



**AUTHENTICATION SYSTEM FOR SERVER ROOM USING  
FINGERPRINT (ASSRUF)**

**NURUNNADIAH BINTI ABDUL HASIB**

This report is submitted in partial fulfillment of the requirements for the Bachelor of  
Computer Science (Networking)

**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA  
2008**



## **DEDICATION**

A special dedication goes to my beloved parents Mr. Abdul Hasib bin Ramly and Mrs. Latifah bt Dahlan because giving support in completing my final year project which is entitled Authentication System For Server Room Using Fingerprint (ASSRUF).

I also would like to dedicate to the lecturers, friends and all people who help and support direct or indirect in finishing my project successfully.

## ACKNOWLEDGEMENT

I would like to gratefully acknowledge the contribution of several people who helped me to complete this project. Firstly, I would like to convey my grateful thanks to my supervisor, Pn. Khadijah bt Wan Mohd Ghazali, for giving contribution and assistance in completing my project which is “Authentication System for Server Room Using Fingerprint”.

I would also like to thank to a few lecturers in Universiti Teknikal Malaysia Melaka (UTeM) in giving me some ideas, information and also for spending their valuable time and effort.

A note of thanks is dedicated to all especially my beloved parents and friends who have been involved directly and indirectly in giving me support and motivation throughout my project.

## ABSTRACT

The Authentication System for Server Room Using Fingerprint (ASSRUF) is developed mainly for institution which have important facilities especially server room. This system is built to provide a high-security in accessing the server room because it is equipped by high cost equipments thus may only allowed authorized user to enter the room. User should provide their fingerprint to the system in order to authenticate whether they are the authorized user or not. Only administrator has the authority and privilege to access ASSRUF system. The architecture of ASSRUF is two-tier architecture which involves client and server architecture. Fingerprint scanner is working at client side while ASSRUF system working at server side. The methodology that has been used in developing this system is Object Oriented Development Life Cycle (OODLC) which consists of initial phase, analysis phase, design phase, implementation phase, testing phase, and evaluation and maintenance phase. An analysis study has been done based on the current systems and all problem statements and requirements have been identified. The interface of ASSRUF has been design according to the requirement and needs of the current market. ASSRUF is working in Windows XP platform and compatible in Microsoft Visual Basic 6.0. Bio Kit System Development Kit (SDK) has been installed in order to ensure the fingerprint scanner can work properly. Two types of approaches in software testing are black box testing and white box testing. Six types of tests have been tested on this system including unit testing, integration testing, function testing, acceptance testing, regression testing and beta testing. Testing phase has successfully done and meet user requirement. This Authentication System for Server Room Using Fingerprint (ASSRUF) will help to provide a high security to server room and overcome the problems that arise nowadays.

