Journal of Theoretical and Applied Information Technology
31st August 2013. Vol. 54 No.3

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

XML WEB SERVICE BASED INTEGRATION MODELING OF NEW STUDENT ADMISSION IN JUNIOR HIGH SCHOOL

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ABSTRACT

The development of web technology has caused a shift in data processing and data storage from desktop based to online. The case study were carried out in all Government Junior high school in Salatiga whose problem is how to design and implement web based system of new student admission. The research adopts XML Web service technology and waterfall system development method. Based on both internal and external testing results, it is found that software implementation using the method performs well.

Keywords: *XML, Web service, Integration, OOAD, modeling*

1. INTRODUCTION

At the beginning of a new academic year, schools from Kindergarten to Senior High School in Indonesia especially Salatiga are busy with New Student Admission. As time goes by, many realize the importance of education in lives. Because of the raising awareness of the importance of education, more candidates enroll in the admission each year. As a result, some problems related to the present system of new student admission occur. The problem generally faced by prospective applicants, in this case the focus is new student admission applicants in Junior High School in Salatiga, is caused by the fact that new student admission is done simultaneously. As a result, an applicant is only eligible to apply in one school. In addition, applicants must also come to the desired school to update the grade rank journal that changes every day according to the number of the received applications. It is done to anticipate if the applicant's name is no longer listed in the journal since it means that the school does not accept the applicant and that the applicant must withdraw his/her application and apply for another school. The weakness of the present new student admission system does not only impact the applicants but also the schools. This is because the schools also have to prepare the quite costly new student admission process. Aside from that, the school must also rank applicant's grades received daily. Therefore, the research question is how to integrate the new student admission derived from a variety of junior high schools in Salatiga?

Based on the background problem caused by the present new student admission manual system, web based online new student admission system using XML Web service is developed out of the present manual system. With web service, the web possesses the following strengths: a) Web Service possesses interoperability that can be accessed by applications performed through different platform, b) Web Service uses open standard and protocol in Internet c) By using HTTP or SMTP, Web Service can penetrate firewall security of an organization without changing firewall configuration, d) Web Service enables functions on software in Internet to be combined into a new Web Service, e) Web Service allows reuse services and components, f) Web Service is loosely-coupled to client.

By this means, practicality in new student admission process and a new web with a new technology whose strength can be used for educational purposes are expected to be developed. The research contribution is the integration of the new student admission system that is built from a variety of platforms using web services.

2. LITERATURE REVIEW

There was a former research to ease data Entry Process of Prospective Students in Government Vocational School 1 Wonosobo [1]. The research developed and implemented a system called desktop application based new student admission. There are some forms in the system, the first form is to input applicants' data, the second form is to modify applicants' data, the third form is to login and the last form is a form to print registration data.

Registration Form is a form used by the school's admin to input applicants' data. The Form to modify applicants' data is used for modifying the saved applicants' data. Login form is used by the school admin to login, whereas the last form displays applicants' data that can be printed and saved by the admin.

The new student admission system is implemented using Java programming language adopting Web service technology. The weakness is that the system is still desktop based that the applicants still have to come to the registration place to register and fill the data in the application form that will later be inputted by the admin into the system.

The second research is by Toninette (2009). The research developed a system called SOA based New

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ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

Student admission possessing three main modules; sales form module, registration module, and college student admission form module. The PSB system uses SOA technology and is developed using Agile Software Development concept, whereas the database used is the existing database in regular registration in Binus [2].

The former two researches used different technologies in their implementation whereas this research uses PHP and Java as programming language for system implementation. The research adopts XML Web service technology, whereas for the database the research uses PHP MyAdmin as database server and SQLite as downloaded data storage in client.

Web service is a software system developed to support interoperability and inter-system interaction in a network. Web service is used as a facility provided by a website to provide service (in the form of information) to other systems, that other systems can interact with the system through the services provided by a system providing web service. Web service stores information data in XML format that the data can be accessed by other systems even though they are of different platform, operation system, or compiler language [3].

