name:

Enter Faculty's Name

Email:

Enter Faculty's Email

Password:

123456

Enter Faculty's Password

Phone:

Enter Faculty's Phone

Dept:

ECE

Choose Faculty's Dept

Faculty type:

HOD

Choose Faculty's Designation

Incharge of:

CSE-3-B

SCHEDULES

Figure 6.10: BlackBoard Admin-Add Faculty

Black Board Administration

WELCOME, ADMIN / VIEW SITE / CHANGE PASSWORD / LOG OUT

Home / App / Faculties

Select faculty to change

ADD FACULTY +

Q

Search

Action:

 Go 0 of 2 selected

<input type="checkbox"/>	FACULTY ID	DEPT	NAME	EMAIL	PASSWORD	PHONE	FACULTY TYPE	INCHARGE OF
<input type="checkbox"/>	6969	CSE	John Ham	j@j.com	123456	9999999999	HOD	-
<input type="checkbox"/>	1	EEE	Mr. Bottom	bottom@gmail.com	123456	2365436563	PROFESSOR	CSE-3-B

2 faculties

FILTER

By dept

All

CSE

ECE

IT

EEE

CIVIL

MECH

By faculty type

All

DEAN

HOD

PROFESSOR

Figure 6.11: BlackBoard Admin-faculty list

6.3 Summary

The mobile application, incorporating the college management system, is a very effective tool which can be used for improving the overall efficiency in a college/university. During these tests, the number of arguments are compared to input parameters, matching of parameters and arguments etc.

The Application was tested on an emulator which lets you prototype, develop and test Android applications without using a physical device. The application performed extremely well in low resource environments where the storage space and network connection is slow. Memory leaks were detected and resolved during development using Leak Canary, Proguard has been used to optimize the code(remove unused resources) and also to obfuscate the core logic for security.

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 Conclusion

The mobile application, incorporating the college management system, is a very effective tool which can be used

for improving the overall efficiency in a college/university. The proposed mobile application portability and ease in use increases its credibility compared to other state-of-art methods.

7.2 Future Enhancement

We plan to add another log-in for students where they can share documents related to subjects and also view their marks, attendance and all relevant information. This is only currently being implemented for our college. In the future, we plan to take it to various other colleges and institutions

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