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AN OBJECT ORIENTED APPROACH FOR CREATING WEB SERVICE PRESENCE SYSTEM

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Abstrak

Web Service dengan metode SOAP (Simple Object Access Protocol) berbasis teknologi ASP.NET digunakan sebagai solusi dalam proses integrasi data dan distribusi data. Teknologi *web service* mampu mengintegrasikan data dari tiap database presensi di ruang kelas, sehingga menghasilkan laporan memonitor kehadiran dosen, karyawan, dan asisten praktikum, yang sebelumnya belum mampu dilakukan oleh sistem aplikasi presensi. Selain itu, *web service* mampu mendistribusikan data yang dibutuhkan untuk proses presensi dari database akademik menuju database presensi di tiap ruang kelas, serta dengan adanya *web service* proses backup data presensi dari database presensi di tiap ruang kelas menuju database akademik dapat dilakukan dengan mudah. Kemudahan-kemudahan yang muncul tersebut akibat adanya penerapan teknologi *web service*, diharapkan mampu meningkatkan layanan dan kinerja dari bagian pengajaran selaku pihak yang bertanggung jawab dalam pengadaan laporan monitoring kehadiran dosen dan mahasiswa, bagian SDM forum asisten selaku pihak yang bertanggungjawab dalam pengadaan laporan memonitor kehadiran asisten praktikum, dan bagian IT selaku pihak yang bertanggung jawab dalam proses distribusi data presensi dan *backup* data presensi. Langkah penelitian yang dilakukan dimulai dari analisis dan desain sistem berorientasi objek, serta implementasi ASP. NET web service.

Kata kunci*:* Sistem Presensi, *Web Service*, SOAP, ASP.NET.

Abstract

Web Service with SOAP method (Simple Object Access Protocol) is used as the ASP.NET technology-based solutions in the process of data integration and data distribution. Web service technology is able to integrate data from each presence database in the classroom, resulting in a monitoring report attendance lecturer, staff, and lab assistant, who previously have not been able to do by the presence of application systems. In addition, the web service is able to distribute the data required for the presence of the database to the database of academic presence in each classroom, as well as with the web service data backup process in the presence of presence of each database classrooms toward academic database can be done easily. Easiness that arise as a result of the application of web services technology, is expected to improve the performance of the service and teaching as part of the responsible parties in the procurement monitoring report the presence of faculty and students, the HRD assistant forum as the party in charge of procurement monitoring report the presence of lab assistant, and IT as part of the responsible parties in the process of data distribution and data backup presence. Stages of study started from object oriented analysis and design, and implementation ASP.NET web.

Keywords: Presence System, Web Service, SOAP, ASP.NET.

INTRODUCTION

Starting in second semester of academic year 2011/2012, discipline and attendance monitoring of faculty, students, and lab assistants in teaching and learning activities is performed by applying a computerized attendance Presence system applications. Presence application is installed on every classroom. STMIK AMIKOM in early 2013 has 16 classrooms and 7 computers lab. Figure 1 describes the scheme Presence systems running today.

Weakness of Presence system are monitoring attendance reporting faculty, students, and teaching journals required by the teaching section, can't be implemented from the Presence application. Similarly, the reporting of attendance monitoring lab assistant needed by Human Resources (HR) Forum Asisten can't be implemented from the Presence application also. All such reporting can't be done since there is no technology that is used to integrate data from Presence database spread in each classroom. The next problem occurs in the process of distributing the lecturers, students, courses, lectures, and lab assistant data from the academic database to the presence database in each classroom are done manually.

Distributed Computing technology can be used to solve these problems. Some of the options that can be used to solve the problems mentioned above is DCOM (Distributed Component Object Model), CORBA (Common Object Request Broker Architecture), RMI (Remote Method Invocation), and Web Service [1]. Web service is a part of the business logic, located at an Internet site, which can be accessed via standard Internet protocols, such as HTTP (Hypertext Transfer Protocol) and SMTP (Simple Mail Transfer Protocol) [2]. Meanwhile, according to Potts and Kopack [3], stating that the web service is a software application that can be accessed remotely using XML. By using the XML document format and HTTP protocol for data communication media, the web service is able to reduce the barriers between operations due to the difficulty of cooperation and between different platforms [4].

