

Implementation of MVC (Model-View-Controller) Architectural to Academic Management Information System with Android Platform Base

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ABSTRACT

It is really a critical factor for an organization nowadays to have an advance information system, which is especially in the terms of service and information for Educational purpose. Therefore the existence of an Academic Management Information System-based mobile application on android platform could make the process of education information service can take place effectively and efficiently since the information can be accessed anywhere.

MVC is a method for making an application by separating data (model) from the view (View) and how to process it (Controller). MVC separates the development of applications based on the key components to build an application such as data manipulation, user interface, and the portion that controls in an application for MVC using the application easier to maintain and develop[1]

General Terms

Implementation MVC, Android Platform, Web Service JSON

Keywords

MVC, Architecture MVC, Android, JSON, Web Service

1. INTRODUCTION

Management information systems are part of the internal business control that includes the use of human resource, documents, technologies, and procedures by management accounting to solve business problems such as the cost of the product, service, or a business strategy[2].

Academic Management Information System is a resource which is related to academic issues and mostly used as a source of information in colleges. Academic management information system using Internet technology resulted academic management information system can be accessed inside or outside the campus, and even around the world through the medium of a computer or Internet-connected gadgets

Academic Management Information System is a resource which is related to academic issues and mostly used as a source of information in colleges. Academic management information system using Internet technology resulted academic management information system can be accessed inside or outside the campus, and even around the world through the medium of a computer or Internet-connected gadgets. In line with the technological development of mobile phones and tablets that have advanced features in accessing the Internet, an academic management information system can also be developed to make the application of the Academic Management Information System-based mobile application.

As we have aware, mobile phones and tablets nowadays are using the Android platform which provides an open platform for developers to create an application that is needed.

Academic Management Information System Applications based mobile application on the Android platform is used to create an efficient environment for both students and lectures. However, there is also a development for the variety of mobile devices with various brand, we therefore required the a technology which allow the exchange of data between platforms.

If each platform has a different native programming, then to access the same data source will need various ways depending on the platform used, however these will cause the data development slower than expected.

Academic management information system application on android platform has the advantage that it can be used by students in mobile android device and certainly more efficient than the application of academic management information system desktop and web based.

Based on MVC architecture, academic management information system applications can be developed further to multiple clients (view) different mobile platforms such as the blackberry, windows phone or iOS

2. MVC (Model-View-Controller)

Architectural MVC (Model-View-Controller) will be used in making a project application that aims to develop great software that will be easy to maintenance and repair as well as giving additional code or reducing code.[3] In the process of developing academic management information system based android platform, each layer in the architectural of MVC (Model-View-Controller) will be implemented differently such as MySQL database serves as a model, based on the Android platform will be the user interface view, and JSON web service as a controller. Below is a general description of the system of academic management information system that has been built using the implementation of the MVC architecture (Model-View-Controller) in which each element has a role in making each of these applications.

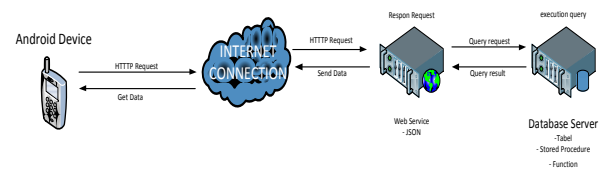


Figure 1 System Overview

System overview above has shown Architectural MVC (Model-View-Controller), which the the role of each of the elements above is the model, view, and controller :

1. Model
The database role are:
 - a. Receive generating query parameters sent by the web service
 - b. Executing queries raised.
 - c. Sending query results back to the web service.
2. View
The role of the android device applications are:
 - a. lay out setting for the application which will be made
 - b. Receiving feedback or input from the user
 - c. Presenting / provide information to the user
3. Controller
Web Service Role is
 - a. Receive variable input from the user, compile them into parameters that will form a query.
 - b. Calling a stored procedure or function, while sending query compiler parameters.
 - c. Catch the query execution results delivered by the model / database.
 - d. Regulate the process of presenting the information to be sent to the component view

2.1 Model

The model is a component that is used to retrieve data from the database / data sources. Functions contained in the Model will be called by the Controller. Academic Management Information System applications that serve as a model here is the database where the database used is MySQL.

