



## **SOA Implementation for Systems Integration Mechanism in two Companies**

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### **ABSTRACT**

Information systems that are implemented using information technology today have become one of the effective support tools for companies to support the smooth running of their business. This technology has also been considered an important resource for companies because it has many benefits in its use. The majority of company information systems use more than 1 application for their business needs. These applications will be more useful if integrated with each other. In this paper, we focus on designing the implementation of integration between 2 applications in 2 different companies using the concept of Service Oriented Architecture. With the implementation of using this concept, it is hoped that each application will become free of dependency and exchange data more efficiently.

**Key words :** Service Oriented Architecture, Integrated System, Web Service, Information System.

### **1. INTRODUCTION**

Implementation of information systems is absolutely essential for companies to support business needs in the current technological era [1] [2]. The fact that a company can manage data using data recording applications in accordance with the needs of each division but does not rule out the possibility that the applications are separate from one another due to different places of implementation that are separated based on their divisions. The case study in writing this thesis is focused on the office automation system in the purchase module in company X and the ERP portal system in the sales module in company Y. Both applications were chosen because so far many features or modules have been integrated. The current

condition is that the integration is only limited to data exchange using data parsing in Json and XML formats. In addition, the addition of new modules based on company needs will always occur and it is very possible for the implementation of intercompany transactions in two separate applications at the two company. Based on these needs and problems, the concept of Service Oriented Architecture can be one good solution for designing the system. Conceptually, SOA is a form of architectural technology that follows the principles of Service orientation (service oriented). This service-orientation concept approaches by dividing large problems into small groups of services that aim to solve certain problems [3]

### **2. PROBLEM STATEMENT AND PRELIMINARIES**

We propose an implementation for integration framework utilizing the Service Oriented Architecture approach. We decide to choose this approach with consideration of this can provide loosely coupled reusable, standards-based, and well-defined services [3]. The integration mechanism involves making a service repository that allows it to be accessed by clients who need it. Service repositories are built using WEB Service with the NodeJS programming language.

#### **2.1 Service Oriented Architecture**

System architecture with the implementation of service-oriented concepts basically will provide basic rules that support the management, development and integration of the system. “Service-oriented architecture can also increase business flexibility and movement in a moving manner by building systems that are accompanied by services that can be used repeatedly” [4].

## 2.2 SOA Characteristic

The characteristics of SOA in general are logical views on a service from business operations that are identified as work functionality independently. Other characteristics can also be a service-oriented message that is connected with the client needed. In addition SOA characteristics can also be a service-oriented description which is generally analogous to such a large function for data processing [5].

## 2.3 Benefits of Service Oriented Architecture

The SOA concept implements a business process that is basically broken down and simplified into smaller services. The goal is if there is a change in the business process, then there is no need to change the whole system but only related services. Of course, with these methods and concepts, the system can quickly adopt and respond to the changes needed. In addition, SOA also has a real responsive time level, which means that if there are changes to rules and business processes, SOA implementation with the ESB model can act on management automatically. This is expected to be able to enforce new business rules or business processes quickly. SOA implementation with a service centric ESB model will be useful in reducing duplication of source code.

## 2.4 Service Oriented Modelling Architecture

SOMA is a software development life cycle method invented and developed by IBM for SOA-based application design [8]. SOMA generally has a description and definition of primary techniques and their role in the SOA project. There are seven main stages in the SOMA framework including business modeling and transformation, solution management, identification, specification, realization, implementation, and evaluation.

## 3. MAIN RESULT

SOMA was chosen as a research method in this paper. That is because SOMA has steps that are suitable for this case study. This section focus on the stages that discuss about the implementation process, start with the application platform used in each company, service identification / declaration. Business processes changes, refine detail components, hardware specifications, and building WEB Service.

### 3.1 Used / Current Application Platform.

This case study is focused on designing the integration mechanism implementation in 2 different applications used by 2 different companies. The first application is the office automation application used by company X and the ERP portal application used by company Y. Following are the details of each related application.

**Table 1:** Detail Used Applications

No	Application Name	Programming Language	Database	Company
1	Office Automation	Java	Oracle DB	X
2	ERP Portal	VB.Net	MySql	Y

From the table 1 we can see that each application from both companies are made by different programming language and even the databases for data storage.