In this study, we use web services technology to solve the research problem.

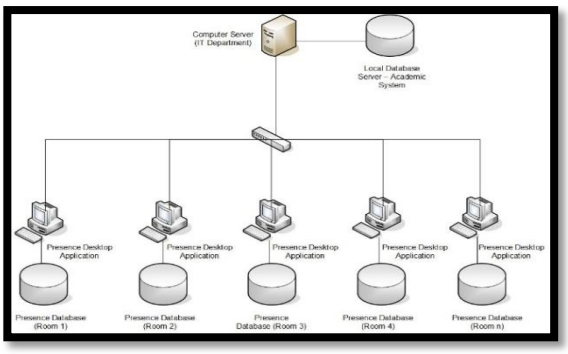

Figure 1. Presence system scheme

Research in the design and development of web services has been done by Sunaryono et. al [5]. Regarding the implementation of the SOAP web service with a method for judging online programming competitions that can be used to compile, execute, and test the source code submitted by contestants, resulting in system design and architecture of online judging system, as well as the implementation of a web service using NuSOAP. Subsequent research conducted by Purnamasari [6] regarding the application of SOAP web service with a method for synchronizing between databases and data integration of academic information system at Bina Darma University.

The results of this research project were initiated Charter, architecture design, and application data integration. The Implementation of web service is using NuSOAP PHP. The third study in the field of education conducted by Dedene et. al. [7] concerning the application of web services to facilitate the teaching staff in the evaluation and distribution of materials to students through the medium of E - Learning. The results of this study are constructed using ASP.NET Web services technology that has the ability to import and export information on environmental education system. Subsequent research on the field of E-Government carried out by Istiyanto and Sutanta [8] and Kuswandi et. al. [9]. The focus of research conducted by Istiyanto and Sutanta [8], namely modeling of interoperability between e-Government applications using the REST web service.

The purpose of the research is to build a web service for solving the problem of interoperability between e-government applications. The results of these studies, namely a web mapping service application process of collecting data from the e-gov1 to e-gov2.