MySQL is a database program that is accessed the network so it can be used for the application of Multi User

2.2 View

View is a component that is responsible for the presentation to the user. View displays the data acquired by Controller. In Academic Management Information System Applications development that act as view here is the user interface based on paltorm android mobile application. User Interface on android built using objects from View and ViewGroup[4]

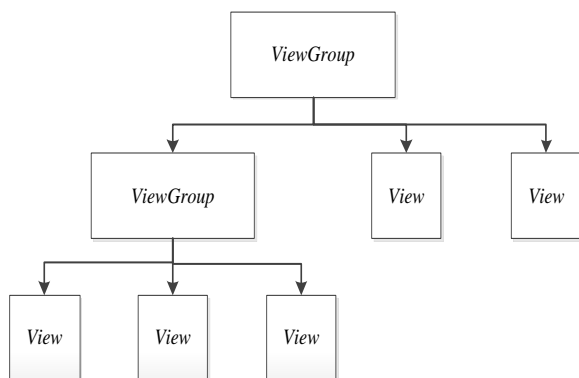


Figure 2 Architectural of Android user interface

Development Base to make User Interface on Android platform is the View. The object of the View that serves as a user interface is determined as Widget. View class is responsible to serve as base to subclass widgets, which offers the entire user interface objects such as text fields and buttons. ViewGroup class handles subclass layout, which offers various kinds of layout architecture[5]

2.3 Controller (JSON)

Controller is a component that serves to invoke a function in the model and send the results via the View, Controller also taking input from the user which would then be processed by the Model

JSON (JavaScript Object Notation) is a data exchange format that is lightweight so that it will be easier to be read and written by the user, it will also be able to be translated and generated by the computer. JSON is an independent text format which apply common language and not require any special language programming[5]

JSON (JavaScript Object Notation) using the following form[5]:

1. Object is a pair of name / value which is not classified. Object begins with the symbol "{" (open brace) and ends with "}" (curly braces). Each name is followed by a ":" (colon) and any name / value pairs separated by "," (comma).

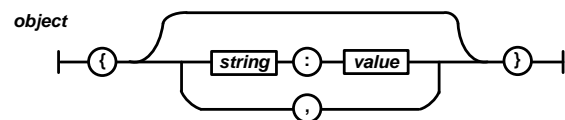


Figure 3 writing format for JSON Object

2. Array is a collection of in series value. Array begins with "[" (open bracket) and ends with "]" (square brackets lid). Each value is separated by "," (comma)

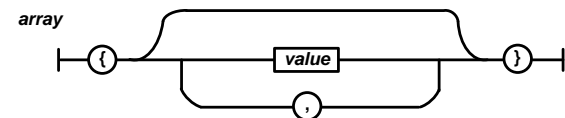


Figure 4 Array writing Format

3. IMPLEMENTATION

Implementation of MVC architecture in the Academic Management Information System Applications (SIMAK) development was started from database model design, web service to retrieve data that consists of php script and queryMySQL design, user interface design for mobile application based on the Android platform

3.1 Model Design Database

The database is an Implementation Model of the MVC architecture (Model-View-Controller) of the academic management information system applications. Here's a context diagram, data flow diagram (DFD) and the general design of the database management information systems academic

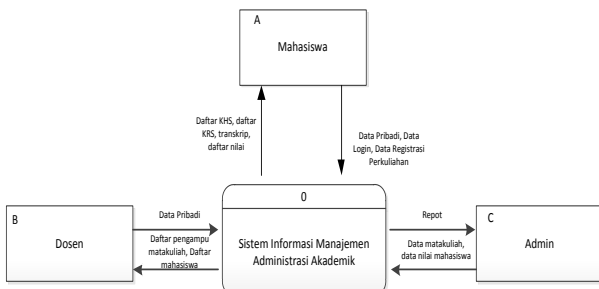


Figure 5 Context Diagram

Context diagram in Figure 5 can be explained from the application of management information systems, and has three entities which are c students, lecturer and administration. Students can view their academic information in the form of student personal data, login and classes registration, from academic management information systems will provide a list of KHS, KRS lists, transcripts and their marks for each subject taken. Administration is able to amend the data of each subjects and each student's mark, then the academic management information system will give report back to the administration. Lecturers are able to insert, view and edit personal data and the system will also be able to provide information for each subject participants and students lists.