Web service is to improve collaboration between programmers and companies that enables other applications to borrow web service without having to know the programming details in it [4], [8].

Web service possesses three entities in its architecture, they are [5], [6], [7]: 1) Service Requester a service requester that searches for and finds services needed as well as uses the services, 2) Service Provider is to provide service and process a registry so that services can be provided, 3) Service Registry plays a role as a central location describing the services that have been registered.

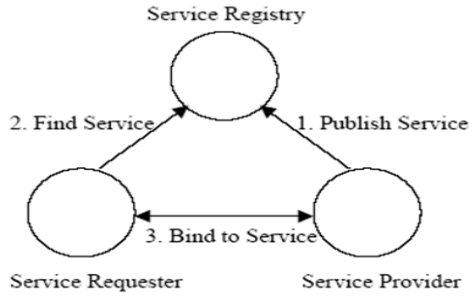

Figure 1. Web Service Architecture [5], [6], [7]

In general, web service involves three operations, they are [5], [6], [7]: 1) Publish/Unpublish: To publish or remove the services into or from the registry, 2) Find: Service requestor searches for and finds the services needed, 3) Bind: After finding the services, binding to service provider is carried out by Service requestor to interact and access the services provided by service provider.

3. RESEARCH METHOD

This research adopts OOAD method [9]. OOAD includes analysis and engineering of a system with object approach. Object oriented analysis (OOA) is an analysis method that analyzes requirement, which is the requirements or necessities/interests to be satisfied by a system from the point of view of classes and objects discovered in company scope.

On the other hand, object oriented design (OOD) is a method to direct object system or subsystem manipulation based software architecture.

3.1 Use case diagram

Use case diagram is a diagram depicting interaction between use case (description of some actions) and actors (set of use case users). The diagram is used to organize and model the behavior of a system needed and expected by users.

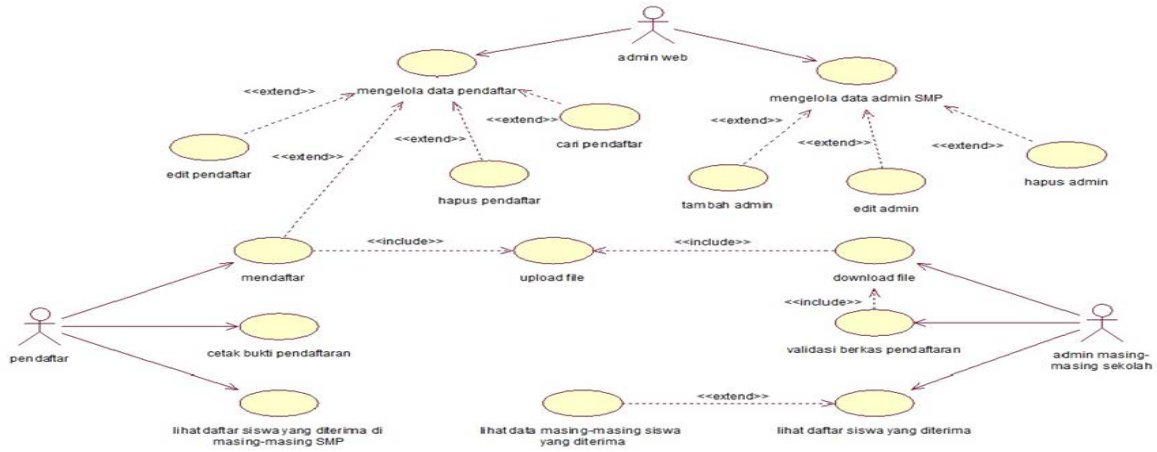

Figure 2. Use Case Diagram

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Figure 2 shows use case diagram in new student admission system in Government junior high schools in Salatiga. The actors in the use case diagram are the actors involved in new student admission process. The actors are applicants, web admin and admin of every Government junior high school in Salatiga. Applicants can apply by uploading documents as the registration requirement, print registration proof and view the new student admission announcement. The Admin of each school can download the documents uploaded by applicants and validate the list of applicants as well as view the complete list of applicants accepted by the schools. On the other hand, web admin can manage the list of applicants and admin data of every school.

