STUDENT INFORMATION SYSTEM BASED ON SERVICE ORIENTED ARCHITECTURE

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Abstrak

Abstract

Information system has become essential in every organization to ensure that the business processes are managed systematically and effectively. The information must be reliable in order to preserve the quality of the information. However, with the drastic evolution of technologies and business environments, the system is facing many challenges to sustain functionalities and the integration of the system’s applications between various types of machines. To cope-up with the changing technologies, organizations have to make some investments to upgrade their information systems to ensure the systems will keep on working in a long time-span. Some organizations have to redo the whole system to keep in pace with the latest technologies. This work has consumed so much time and the cost is quiet expensive. In this project, Student Information System Based on Service Oriented Architecture is developed. The system is implementing the Web Service technologies to create loosely-coupled applications. Web Service technologies have the capabilities of integrating various kinds of applications regardless of their technologies, operating systems and programming languages. In developing the system, Service Oriented Modeling Architecture is used. The Web Service is developed using Java programming language and Microsoft SQL Server 2005 for its back-end database.
Acknowledgement

Alhamdulillah and all the Praise and Gratitude to the Almighty Allah because of His blessings, I managed to finish the project after struggling with all the challenges that came along the way. This project wouldn’t have come into reality without the guidance from my supervisor, Mr. Nurnasran b. Puteh who has encouraged me to keep working until the finishing line. This project is also a remembrance to my late father, Ahmad b. Mat Amin who kept inspiring me with his prayers and blessings. Not forgotten to my mom that is always there for me. Finally, this project is dedicated to my husband and children that are always by my side. Thank you for being such inspiring!
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>SOA</td>
<td>Service Oriented Architecture</td>
</tr>
<tr>
<td>XML</td>
<td>eXtensive Markup Language</td>
</tr>
<tr>
<td>SOMA</td>
<td>Service Oriented Modeling Architecture</td>
</tr>
<tr>
<td>UDDI</td>
<td>Universal Description, Discovery &amp; Integration</td>
</tr>
<tr>
<td>WSDL</td>
<td>Web Service Definition Language</td>
</tr>
<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>HTTP</td>
<td>HyperText Transfer Protocol</td>
</tr>
<tr>
<td>FTP</td>
<td>File Transfer Protocol</td>
</tr>
<tr>
<td>EDI</td>
<td>Electronic Data Interchange</td>
</tr>
<tr>
<td>B2B</td>
<td>Business To Business</td>
</tr>
<tr>
<td>RPC</td>
<td>Remote Procedural Call</td>
</tr>
<tr>
<td>REST</td>
<td>REpresentational State Transfer</td>
</tr>
<tr>
<td>HTML</td>
<td>Hypertext Markup Language</td>
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CHAPTER ONE
INTRODUCTION

1.1 Introduction

In an organization, information about its business process should be managed properly to ensure that it can be retrieved, manipulated, and updated quickly when necessary. Nowadays, information is a valuable asset and it is not only being stored in the system. The management team has started to emphasize the value of the information. Instead of keeping the information in the form of electronic system, it is very crucial to ensure that the information can be accessed instantly whenever it is needed. The information must always be updated to ensure that the data is relevant and useful. To enable those capabilities, an organization must has an information system which is a set of interrelated components that collect, process, store and distribute information to support decision making, coordination and control (Kenneth, 2004). The organization needs information system because it has become essential for manager and executives as the organization needs them to keep surviving and competing with other organizations. Information system also helps the company to extend their reach to any locations and it must also be flexible so that it can easily accommodate to any changes in the way they handle their businesses (Xuexiang & Xiaoming, 2011). Student Information System based on Service Oriented Architecture (SOA) is meant to fulfill those needs. SOA is a collection of services that communicates with each other (Carter, 2000). Figure 1.1 shows the basic of SOA
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REFERENCES


8. Zhang Xiao-guang; Li Jing-song; Zhou Tian-shu; Yang Yi-bing; Chen Yun-qi; Xue Wan-guo; Zhao Jun-ping (2009). *Design and