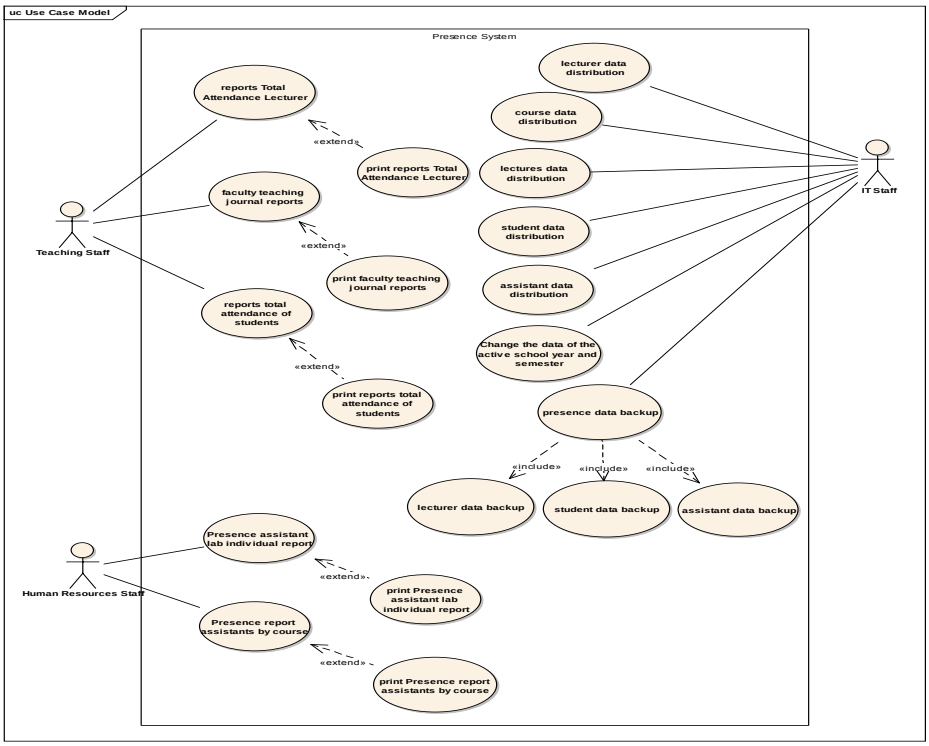

Figure 2. Use Case Diagram of The System.

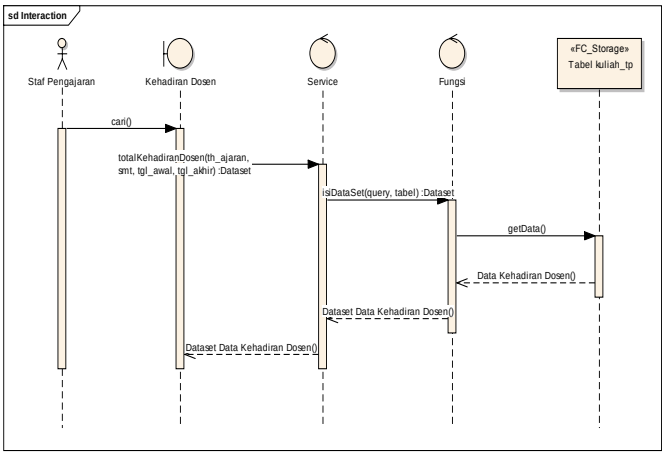

Figure 3. Sequence Diagram for Use Case Viewing Reports Total Attendance Lecturer.

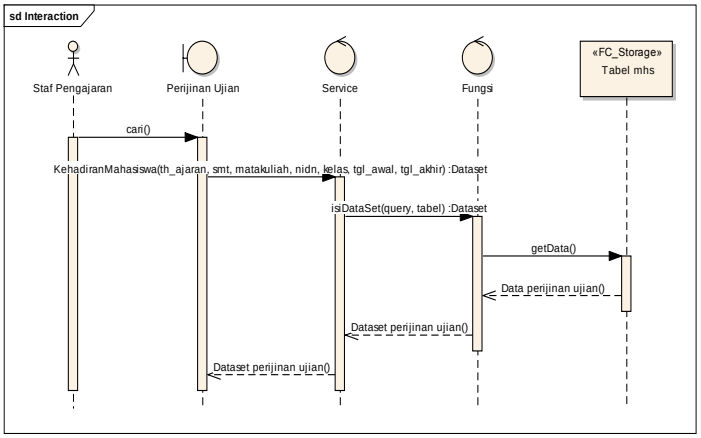

Figure 4. Sequence Diagram for Use Case Total Attendance Students.

While, the focus of research conducted by Kuswandi et al [9] on the use of SOAP web service for data consolidation between SIAK database center in DEPDAGRI with SIAK database in province. The result of this research is the design of an integrated SIAK between DEPDAGRI and each province, and the digital signatures application with SHA-1 for web service security.

FUNCTIONAL REQUIREMENT

IT Department : First, IT Staff are able to distribute the data lecturers, courses, lectures, student, lab assistant to the presence database. Second, The user is able to change the data current academic year and semester tuition. Third, The user is able to perform data backups presence of lecturers, students, and lab assistant from presence database to academic databases.

Teaching Department : First, Teaching staff is able to view and print reports total attendance per lecturer for the entire course is taught by academic year and semester specified by the user. Second, The user is able to view and print reports total attendance of each student based on academic year, semester, faculty, courses, lectures period of time, and user-defined classes. Third, The user is able to view and print a journal report based faculty teaching every academic year, semester, courses, lectures types, and user-defined classes.

