

# Single Page Application for Business Intelligence Dashboard

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## ABSTRACT

This study develops a single page application (SPA) model which is implemented in the business intelligence dashboard at the Sriwijaya State Polytechnic. The technology used in this research is AJAX on the client side, and RESTful web service on the server side. Several HTTP methods such as GET, PUT, POST, and DELETE can be easily implemented in a RESTful web service. Information generated from RESTful web services can be used as a reference in providing information to be displayed in web pages dynamically without having to reload web pages using AJAX. The information obtained from this RESTful web service then can be visualized in the form of tables and graphs on the Business Intelligence application dashboard. The results of this study indicate that the SPA model can provide a variety of information needed in a web page.

**Keywords:** Single Page Application, RESTful Web Service, Business Intelligence

## 1. INTRODUCTION

The use of the internet today as a medium for disseminating information is very widespread. One application that runs on a web network is a web application. With this web application, it is possible to disseminate information in the form of text, links, audio, and video that can be easily accessed. The consequence that arises from implementing web applications is repeated bandwidth usage when loading information on web pages. One type of application that is currently being widely used by organizations is Business Intelligence (BI) [12]. This BI application is used to analyze reports related to business activities carried out.

The concept of Single Page Application (SPA) using Javascript, HTML, and AJAX is one of the features that can be used in developing web applications by minimizing bandwidth usage and processing information in web pages faster. SPA makes the request and response process more efficient as the interaction between the server and client in accessing web pages. Database operations in the form of CRUD (create, read, update, delete) can be performed without having to

reload the web page. This allows it to be done using AJAX technology on the client side and RESTful web services on the server side.

This study aims to build a Business Intelligence (BI) application model that can be used by top management at the Sriwijaya State Polytechnic in the decision-making process and strategic planning. The technology used to support BI application implementation is Single Page Application (SPA) technology using AJAX and RESTful web service technology in providing distributed and cross-domain data sources.

## 2. LITEARUTER REVIEW

### 2.1. Business Intelligence

Business intelligence (BI) is a system consisting of technical and organizational elements that provides users with historical information for analysis and enables effective decision making and management support for the main goal of improving organizational performance [6]. Business Intelligence (BI) provides historical data, current data, and is able to make predictions from the point of view of business operations, and generally uses data that comes from various data

sources and is collected in a data warehouse. In BI there are also reporting services, informative data analysis, visualization, and can be developed with various data mining algorithms [7].

The main focus of business intelligence (BI) is to support the decision-making process in an organization [8]. In general, data warehouse technology is used as the main component in the development of business intelligence, and the information displayed can be presented in the form of graphs and diagrams [11]. Bar graphs, line graphs, pie charts are types of graphs that are often used in presenting information in Business Intelligence [12].

The main component in the development of Business Intelligence is the ETL (Extract, Transform, Load) process in the data warehouse stage as shown in Figure 1. The Extract stage is taking data from the data source, the Transform stage is an activity to perform cleansing, aggregation, summarization, and the Load stage is the process for storing data in a data warehouse in the form of a multidimensional database. In general, this ETL stage uses a series of scripts or program code that adapts to the type of database management system (DBMS) or other supporting tools in data warehouse development.

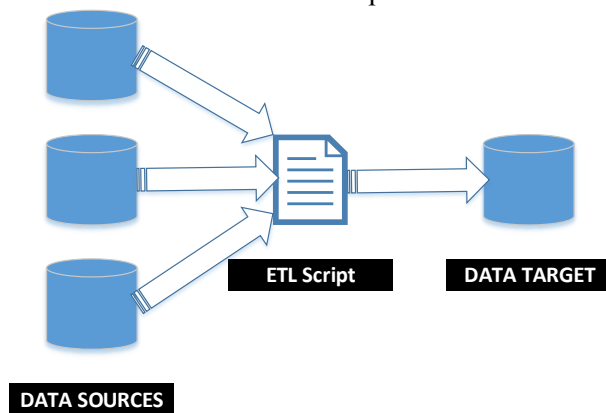


Figure 1 ETL Process adapted From [12]

### 2.2 Single Page Application

The concept of Single Page Application (SPA) refers to a web application that only displays information on one page. This means that even if the user switches to another menu, the URL in the web application does not show the change. The components and content of the web page are loaded dynamically depending on the interaction needs or user requests [1]. In this interaction, the server side simply sends and updates certain sections according to user requests so as to save bandwidth. With the small bandwidth used in this SPA concept, it will

provide a high response and convenience for users [2]. SPA is implemented in an HTML page and some javascript files are loaded in a web page on demand [3].