### 3.2 Service Identification

This case study is focused on designing the integration One of the main objectives of the design of the implementation of this integration is the creation of a service repository. Service repositories are useful for accommodating services used for both applications. The services are designed based on functions that exist in both applications, the mechanism is that if there are functions that are called or used repeatedly, then the function can be declared as a service. And it is very possible that one service consists of more than one function or even more than one service. The following are the detailed functions contained in the office automation application.

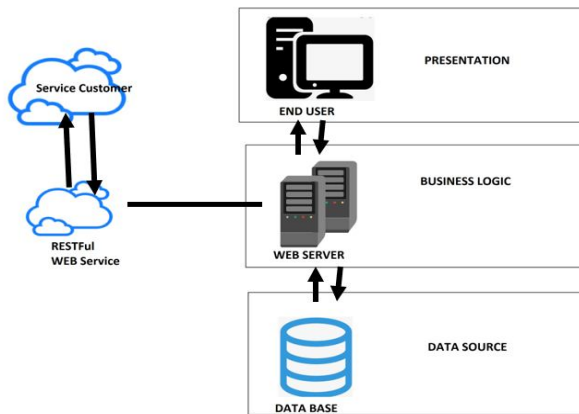
**Table 2:** Detail Service Of Office Automation Application

Office Automation (Portal) PT. X Services :	
1. Purchase Order Management	Input Data Purchase Order, Submit Data Purchase Order, Set Workflow, Release Document, Posting Data Purchase Order into ERP Application
2. Receipt Plan / Demand Management	Get Data Document Purchase Order, Input Data Good Receipt Plan (Based On Document PO), Submit Data Good Receipt Plan, Set Workflow, Release Document, Print Good Receipt Plan Document
3. Good Receipt Verification	Get Data Document Delivery (From Company. Y), Input Receipt Quantity, Submit Data Receipt Quantity, Release Document, Create Document Goods Receipt, Posting data Goods Receipt into ERP Application, Print Goods Receipt document

From table 2, we can see the details of the services that have been identified based on the functions found in the office automation application in company X. These services will be designed and placed in the service repository so that they can be accessed by applications that require them.

### 3.3 Method Adoption Workshop

In the existing design of the SOA concept, it is possible to connect between applications despite different programming languages. This is very suitable when applied to the case study at company X, because the current condition is that office automation applications must be connected and integrated in the ERP portal system at company Y. On the other hand, data retrieval still uses the querying method and the resulting data tends to be the same because at Basically these 2 systems produce 1 transaction cycle simultaneously. Therefore making a restful web service is the right solution to integrate 2 systems that have different programming languages. Here is the conceptual architecture that will be built.



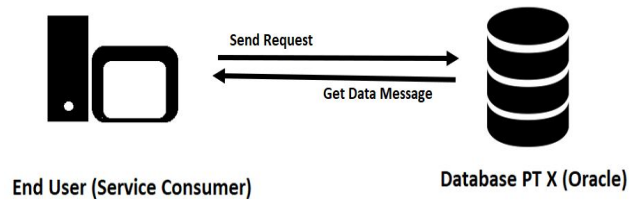
**Figure 1:** Office Automation Conceptual Architecture with RESTful Web Service as Main Technology.

From figure 1 we can see the conceptual architecture of office automation application. Conceptually, the integration mechanism is built with the relationship between the data source, business logic, and presentation layer. These three components will produce data or results that have been processed by the service related to the client or application that requires it.

### 4. CONTROL DESIGN

This section will present some important elements for building a web service. Starting from the integration architecture that uses the web service itself, the old way in the process of data parsing. Conceptually, each company X and company Y will access the same WEB Service. The access mechanism is carried out starting from the application that makes the request for the required service, then it is processed and identified by the service registry and the service provider will present the requested service. Service providers are entities or service provider systems that can be accessed by various applications. Whereas consumer service is a client that requests service as needed to the service registry.