Figure 6 is a level 0 DFD of academic management information system. Based on DFD level 0 students' entity connected with the student registration module, view grades, data updates, view academic transcripts, view KHS. Lecturers' entities connected to data updates, view a list of students, view the course. Admin entities connected to the module data input. As mentioned earlier in the context diagram, DFD level 0 is a system general design of academic management information, however the application is made for students' use only

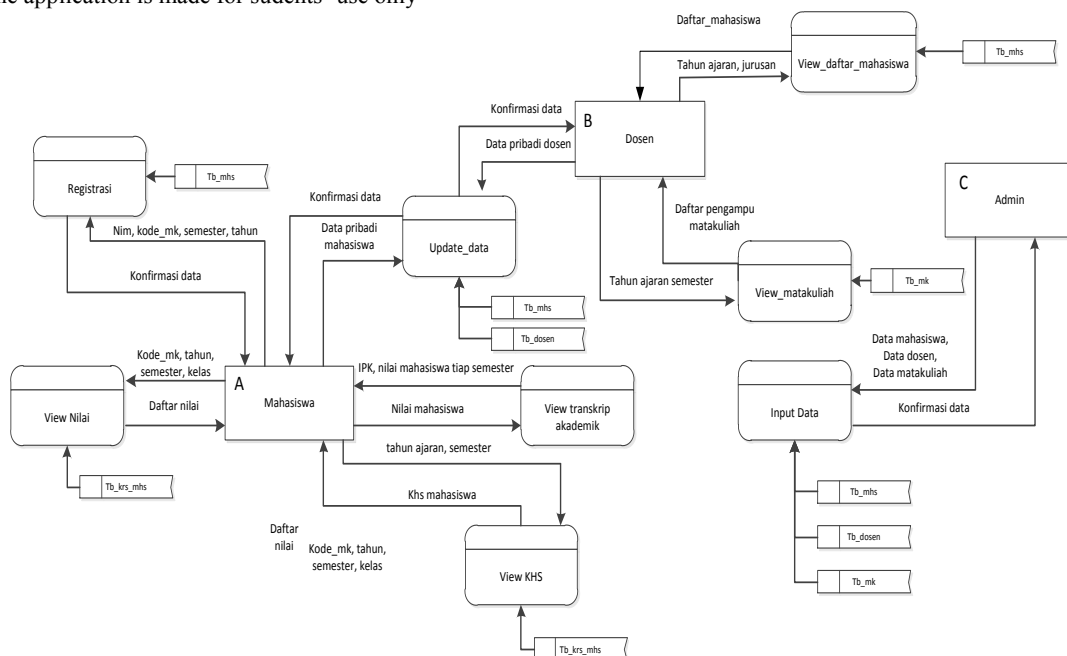


Figure 6 DFD Level 0

3.2 Webservice Design

In the implementation of the MVC architecture, web service has a role as a controller. Web Service design is aimed to retrieve data from a php script and query MySQL.

Lecturers and admin will have different applications but still the same academic management information

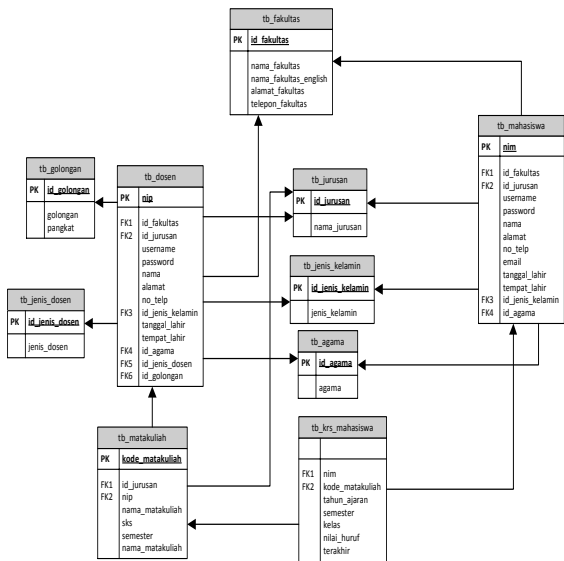


Figure 7 Database Model Design

From database model design in Figure 7, there are 3 main tables **tb_dosen**, **tb_mahasiswa** and **tb_matakuliah** which are the core of management information systems, there are several academic and master tables normalized results of the three main tables above are **tb_golongan**, **tb_jenis_dosen**, **tb_agama**, **tb_jurusan**, **tb_jenis_kelamin**, and **tb_krs_mahasiswa**.