## ABSTRAK

*Authentication System for Server Room Using Fingerprint (ASSRUF)* dibangunkan khasnya kepada institusi yang mempunyai kemudahan penting terutama bilik server. Sistem ini adalah bertujuan untuk menyediakan keselamatan yang tinggi ketika pengguna mengakses bilik server kerana bilik server dilengkapi dengan pelbagai peralatan yang canggih dan mempunyai kos yang tinggi. Oleh itu, ia hanya membenarkan pengguna yang berdaftar sahaja untuk masuk ke dalam bilik server. Untuk mengakses ke dalam bilik server, pengguna perlu mengimbas cap jari dan sistem ini akan mengesahkan sama ada pengguna itu berdaftar atau tidak. Hanya pihak pentadbir sahaja yang mempunyai kuasa dan hak untuk menguruskan sistem ini. Struktur sistem ini menggunakan dua peringkat iaitu pengguna dan server. Pengimbas cap jari berada di pihak pengguna manakala sistem ASSRUF diadaptasi di pihak server. *Object Oriented Development Life Cycle (OODLC)* telah dipilih sebagai metodologi untuk membangunkan sistem ini. Metodologi ini mengandungi beberapa fasa iaitu fasa permulaan, fasa analisis, fasa merekabentuk, fasa implementasi, fasa ujian dan fasa evolusi dan penyelenggaraan. Kajian terhadap sistem sedia ada telah dibuat dan beberapa kekurangan terhadap sistem tersebut telah dikenalpasti. Antaramuka bagi sistem ASSRUF telah direka berdasarkan keperluan dan permintaan pasaran semasa. Sistem ASSRUF boleh digunapakai pada sistem pengoperasian *Windows XP* dan sesuai diadaptasikan pada *Microsoft Visual Basic 6.0. Bio Kit System Development Kit (SDK)* telah di *install* untuk membolehkan pengimbas cap jari bekerja dengan baik. Dua pendekatan telah digunakan dalam fasa ujian iaitu ujian kotak hitam dan ujian kotak putih. Enam jenis ujian telah diuji pada sistem ini iaitu ujian unit, ujian gabungan, ujian kegunaan, ujian penerimaan, ujian ubah suai dan ujian beta. Fasa ujian ini berjaya dan memenuhi permintaan pengguna. Oleh itu, *Authentication System for Server Room Using Fingerprint (ASSRUF)* diharap dapat membantu dalam menyediakan keselamatan yang tinggi kepada bilik server disamping dapat mengatasi masalah yang wujud pada sistem yang sedia ada.

## TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
	<b>DECLARATION</b>	ii
	<b>DEDICATION</b>	iii
	<b>ACKNOWLEDGEMENTS</b>	iv
	<b>ABSTRACT</b>	v
	<b>ABSTRAK</b>	vi
	<b>TABLE OF CONTENTS</b>	vii
	<b>LIST OF TABLES</b>	xi
	<b>LIST OF FIGURES</b>	xiii
	<b>LIST OF DIAGRAMS</b>	xv
	<b>LIST OF ABBREVIATIONS</b>	xvi
	<b>LIST OF ATTACHMENTS</b>	xvii
<b>CHAPTER I</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Project Background	1
	1.2 Problem Statements	2
	1.3 Objective	3
	1.4 Scope	4
	1.5 Project Significance	4
	1.6 Expected Output	5
	1.7 Conclusion	5



<b>CHAPTER II</b>	<b>LITERATURE REVIEW AND PROJECT</b>	
	<b>METHODOLOGY</b>	<b>6</b>
2.1	Introduction	6
2.2	Literature Review	7
2.2.1	Domain	7
2.2.2	Keyword	7
2.2.2.1	Biometrics	8
2.2.2.2	Fingerprints	10
2.2.2.3	Authorization and Authentication	13
2.2.2.4	Server Farm	13
2.2.3	Previous Research	14
2.2.3.1	Existing System	14
2.2.3.2	Techniques	18
2.3	Proposed Solution	19
2.3.1	Project Methodology	19
2.4	Project Requirements	22
2.4.1	Software Requirement	22
2.4.1.1	Equipment/development tools	22
2.4.1.2	Operating system	22
2.4.1.3	Database System	22
2.4.2	Hardware Requirement	23
2.4.3	Network Requirement	23
2.5	Project Schedule and Milestones	23
2.6	Conclusion	25
<b>CHAPTER III</b>	<b>ANALYSIS</b>	<b>26</b>
3.1	Introduction	26
3.2	Problem Analysis	27
3.2.1	Current Scenario	27
3.3	Requirement Analysis	29
3.3.1	Data Requirement	29
3.3.2	Functional Requirement	30
3.3.2.1	Admin	31