### 2.3 AJAX Technology

AJAX (Asynchronous Java Script and XML) is a technology that uses the HTTP protocol to communicate between the server and client sides in web application development. In contrast to conventional technology in web application development which requires the user to wait for information to be loaded on a web page, using AJAX allows a web page to update its information, without having to reload the web page [4].

### 2.4 RESTful Web Service

RESTful web service is a client/server communication protocol using resources in the form of URIs. RESTful web services use HTTP methods such as GET, PUT, POST, and DELETE for data operations [5]. There are 2 protocols used in web service development, namely SOAP and REST protocols. Meanwhile, in terms of data formats that are exchanged can be in the form of XML and JSON [9]. In its implementation, RESTful web services can be accessed through desktop applications, web applications and mobile applications [10].

## 3. IMPLEMENTATION AND RESULTS

The Business Intelligence application model was developed using a Single Page Application and implemented in a business intelligence application at the Sriwijaya State Polytechnic. AJAX technology and RESTful web services are used in the interaction between the client and server sides. Some of the results of this study can be explained as follows.

### 3.1 Display of Dashboard Page

Figure 2 is a business intelligence dashboard page displaying data in graphical form. The data presented is obtained by sending a request to the server via AJAX from the client side, then the server responds in the form of JSON data through a RESTful web service application which is then sent to the client and loaded on a web page. It can be seen in Figure 1 on the left side of the bar graph information on the number of departments by level, while on the right side there is a pie graph showing department by level accreditation information.

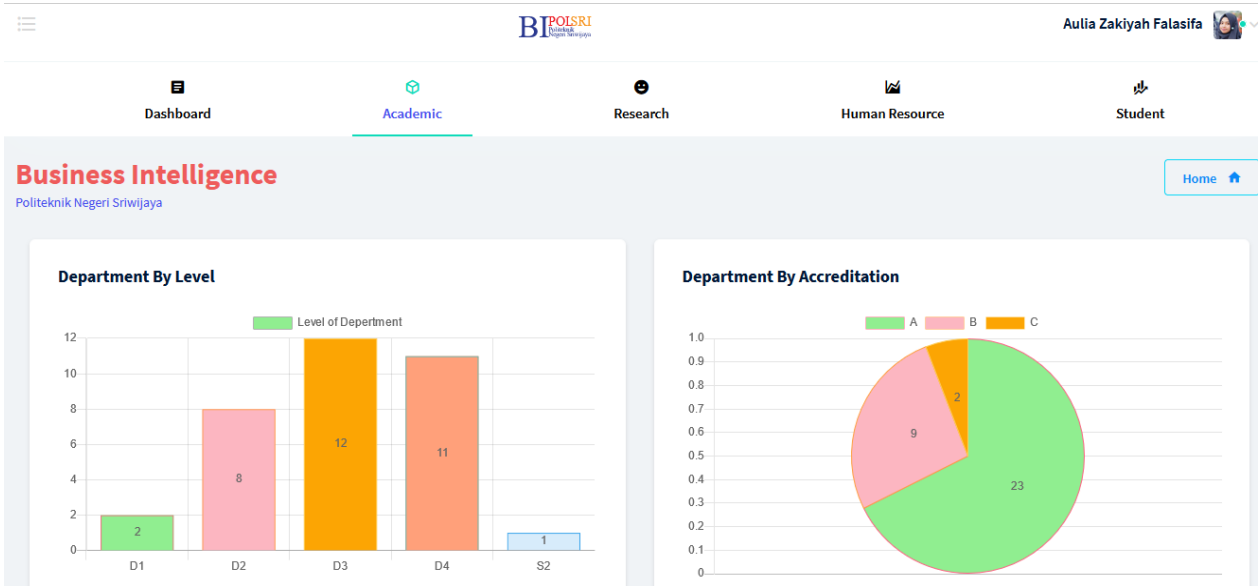


Figure 2 Department Page Display in Graphical Form

Furthermore, Figure 3 displays a web page containing information on lecturer data in tabular form. In this page, JSON data is also sent by the server via a RESTful web service and through the AJAX mechanism the data is loaded in tabular

form, which includes sorting, searching, and paging facilities. This data is important to provide information regarding the total number of lecturer data, and initial information in providing master data.