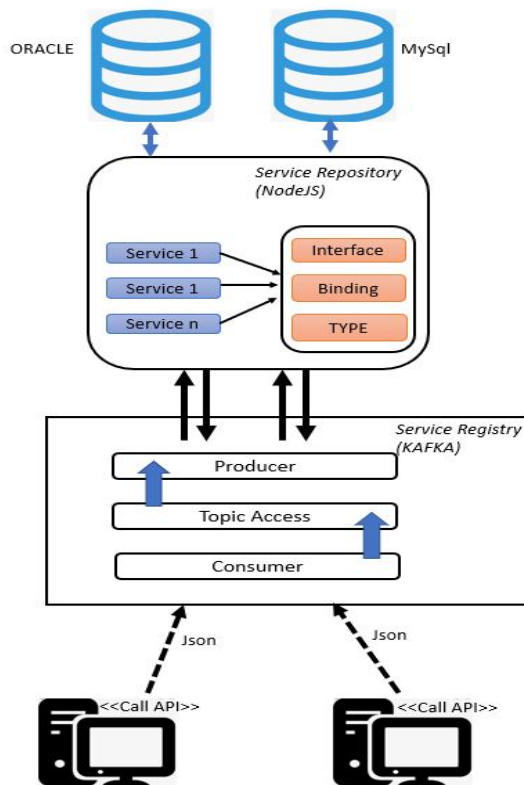
The current condition of data parsing on company X that each user calls a function that is processed using querying activities in the ORACLE database. The process is still using a database in data retrieval and has not yet adopted the API technology via the WEB Service.



**Figure 2:** Old architecture before the implementation of SOA

In figure 2 we can see the detail of old architecture in office automation system before the implementation of SOA concept. In the implementation mechanism of integration using the concept of SOA, the technology used is WEB Service. This technology is used because it has an XML web standard that strongly supports the SOA concept. The XML standard consists of Web Service Definition Language (WSDL), Universal description, discovery, and integration (UDDI), and simple object access protocol. For details of the mechanism, the Office Automation application in company X that is used by the user or can be called a client will request a service by calling a link with API technology and throwing data as its parameters in the form of Json. Then the link along with these parameters will be processed first in the service registry to be registered as data that calls the service this is done in the UDDI section. There are three main elements in the service registry, namely consumer, topic access, and producer. Each of these elements has a function according to their role in service registry. On the other hand, the service registry is built using a technology programming language called Kafka.

Then the process data from UDDI or the service registry is thrown and the process is continued in the service repository or WSDL section. In this section the service is run according to the request requested. If the requested service is available, the service provider will retrieve the relevant data source data as needed. The results of data retrieval or service will be thrown into the service registry and eventually the output will be received again in the User client section. For the new architecture after the implementation of SOA Concept can be seen in figure 3.



**Figure 3:** New architecture after the implementation of SOA

In figure 3 explained about new architecture after the implementation of SOA Concept. Web service is built using the NodeJS programming language. That is because the NodeJS can handle thousands of connections simultaneously with limited resources. In the end the API will be generated and collected in the WEB Service to form a service repository that can be accessed by various applications with various types of platforms. In this case, here is the source code for the service get delivery process.

```

var db = require('./db_config');
var documentNumber = require('documentNumber');

db.connect(function(err) {
  if (err) throw err;

  let sql = "SELECT * FROM t_deliveries WHERE docNumber = documentNumber";
  db.query(sql, function (err, result) {
    if (err) throw err;
    console.log('ID \t DOCUMENT_NUMBER \t \t STATUS');
    console.log('-----');
    result.forEach(deliveries => {
      console.log(`${deliveries.id} \t ${deliveries.documentNumber} \t ${deliveries.status}`);
    });
  });
});

```

**Figure 4:** Service Of Get Delivery process

In the picture 4 above, shows the code of the service get document delivery with the document number parameter. The service is used to display document data delivery / delivery at PT. Y which is specific because it is filtered using a document number as needed.

## 5. CONCLUSION

Based on the results of this research, there are some things that can be used as conclusions. Are as follows :

1. The service oriented architecture mechanism can be technically implemented in the office automation system at company X. That is because the WEB Service technology that is built is open source API and can be accessed by any application that has an interest including the office automation system.

2. The implementation mechanism with the SOA concept can also be applied to ERP Portal applications at company Y. This is because company Y has an ERP Portal application that is built using the VB.Net language and MySQL database where both of these are not a problem when integrated using WEB Service.

3. Implementation of Service Oriented Architecture mechanism is very suitable for this research because the case is the existence of an intercompany transaction cycle involving 2 companies with each company having different applications accompanied by the platform, programming language, and database used.

4. In the future, a good better performance in office automation applications can be done by combining SOA with other supporting technologies such as heterogeneous data integration [9] which is useful for data integration at a more advanced level. Besides that, it can also be combined with MIMO technology [10] for data transfer and can also be combined with Arduino devices [11] which can be used for IoT so that the data recording and structured side can be more complex.

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