Human Resources Department : Human Resource of Forum Asisten staff is able to view and print reports presence all assistant and all course based on academic year, semester, lecturers, and user-defined subjects.
Figure 2 describes the various use cases and actors involved in this system.

BUSINESS PROCESS REALIZATION

At this stage, data modeling objects and relationships between objects using the Sequence Diagram. Sequence diagrams show how groups of objects collaborate in some behavior [10]. Based on the use case diagram in Figure 2, there are 12 sequence diagrams on the web service.

The multiple sequence diagrams are translated as follows:

1. Sequence Diagram for use case Viewing Reports Total Attendance Lecturer
   In Figure 3, the teaching staff accesses a total attendance of lecturers to display information with a total attendance of lecturers in the form of data input parameters academic year, semester, date of the beginning of the course, and the course end date. The output provided by the web service to a desktop application dataset containing total attendance lecturer information.
2. Sequence Diagram for use case Total Attendance Students.
   In Figure 4 the teaching staff accesses student attendance service to display information with a total attendance of students in the form of data input parameters academic year, semester, course code, NIDN, grade, date of beginning and end of the lecture period. The output provided by the web service to a desktop application dataset containing total student attendance information.

CLASS STEREOTYPES

Analysis class stereotype is a phase to identify the type of class, a vital component in the object-oriented modeling [11]. In this study, there are two types of class stereotypes in the web service modeling system, namely Boundary class and control class. Table 1 describes the list of classes and Boundary Control class contained in the web service system.

Table 1. Boundary and Control Class

Boundary Class	Control Class
1. frmPresensiAsistenPerKelas	1. Fungsi
2. frmPresensiAsistenIndividual	2. Service
3. frmKehadiranDosen	3. AsistenManager
4. frmJurnalPengajaran	4. DosenManager
5. frmBackupPresensi	5. MahasiswaManager
6. frmKehadiranMahasiswa	6. KuliahManager
7. frmDistribusiAsisten	7. PerkuliahanManager
8. frmDistribusiDosen	8. SettingManager
9. frmDistribusiMahasiswa	
10. frmDistribusiMatakuliah	
11. frmDistribusiPerkuliahan	
12. frmPengaturanAkademikSemester	

CLASS DIAGRAM

The next process is the manufacture of Class diagrams. Class diagrams describe the types of objects of a class in the system and the static

relationships that exist between these objects. Class diagrams also describe the properties and operations of a class and restrictions contained in the relationships between objects [10].

Based on the analysis of sequence diagrams and class stereotypes that had been done, lists the services contained in the web service class Service is consists of 14 services. These services are in the form of method or operation on class service. Class Function is the class that serves as the coordinator and the object of the controller class Service, Asisten Manager, Dosen Manager, Mahasiswa Manager, Kuliah Manager, Perkuliahan Manager, and Setting Manager to communicate with data storage.

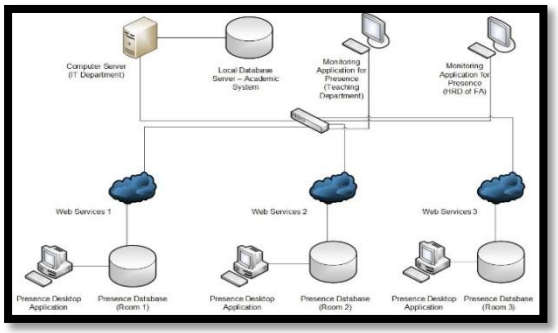

Figure 5. Scheme Integrated Presence System with Web Service.

WEB SERVICE DESIGN SCHEME

The design scheme of integrated presence system with web service technologies, can be explained in Figure 5. Based on Figure 5, can be explained Presence system scheme integrated with the web service as follows: IT staff via desktop application client can distribute the necessary data for the presence of academic databases to the databases of presence in each classroom via a web service that is installed on each system Presence classrooms. In the process of data backup of the Presence database in each classroom to the academic database, IT staff can utilize a web service that can invoke through desktop client application. Teaching staff and the HR assistant can utilize the web service to generate reports monitoring the presence information retrieved from the database in each classroom.