Webservice which is used in this application is to JSON. Herewith script sample program on the implementation of the web service JSON

```
function db_query($sql){
    $link =
mysql_connect("localhost","root","");

    mysql_select_db("db_akademik",$link);
    return mysql_query($sql,$link);
}

if($_GET[action]=="krs_semester"){
    $return_arr = array();
    $query = db_query("
SELECT
tb_krs_2008.tahun_ajaran, tb_krs_2008.semester,

    tb_krs_2008.kode_matakuliah,
tb_matakuliah.nama_matakuliah,

    tb_matakuliah.sks, tb_krs_2008.kelas

FROM tb_krs_2008, tb_matakuliah
WHERE
tb_krs_2008.nim='$_GET[nim]' AND
tb_krs_2008.semester='$_GET[seme
ster]'

AND
tb_krs_2008.kode_matakuliah=tb_matakuliah.kode_
matakuliah");

    while ($row =
mysql_fetch_array($query, MYSQL_ASSOC)) {

        $row_array['tahun_ajaran'] =
$row['tahun_ajaran'];

        $row_array['semester'] =
$row['semester'];

        $row_array['kode_matakuliah'] =
$row['kode_matakuliah'];

        $row_array['nama_matakuliah'] =
$row['nama_matakuliah'];

        $row_array['sks'] = $row['sks'];
        $row_array['kelas'] = $row['kelas'];

        array_push($return_arr,$row_array);
    }
    echo json_encode($return_arr);
}
}
```

Program code above is a webservice code that contains the command to display the student GPA in one semester, in which to receive the data and display it again using json array format.

The results of a database query stored in an array and at the end of the program syntax echo json_encode (\$ return_arr), the array is placed in a variable \$ return_array and converted into a format json array, to perform test whether webservice is already well try to access by web browser and sending the required parameters through a browser URL as shown in the picture. URL accessed are:

http://localhost/ws_simakft/krs_mhs.php?action=krs_semester&nim=0804505070&semester=2

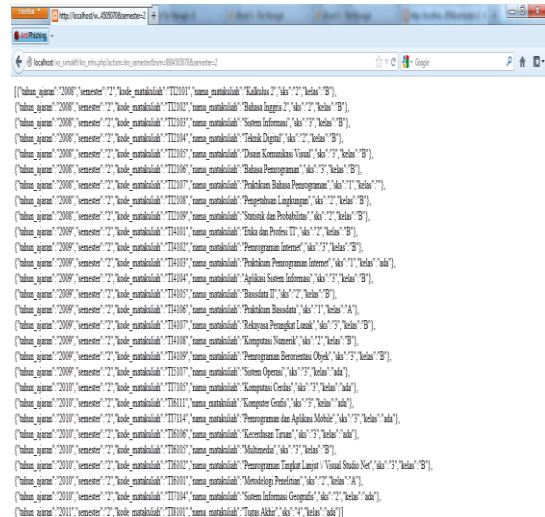


Figure 8 result from web service trial in browser

The data will be seen as follows

```
[{"tahun_ajaran":"2008","semester":"2","kode_ma
takiliah":"TI2101","nama_matakuliah":"Kalkulus
2","sks":"2","kelas":"B"},
.
.
.
{"tahun_ajaran":"2011","semester":"2","kode_mat
akuliah":"TI8101","nama_matakuliah":"Tugas
Akhir","sks":"4","kelas":"ada"}]
```

Feedback indicating that the data sent has contained array json format

```
if($_GET[action]=="insert_matakuliah"){
    $input =
file_get_contents('php://input');
    $jsArray =
json_decode($input);
    $sql = "INSERT INTO
tb_krs_20$angkatan[tahun]
(nim,
tahun_ajaran, semester, kode_matakuliah, kelas)
VALUES
('".$jsArray[0]->{'nim'}."',
'".$jsArray[0]->{'tahun_ajaran'}."',
'".$jsArray[0]->{'semester'}."',
'".$jsArray[0]->{'kode_matakuliah'}."',
'".$jsArray[0]->{'kelas'}.'"
);
    echo"$sql";
    db_query($sql);
}
```

The next implementation is sending data in JSON format, Web Service JSON will receive data in its required format data which will then discussed further in android application. In Web Service, Array will be divided and will be modified to match with the Value in Query MySQL so that will be in line with value in the table

3.3 Android Design

Based on MVC architecture, android design will act as a view as android itself is a user interface of academic management information system application. The future design of the application of management information academic system herein consists of the XML file, Class is connection with JSON and modifications of android manifest.

KRS design feature will make the KRS data appear as table and in order to perform the data, is required to have Class to be able to send and receive data from Web Service as shown in the following