The 'List Of Lecturer' page includes a search bar and a table with the following data:

ID Lecturer	Lecturer Name	Sex	Email	Spesilazation
1710061982	MUHAMMAD JUNESTRADA DIEM	L		Ilmu Ekonomi
1711061966	ZULFIKRI	L	zulkiifiwancik@yahoo.com	Akuntansi
1715021982	RIMA FEBRIANTI	L	rima_febrianti@yahoo.com	Ilmu Ekonomi
1717081977	AMRI UTAMA	P	amriutama2@gmail.com	Akuntansi
1719051969	HADLI A. HARAHAH	L		Teknik
1721051995	KIRANTI ANDELA PUTRI	P	andelaputrikiranti@gmail.com	Adminstras Bisnis
1721101981	IRWAN JAYA	L	irwan_guide81@yahoo.com	Bahasa Inggris
1726011994	HADI WIJAYA	L	hadi.jedank@gmail.com	Ilmu Komputer
1728021989	RIO PERMATA	L		Ilmu Komputer
1729011967	RUDA ERMANSYAH	L		Airline Reservation

Figure 3 Lecturer Page Display in Table Form

### 3.2 Performance of Application

Figure 4 is the performance of a RESTful web service as seen from the network traffic which is the communication between the client/server. In the picture there are a series of requests that come from the client with the HTTP GET method that accesses 2 domains, namely `https://integrator.polsri.ac.id` and `https://busin.polsri.ac.id`. This request is sent using the AJAX method to request services to the address `https://integrator.polsri.ac.id` which contains several RESTful web services operations, and the resulting information is then visualized in the business

intelligence dashboard located in the `https://busin.polsri.ac.id` in the form of table data or in the form of various kinds of graphic information to make it easier to read the information. With the AJAX method, the information in the web page can be easily updated without having to reload the web page when making a request to the server, and receiving a response from the server.

Because it involves 2 different domains, in developing a RESTful web service on the server side it is necessary to add a cross join mechanism, so that access to resources can be done. Setting this up by adding a script like the following program notation:

```
Header('Access-Control-Allow-Origin: *');
Header('Access-Control-Allow-Headers: *');
Header('Access-Control-Allow-Methods: GET,
POST, OPTIONS, PUT, DELETE');
```

The 1st line is used so that RESTful web services can be accessed from various sources or other domain addresses, while the 2nd line allows RESTful web

service consumers to add header options in their program scripts when making requests, while the 3rd line allows Standard methods of RESTful web services can be accessed from various source domains and applications.

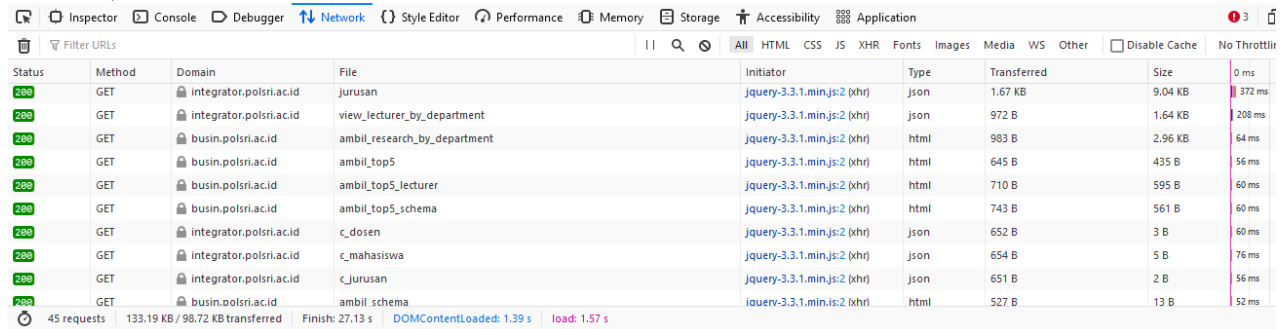


Figure 4 Monitoring Network Implementation of Single Page Application

#### 4. CONCLUSION

Based on the research that has been done, it can be concluded that the Single Page Application (SPA) concept can be used as a model of interaction between client and server by utilizing AJAX technology and RESTful web services. CRUD operations (create, read, update, delete) can be done easily without having to reload web pages repeatedly. These processes are executed indirectly visible to the user, and there is no need to display the detailed stages of execution. The results of the execution in the form of output information in the form of graphs and tables will then be on the web page without showing the process of loading the web page. This makes web applications lighter and faster to respond. From the business intelligence applications that have been produced, it shows that SPA technology is very helpful in providing dynamic data sources, and improving system performance with easy data access and web application response speed.

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