RESULT AND DISCUSSION

Web Service Implementation

Web service implementations on this research are using ASP.NET technology.
ASP.NET Web Service Development using Visual Studio.NET 2010 development tools. There are 14 services on web service presence system that can be used for process integration and distribution of data. Each system in the presence classroom lectures has a web service. The client application sends a request to the web service in the form of XML. The web service will do the parsing of the request, run the service, and send the response back to the client is also in the form of XML. Both the request and the response, both are using the SOAP protocol.

Service for Reports of Total Lecturer Attendance

This service is used to display information with a total attendance of lecturers with input parameters are academic year, semester, date of the beginning of the course, and the course end date. This service provides an output dataset containing total attendance lecturer information.

Figure 6 describes the sample SOAP message Request and Figure 7 describes the Response SOAP messages in XML format for service of Total Reports Attendance Lecturer.

```
POST /ServicePresensi.asmx HTTP/1.1
Host: localhost
Content-Type: text/xml; charset=utf-8
Content-Length: length
SOAPAction: "http://ruang3-
1.amikompurwokerto.ac.id/totalKehadiranDo
sen"
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:xsi="http://www.w3.org/2001/XMLSche
ma-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSche
ma"
xmlns:soap="http://schemas.xmlsoap.org/so
ap/envelope/">
<soap:Body>
<totalKehadiranDosen
xmlns="http://ruang3-
1.amikompurwokerto.ac.id/">
<th_ajaran>string</th_ajaran>
<smt>unsignedByte</smt>
<tgl_awal>dateTime</tgl_awal>
<tgl_akhir>dateTime</tgl_akhir>
</totalKehadiranDosen>
</soap:Body>
</soap:Envelope>
```

Figure 6. SOAP Request Message for Total Lecturer Attendance.

Service for Reports of Total Student Attendance

This service is used to display information with a total attendance of students with input parameters are academic year, semester, course code, NIDN, the date of the beginning and end of the course, and class. This service provides an output dataset containing total student attendance information.

```
HTTP/1.1 200 OK
Content-Type: text/xml; charset=utf-8
Content-Length: length
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:xsi="http://www.w3.org/2001/XMLSche
ma-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSche
ma"
xmlns:soap="http://schemas.xmlsoap.org/so
ap/envelope/">
<soap:Body>
<totalKehadiranDosenResponse
xmlns="http://ruang3-
1.amikompurwokerto.ac.id/">
<totalKehadiranDosenResult>
<xsd:schema>schema</xsd:schema>xml</total
KehadiranDosenResult>
</totalKehadiranDosenResponse>
</soap:Body>
</soap:Envelope>
```

Figure 7. SOAP Response Message for Total Lecturer Attendance

```
POST /ServicePresensi.asmx HTTP/1.1
Host: localhost
Content-Type: text/xml; charset=utf-8
Content-Length: length
SOAPAction: "http://ruang3-
1.amikompurwokerto.ac.id/KehadiranMahasis
wa"
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:xsi="http://www.w3.org/2001/XMLSche
ma-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSche
ma"
xmlns:soap="http://schemas.xmlsoap.org/so
ap/envelope/">
<soap:Body>
<KehadiranMahasiswa xmlns="http://ruang3-
1.amikompurwokerto.ac.id/">
<th_ajaran>string</th_ajaran>
<smt>unsignedByte</smt>
<matakuliah>string</matakuliah>
<nidn>string</nidn>
<kelas>string</kelas>
<tgl_awal>dateTime</tgl_awal>
<tgl_akhir>dateTime</tgl_akhir>
</KehadiranMahasiswa>
</soap:Body>
</soap:Envelope>
```

Figure 8. SOAP Request Message for Total Student Attendance.