Figure 9 example of tables in android view

```
public static String retrieveJsonStr(String url) throws IOException{
    DefaultHttpClient client = new DefaultHttpClient();
    HttpGet getRequest = new HttpGet(url);
    HttpResponse getResponse = client.execute(getRequest);
    HttpEntity getResponseEntity = getResponse.getEntity();
    return EntityUtils.toString(getResponseEntity);
}

private void tampil_krs(String data) {
    data="action=krs_tahun_semester&nim="+nim_tampil+"&tahun_ajaran="+tahun_ajaran+"&semester="+tid_semester;

    String url = "http://10.0.2.2/ws_simakft/krs_mhs.php?" + data;
    try {
        String source = retrieveJsonStr(url);

        JsonParser p = new JsonParser();
        JSONArray jsArray;

        jsArray = p.parse(source).getAsJSONArray();

        String[] option = new String[jsArray.size()];
        String[] jumlah_sks = new String[jsArray.size()];

        int total_sks = 0;

        for (int i=0;i<jsArray.size();i++){
            JsonObject jo = jsArray.get(i).getAsJsonObject();
            option[i] = jo.get("nama_matakuliah").getAsString();
```

```
                jumlah_sks[i] = jo.get("sks").getAsString();

        t1 = new TextView(this);
        t2 = new TextView(this);

        t1.setText(option[i]);
        t2.setText(jumlah_sks[i]);

        final TableRow row = new TableRow(this);
        row.addView(t1);
        row.addView(t2);

        table.addView(row, new TableLayout.LayoutParams(
            LayoutParams.WRAP_CONTENT,
            LayoutParams.WRAP_CONTENT));
    }
}
}
```

4. RESULT

From the implementation results of the MVC architecture described above can be explained some of the test results on android device. Initial menu of the academic management information system is the login menu. At the login menu there is a user id, username and password. The application will send the value of the userid, username and password to the webservice, the webservice then will check in its database whether the data in the parameter is match. If the data is not found, then the program will be error and raises alerts that the username and password is incorrect

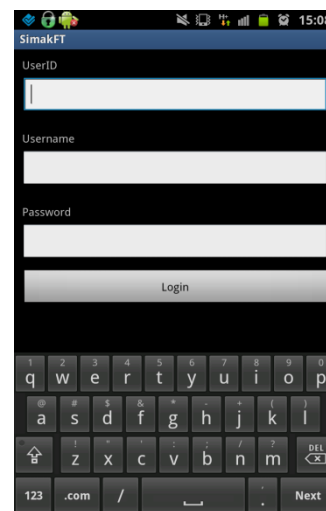


Figure 10 Menu Login Design

After the user logs in, the academic management information system main menu will appear as shown in Figure 11 . For example, a user wants to see his/her own mark on a certain subject, the user then select option of spinner in the menu of the subject mark list

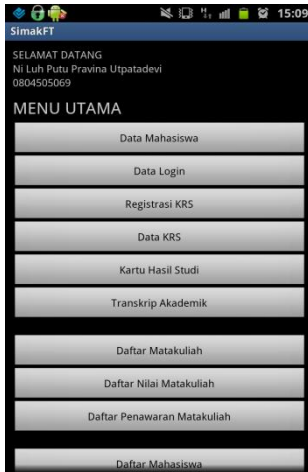


Figure 11 The main menu of academic management information system

To display a list of subjects, application sends some parameter values based on the options selected by the user in advance, such as in Figure 12

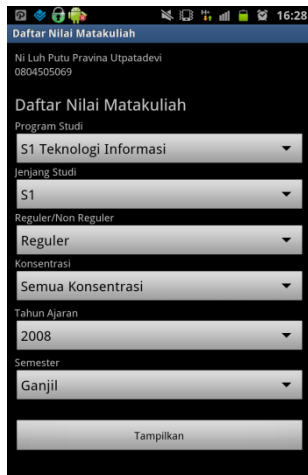


Figure 12 Some options in the subjects mark list display

To display a list of subjects, application sends some parameter values based on the options selected by the user in advance, such as in Figure 12

Nama Mahasiswa	Nilai
Ni Made Ari Lestari	A
Ni Nyoman Trisna Jayanti	B
Agus Anwar Eka Wahyudi	C
Ida Bagus Yogi Pratama	B
I Made Bagus Wisnu DS	C
Made Dwiki Wirya Suharta	B
I Dewa Nyoman Anom A Manuaba	A
Nanda Irawan	C

Figure 13 Subject Marks display list

Once the user selects a list of subjects he wants to view, the subjects list will be displayed in the form of data grid. To have the subjects mark list display, previously chosen parameter will be added by subjects code then the application will send the request to web service. After that, the web service will send back the request in the form of subject marks list as shown in figure 13

5. CONCLUSION

Academic management information system with android based has been successfully created with the implementation of the MVC architecture (Model-View-Controller) which database serves as Model, android act as view and JSON web service as Controller. Architectural MVC (Model-View Controller) separates the major components in the development of an application such as data manipulation, user interface display and webservice will be the controller to make sure the application maintained easier in later future

6. ACKNOWLEDGMENTS

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