	3.3.2.2 User	33
	3.3.3 Non-functional Requirement	34
	3.3.4 Other Requirement	35
	3.3.4.1 Software Requirement	35
	3.3.4.2 Hardware Requirement	37
	3.3.4.3 Network Requirement	38
3.4	Conclusion	39
<b>CHAPTER IV</b>	<b>DESIGN</b>	<b>40</b>
4.1	Introduction	40
4.2	High- Level Design	41
	4.2.1 System Architecture	41
	4.2.2 User Interface Design	42
	4.2.2.1 Navigation Design	45
	4.2.2.2 Input Design	46
	4.2.2.3 Output Design	47
	4.2.3 Database Design	50
4.3	Detailed Design	55
	4.3.1 Software Design	55
	4.3.2 Physical Database Design	58
	4.3.2.1 Data Definition Language (DDL)	59
	4.3.2.2 Data Manipulation Language (DML)	60
4.4	Conclusion	61
<b>CHAPTER V</b>	<b>IMPLEMENTATION</b>	<b>62</b>
5.1	Introduction	62
5.2	Software Development Environment Setup	62
5.3	Software Configuration Management	64
	5.3.1 Configuration Management	64
	5.3.2 Setup and Configuration Step	65
	5.3.3 Version Control Procedure	66
5.4	Implementation Status	67
5.5	Conclusion	68

<b>CHAPTER VI</b>	<b>TESTING</b>	<b>69</b>
6.1	Introduction	69
6.2	Test Plan	70
6.2.1	Test Organization	70
6.2.2	Test Environment	71
6.2.3	Test Schedule	72
6.3	Test Strategy	73
6.3.1	Classes of Test	73
6.4	Test Design	76
6.4.1	Test Description	76
6.4.2	Test Data	78
6.5	Test Result and Analysis	80
6.6	Conclusion	83
<b>CHAPTER V</b>	<b>CONCLUSION</b>	<b>84</b>
7.1	Observation on Weakness and Strength	84
5.1.1	Strengths	84
5.1.2	Weakness	85
7.2	Proposition for Improvement	85
7.3	Contribution	86
7.3.1	User Manual	86
7.4	Conclusion	86
	 <b>REFERENCES</b>	 <b>88</b>
	 <b>BIBLIOGRAPHY</b>	 <b>90</b>
	 <b>APPENDICES</b>	 <b>91</b>

## LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Comparison between authorization methods	17
2.2	Project Milestone	24
3.1	Data requirement for Table Login	29
3.2	Data requirement for Table Staff	29
3.3	Data requirement for Table Log	30
3.4	Specification of computer device	37
3.5	Comparison between Optical and Non-Optical Sensor	38
4.1	Input Design for Each Interface	46
4.2	Data Dictionary of ASSRUF system	53
4.3	Description of Table Login	59
4.4	Description of Table Staff	59
4.5	Description of Table Log	59
5.1	Version Details of ASSRUF	67
5.2	Implementation Status	67
6.1	Categories of User	71
6.2	Test Facilities Component	72
6.3	Test Schedule	72
6.4	Test Cases For Login Module	76
6.5	Test Cases For User Registration Module	77
6.6	Test Cases For Maintenance Module	77
6.7	Test Cases For Fingerprint Authentication	78
6.8	Test Cases For Generate Report Module	78
6.9	Test Data For Fingerprint in Registration Module	79

<b>6.10</b>	<b>Test Case Result For Login Module</b>	<b>80</b>
<b>6.11</b>	<b>Test Case Result For User Registration Module</b>	<b>81</b>
<b>6.12</b>	<b>Test Case Result For User Maintenance Module</b>	<b>81</b>
<b>6.13</b>	<b>Test Case Result For Fingerprint Authentication</b>	<b>82</b>
<b>6.14</b>	<b>Test Case Result For Generate Report Module</b>	<b>83</b>

## LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	The Characteristic of Biometric	8
2.2	The Fraction of Biometric Market	9
2.3	Fraction ridge on palm of hand	10
2.4	Fraction ridge on sole of feet	10
2.5	The structure of fingerprint	11
2.6	Type of loop pattern	11
2.7	Type of whorl pattern	12
2.8	Type of arch pattern	12
2.9	Server Room	13
2.10	Smart Card with Microprocessor Chip	16
2.11	Object-Oriented Development Life Cycle	20
4.1	System Architecture of ASSRUF	42
4.2	Login Interface	42
4.3	Main Menu Interface	43
4.4	Registration Form Interface	43
4.5	User Maintenance Interface	44
4.6	Fingerprint Authentication Interface	44
4.7	Log Report	44
4.8	Successful Login Message	47
4.9	Failed Login Message	47
4.10	Successful Registration Message	48
4.11	Failed Registration Message	48
4.12	Successful Delete Message	49

<b>4.13</b>	<b>Successful Update Message</b>	<b>49</b>
<b>4.14</b>	<b>Expected Report</b>	<b>50</b>
<b>4.15</b>	<b>Third Normal Form for Table Login</b>	<b>54</b>
<b>4.16</b>	<b>Third Normal Form for Table Staff</b>	<b>54</b>
<b>4.17</b>	<b>Third Normal Form for Table Log Report</b>	<b>54</b>
<b>5.1</b>	<b>System Architecture for ASSRUF</b>	<b>63</b>
<b>5.2</b>	<b>Overview of Environment Architecture for ASSRUF</b>	<b>63</b>

**LIST OF DIAGRAMS**

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
3.1	Sequence Diagram of Password Based Authentication	27
3.2	Sequence Diagram of Smart Card Based Authentication	28
3.3	Use Case of ASSRUF System	30
3.4	Activity Diagram For Enrol User Process	31
3.5	Activity Diagram For Update Changes Process	32
3.6	Activity Diagram For Generate Log Process	33
3.7	Activity Diagram For Authentication Fingerprint Process	34
4.1	Navigation Flow of ASSRUF system	45
4.2	Entity Relationship Diagram (ERD)	51



**LIST OF ABBREVIATIONS**

<b>ASSRUF</b>	<b>Authentication System For Server Room Using Fingerprint</b>
<b>ERD</b>	<b>Entity Relationship Diagram</b>
<b>GUI</b>	<b>Graphic User Interface</b>
<b>LDM</b>	<b>Logical Data Model</b>
<b>OOAD</b>	<b>Object-Oriented Analysis and Design</b>
<b>OOBC</b>	<b>Open Database Connectivity</b>
<b>OODLC</b>	<b>Object-Oriented Development Life Cycle</b>
<b>PIN</b>	<b>Personal Identification Number</b>
<b>PKI</b>	<b>Public Key Infrastructure</b>
<b>RAD</b>	<b>Rapid Application Development</b>
<b>RDBMS</b>	<b>Relational Database Management System</b>
<b>SDK</b>	<b>Software Development Kit</b>
<b>SDLC</b>	<b>System Development Life Cycle</b>
<b>UAT</b>	<b>User Acceptance Testing (UAT)</b>

**LIST OF ATTACHMENTS**

<b>ATTACHMENT</b>	<b>TITLE</b>	<b>PAGE</b>
<b>A</b>	<b>Log Book</b>	<b>91</b>
<b>B</b>	<b>Proposal</b>	<b>96</b>
<b>C</b>	<b>Gantt Chart</b>	<b>100</b>
<b>D</b>	<b>User Manual</b>	<b>102</b>

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Project Background**

As information technologies advance greatly year by year, the security aspects become the most importance features. As a result, biometric technologies have given considerable attention. One of the most popular biometric technologies is fingerprints because of its ease of use, non-intrusiveness and reliability. In addition, fingerprints are unique for each person even an identical twin.

Fingerprint authentication is suitable to be used at rooms which provide high-security to importance facilities like server room. Server room is a collection of computer servers which usually maintained by an enterprise to accomplish server needs. Server room will have both a primary and a backup server, so that in the event of the failure of the primary server, a backup server will take over the primary server's function.

The server room is typically allocated with network switches and routers which enable communication between different parts of the cluster and the users of the cluster. These facilities are equipped with high cost equipments thus only allow authorized users to enter and exit from these facilities.