Capital letters should be used for the section titles. For subsections, the first letter of each word should be in capital letter and followed by small letters. One line space should be given above the sub section while no space should be given below the heading and text.

3.2 Activity diagram

Activity diagram is developed to explain system workflows of the interrelated actors. In the research, the activity diagram is aimed at explaining the interaction between applicants and the admin of each Junior High School as can be seen in Figure 3. Activity diagram in Figure 3 explains system workflows where at the beginning applicants register and then uploads the document. The Admins of each school can consult the data to know which applicants are accepted by their schools. Next, the admin of each Junior high school validate the data of every applicant by downloading applicants' documents and match them with the grade inputted by the applicants.

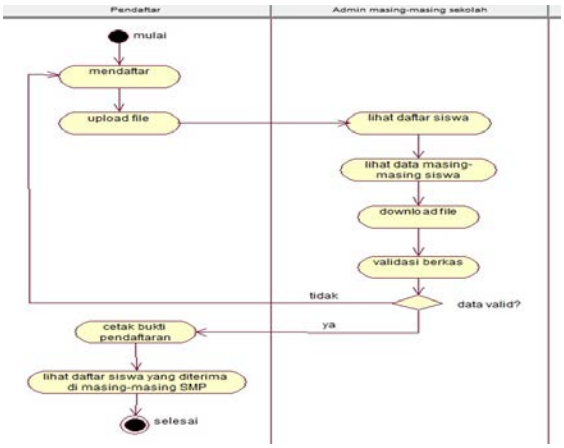

Figure 3. Activity Diagram

If the applicants' data are valid, the applicants can print the registration proof, but if the data are not valid, the applicants must upload the appropriate documents according to the data inputted by the applicants. Applicants can also view new students announcement board in the registration website.

3.3 Class diagram

Class diagram describes the objects involved in system and the relationships among them. Class is a specification that will produce an object if it is initialized and is the core of object oriented development and design. Class describes the state (attribute or property) of a system as well as offers services to manipulate the state (method or function).

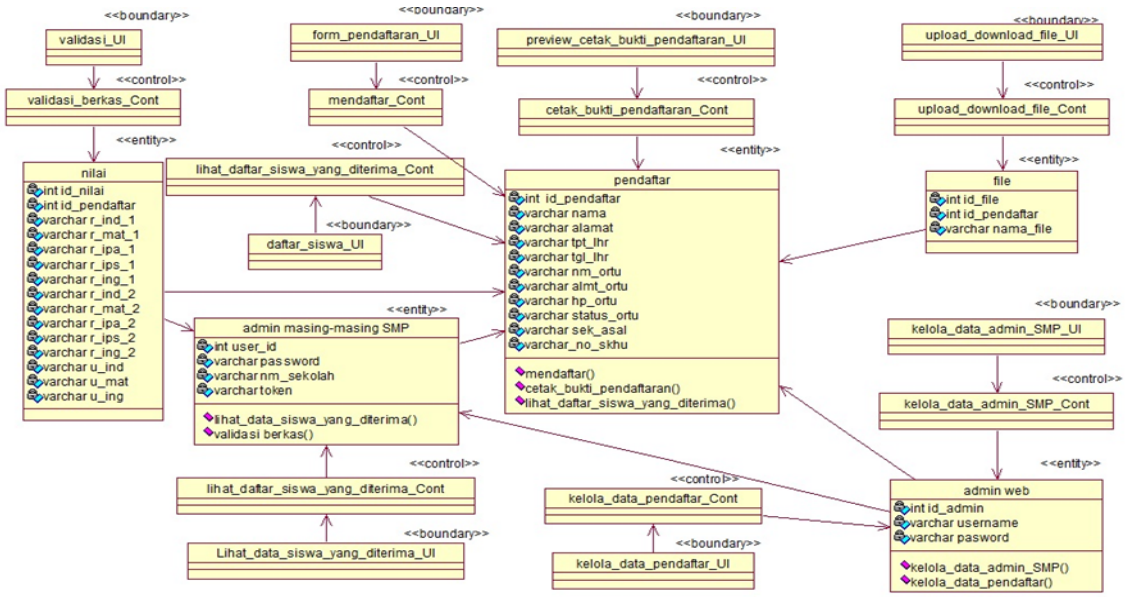

Figure 4. Class Diagram

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31st August 2013. Vol. 54 No.3