Figure 8 describes an example of a SOAP Request message and Figure 9 describes the Response SOAP messages in XML format for service of Total Attendance Student Reports.

```
HTTP/1.1 200 OK
Content-Type: text/xml; charset=utf-8
Content-Length: length

<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:xsi="http://www.w3.org/2001/XMLSche
ma-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSche
ma"
xmlns:soap="http://schemas.xmlsoap.org/so
ap/envelope/">
<soap:Body>
<KehadiranMahasiswaResponse
xmlns="http://ruang3-
1.amikompurwokerto.ac.id/">
<KehadiranMahasiswaResult>
<xsd:schema>schema</xsd:schema>xml</Kehad
iranMahasiswaResult>
</KehadiranMahasiswaResponse>
</soap:Body>
</soap:Envelope>
```

Figure 9. SOAP Response Message for Total Student Attendance.

Web Service Testing

Testing functionality of the web service is do with black box method using soapUI v. 4.6.1 software and through the desktop client application interface. Presence database is used to test derived from 2 class rooms and 2 computer lab on academic year 2013/2014. Four databases are presence database 2.1, 2.7, Lab 5 and Lab 6.

Figure 10 describes the results testing services of total attendance lecturers and Figure 11 describes the results testing services of total student attendance using desktop client application that consumes the web service. Figure 10 describes information about total attendance of lecturers with input parameters to the web service are data of the academic year, the date of the beginning and end of the course.

Input parameters are used as examples, namely the academic year 2013/2014 semester "ganjil", the course starting date 1 September 2013, and the end of the course date 31 October 2013. There are 35 data records on the test results. Figure 11 describes information about total attendance of students with input parameters to the web service are data of the academic year, course ID, NIDN, class, the

date of the beginning and end of the course. Input parameters are used as examples, namely the academic year 2013/2014 semester "ganjil", course ID TI006, 0605025702 as NIDN, TI13A ASD class, and the course starting date 1 September 2013, the end of the course date 31 November 2013. There are 50 data records on the test results.

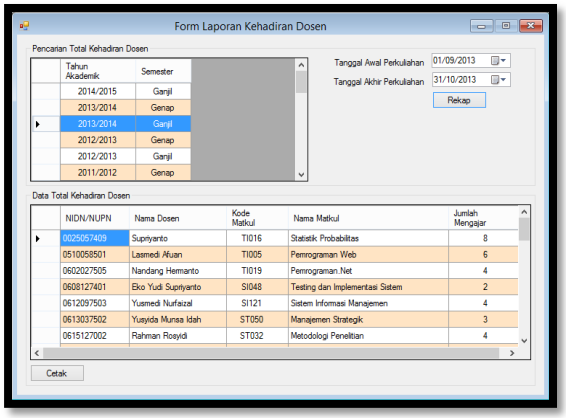

Figure 10. Total Attendance Lecturer Service.

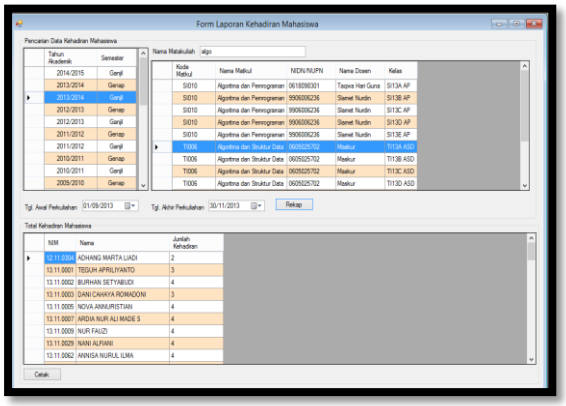

Figure 11. Total Attendance Students Service.

CONCLUSION

Once the research is done, start from systems analysis phase to testing of the system is integrated with presence web service is done, then some conclusions can be drawn as follows:

A. Web services are built using SOAP (Simple Object Access Protocol) protocol.
B. There are 14 services that are available on the web service to meet the functional needs of the system users are integrated with presence web service.
C. Based on the test results of all services on the web service, it can be concluded that the entire service is functioning properly for data integration and distribution.

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