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Figure 4 is a class diagram developed in new student admission system. There are five entities in the diagram, they are register, grade, admin of each Junior High School, file and admin web. Every entity developed is directly connected to controller, which is a function carried out on the entity that is an implementation of the usecase developed. Grade entity relates to controller validation, whereas applicant entity relates to three controllers, applicant, print registration proof, and view the list of students accepted by every Junior High School. Admin of Junior High School relates to view list of students accepted by controller. File entity relates to controller upload and download documents, whereas admin web entity relates to manage controller of admin data Junior high school and applicants' data.

Each controller relates to boundary with the same name. For example Validasi_UI relates to Validasi_Cont, in other word, interface validation users possess controller function to validate grade entity. Boundary is interface user that can be seen by actors.

3.4 Sequence diagram

Sequence diagram describes object interactions in and around the system (including users, display, and etc.) in the form of message described toward time. Sequence diagram consists of vertical dimension (time) and horizontal dimension (related objects). Sequence diagram is commonly used to describe scenario or a series of steps done as a response of an event to produce certain output.

1. Register Sequence diagram

The first activity that can be carried out by applicants is to register. Register Sequence diagram for applicant is shown in Figure 5.

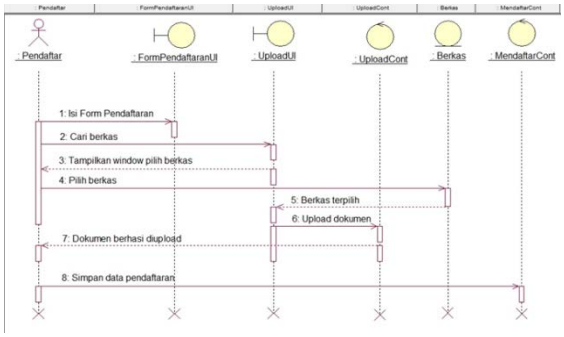

Figure 5. Sequence Diagram of Register

Explanation of Figure 5: applicants fill in the registration form provided in interface web and search for the document image file to be uploaded. In the meantime, registration page displays files to be chosen. After the file is chosen, applicants save the registration data.

2. Sequence Diagram of Print the Registration Receipt

Aside from registerimg, applicants can also print the registration receipt. The workflow of print registration proof system explains applicant's actions to print registration receipt. Interface preview of print registration proof displays applicants' data that is ready to be printed. Finally applicants can print the registration receipt.

4. Sequence Diagram of the View list of students accepted in every Junior High School

Applicants can view list of students in every Junior High School. Sequence diagram for the activity explains the workflow of view list of the students accepted by every Junior High School. First, applicants choose the school of which they want to view the list and then interface will display the list of the students accepted by the school.

5. Sequence Diagram of the Document Download

Document download is done by the admin of each school to carry out validation. The workflow of download document activity is that first, admin of each school initially chooses which document to be downloaded, then interface will call download file function to downloadcontroller. After the file is retrieved, interface will display the file that has been succesfully downloaded.

6. Document Validation Sequence Diagram

Document validation is an activity done by the admin of each school. The admin chooses student's grade that will be validated. After the grades are chosen, grade validation will be carried out by controller validation. Next, the grades that have been successfully validated will be displayed by interface to the admin of each school.

7. View Data of the accepted students Sequence Diagram

Another activity that can be done by the admin of each school is to view the complete data of every student. In this activity, the admin of each school initially chooses the name of the students whose complete data are going to be viewed in interface. Next, interface will call view students' complete data controller function. After the complete data is retrieved, interface views the complete data of the students to the actor, in this case the admin of each school.

4. RESULTS AND DISCUSSION

In carrying out system integration, architecture to explain system workflow of the system is developed. The system architecture can be seen in Figure 6. Figure 6 describes system mechanism in carrying out data exchange by using XML Web service. Applicants access registration website by opening the URL web. After the website is opened, applicants do the registration. Applicants' data is then stored in the database of webserver.

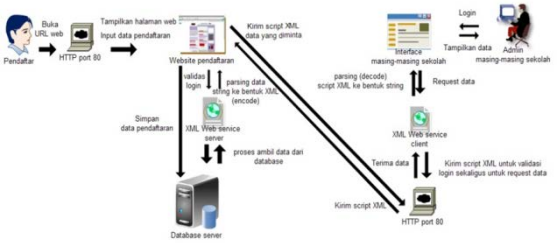

Figure 6. Design of System Architecture

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On the other side, the admin of each school requests to access the data in database server. The data is then retrieved from database server and is encoded from string to XML. The XML data is sent through HTTP port 80 to the interface of each school. Before being displayed, the data is decoded from XML to string so that the data can be read by each school's application.

4.1 System Integration in Server

Data transmission function from server to client uses Web service technology with XML. Description of the data transmission can be seen in Program Code 1 where the existing value in every XML tag is the data that will be taken by client. Data transmission uses Http Post Request method with XML String content.

Code Listing 1. Code of Web Service on Server

Code Listing 1 explains data conversion into XML. The data is the data taken from database according to the id of every applicant based on the request of every client. The data taken are applicants' id, name, photograph, address, place of birth, date of birth, parents' name, parents' address, parents' phone number, parents' status, previous school id, previous school's name, SKHUN number, report card grade of the first and second semester as well as national exam grade.

Validation of username and password sent by client is prior to XML data transmission to client. It is aimed at data security as well as appropriateness of the data with each request from every client.

The function translates the XML tag sent by every client in the form of username and password. The username and password encoded into string will be validated with the data in databaseserver. If the data transmitted is valid, the access of applicants' data retrieval is accepted.

Because it is XML Web service system integration, the data transmitted is string data. Therefore, image data transmission needs to be encoded by converting image into string using base64. To transmit data from server to client, image is encoded into string. First, image file is retrieved from the folder; in this case the folder is labelled Photograph. Next, the image is encoded into string using code base64 $base64 = chunk_split (base64_encode ($picture));.

4.2 System Integration in Server

Web service workflow in client: first, admin of one of the schools logins to the system. The system sends username and password to server in the form of XML. If username and password are valid, login is successful but if it is not valid loginfailed message will appear.

After the login is successful, client will request data to server. The request is carried out in order for the client to be able to display list of the applicants accepted by the school.

The tag transmitted is in the form of request for data and token. After data request is successful, data will be transmitted by server in XML Web service. The data is then encoded by client into string data that it can be read by client application. Code Listing for data encoding can be seen in Code Listing 2.

Code Listing 2. XML Parsing on Client

Code Listing 2 is data encoding function done by client, which is by retrieving value from every XML tag sent by server. Next, the encoded data is stored in databaseclient and is then displayed in each school's application. In XML tag sent by server, there is image data in string format. For client to be able to display the data in the form of image, a decode function is required. Therefore, decode base64 function that enables to decode image data in string format into jpg or image is used.

4.3 Integration Testing on Client

Integration testing is done to know whether the integration developed has succeeded and has met the expectation or not. In this system, first, integration testing is done on the login process where client send username and password to admin.

If username and password inputted do not match, login fails and the message received is invalid login. If login is successful, the message received is access accepted. Then, token to request data will be sent. After the request, server will transmit the data based on client's

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

request. The data retrieved will be displayed in interfaceclient.

XML tag contains the number of data downloaded, total existing data, applicant's registration numbers, applicant's names, applicant's addresses, place and date of birth, parents' names, parents' address, parents' phone numbers, parents' status, applicant's id and applicant's previous school, report card grade of semester one and two, as well as applicant's national exam grade. In addition, the tag also contains applicant validation status. The presence of the two reports, Code Listing 8 and Code Listing 5, prove that the integration done in client side performs well.

4.4 Integration Testing on Server

When client login, server accepts username and password data sent by the client. The username and password received by server in XML tag. After login, client will request the data. The data Request in XML Web service is read by server. There is tagtoken in the request. The token owned by each school is different one from another because the data sent to each school is different. Therefore, a code or characteristic to mark each school is needed to anticipate data exchange and double data. The token is sent by server after client has login.

The two program codes displayed before, indicate that the system in the server behaves well. Server can respond login from client and read data request command sent by client.

5. CONCLUSIONS

Information technology is needed to help manage data and ease small scope, medium, as well as big scope working process. The new system of New Student Admission aimed for Junior High School is one of the solutions to help filtering Primary School graduates who want to continue to a higher level of education. This system also helps to rank and provide new innovation to ease students in finding schools.

From the analysis and engineering of the system of New Student Admission in Junior High School in Salatiga, it can be concluded that:

1. The use of AJAX technology in web helps optimizing realtimerefreshing process that the up to date admission announcement data can be provided.
2. The use of Web service for system integration between server and client enables the distributed system to behave well.
3. Based on the testing performed, the Web service used in the system behaves well in both server and client.
4. Based on the testing performed, as a whole, system integration behaves well and can be applied in the real new student admission system.
5. The use of two applications with different language programming between client and server proves that the application can perform well in multi platform.
6. The use of base64 is a good solution for XML Web service based program or application engineering to encode image data to string data and vice versa.
7. The use of SQLite eases client application to store the data in database without having to install various driver software database.

6. FUTURE WORK

The variants of integration architecture are: 1) Point-to-point architecture, 2) Hub-and-spoke architecture, and 3) Service-oriented architecture. Point-to-point architecture is a collection of independent systems which are connected through a network. Hub-and-spoke architecture is a further stage in the evolution of application and system integration, in which a central hub takes over responsibility for communications. Service-oriented architecture is the integration of different applications to form a functioning whole by means of distributed and independent service calls, which are orchestrated through an ESB and, if necessary, a Process Engine.

This research still used the point to point architecture. In the next research we want to use the service oriented architecture.

REFRENCES:

[1] Diyanto, M.,& Sidiq. T.N., 2010. *Aplikasi Penerimaan Siswa Baru Menggunakan Java Berbasis Client Server untuk Mempermudah Pendataan Calon Siswa Baru di SMK N 1 Wonosari*, Yogyakarta: Teknik Informatika, Sekolah Tinggi Manajemen Informatika dan Komputer.

[2] Toninetti. 2009. *Analisis dan Perancangan Modul Aplikasi Penerimaan Mahasiswa Baru Berbasis SOA*. Jakarta:Binus.

[3] Juric, M.B., Loganathan, R., Sarang, P., dan Jennings, F., 2007, SOA Approach to Integration, Packt Publishing, Birmingham, B27 6PA, UK.

[4] Josuttis, N.M., 2007, SOA in Practice, O'Reilly Media, Inc. 1005 Gravenstein Highway North, Sebastopol, CA 95472

[5] Erl, T., 2005, Service-Oriented Architecture: Concepts, Technology, and Design, Prentice Hall PTR, Upper Saddle River, New Jersey 07458

[6] Schmutz, G, Liebhart, D., Welkenbach. P., 2010, Service-Oriented Architecture: An Integration Blueprint, Packt Publishing, Birmingham, B27 6PA, UK.

[7] Roshen, W., 2009, SOA-Based Enterprise Integration: A Step-by-Step Guide to Services-Based Application Integration, McGraw-Hill Companies, United States

[8] Louridas, P., 2008, Orchestrating Web Services with BPEL, IEEE Software, March/April 2008, Published by the IEEE Computer Society

[9] Solamo, R. , Antonio, J. , Asrani, N. , Chen, D. , de Guzman, O. , Feria, R. , Petines, J. P. , Shin, S. , Srinivas, R. , Thompson, M. , Villafuerte, D. : Software Engineering, Java Education & Development Initiative. Sun Microsystem, 2006.