Currently, not all institutions implement security in their high-security facilities. However, some institutions protect their facilities by implementing password verification, smart card and other security features but it is not really secured. It might be manipulated and hacked by unauthorized user.

Due to these current problems, Authentication System for Server Room Using Fingerprint (ASSRUF) is proposed. This system may eliminate the current problems and make the system more secure.

## **1.2 Problem Statement**

Several problems are identified from the current systems and they might bring any implications to the institutions. They are:

- **Lack of Security**

Some of the server room did not have security features to secure the equipments. It makes the rooms can be easily accessed by unauthorized users.

- **Password Forgotten**

Usually, password based authentication is used to protect the important facilities. An authorized user needs to enter user ID and password before entering a server room.

However, the common problems are the authorized user might forget the password or the password has been stolen by unauthorized user. It occurs because this password has to change as often as required in order to avoid the rooms from attacked by the hacker.

- **Smart Card Deficiency**

Smart card is easy and portable to bring anywhere. This advantage makes it easy to be stolen by unauthorized user. They may enter the room by using other user card which does not belong to them. Additionally, it is also possible for the smart card to get damaged.

### 1.3 Objectives

Based on the current system problems, there are some objectives have been identified which are:-

- **To improve security features at server room.**

Due to the importance of securing high cost equipments and facilities, this system is proposed. By implementing this security features, it will replace the current system and make the rooms become more secured. Fingerprints technology may increase the site security of server room and allow the correct persons to enter it. The system will guarantee that only authorized users can obtain accessibility therefore makes the security more effective and efficient.

- **To built a system that can read fingerprints image.**

This system is use to avoid unauthorized user to enter the room. It will verify user's information before letting them to enter the room. If the image do not same with the one in the database, the user are not allowed to enter the room. This will eliminate the use of password system.

- **To test the system to the real target user**

By implementing the system to the target users, developer definitely can know whether the system is meet user requirement in order to make the security at the server room become more secured.

#### **1.4 Scope**

Authentication System for Server Room Using Fingerprint is developed to secure server room's environment. Server room is a room that has high-cost equipments and importance facilities. Therefore, only authorized user can enter the room. The target users are administrators and users that need to set up and maintain the server room.

There are many types of biometric characteristics which can be used for security features. Therefore, this system will use fingerprint authentication to authenticate the correct user before enter the security facilities.

#### **1.5 Project Significance**

The system that will be developed is aimed to provide security features at server room which is a high-security facility. This room has high cost equipments which are needed to be protected from any unauthorized user. This system is needed to replace the current system that did not really secure the facilities.

Using this system, it will only verify authorized users to enter the room. Furthermore, it is proposed to overcome the current problems that usually occur. The problems like password forgotten, smart card stolen and unauthorized users will be eliminated and the facilities become more secured.

## **1.6 Expected Output**

The Authentication System for Server Room Using Fingerprint (ASSRUF) that will be developed to scan and authenticate the fingerprints. Administrator can generate report on users that have entered the room for a certain time.

## **1.7 Conclusion**

To eliminate the problems that have been occurred in the existing system, the Authentication System for Server Room Using Fingerprint is proposed. This system will upgrade the current systems to make it more secure and strength to the security system.

The next chapter, which is Chapter II will explain about literature review and project methodology. It focuses on facts and findings, the technique that will be used, project methodology and project requirement including software, hardware and other requirements. It also will discuss on the project schedule and the milestone of this project.

## **CHAPTER II**

### **LITERATURE REVIEW AND PROJECT METHODOLOGY**

#### **2.1 Introduction**

There are two main subtopics in this chapter which are literature review and project methodology. Literature review is a part which focuses on the research of the existing systems and future applications of Authentication System for Server Room Using Fingerprint (ASSRUF). This part involved the process of searching, collecting and analyzing the information that have been related to this project.

The other subtopic is project methodology. The methodology is a description of the selected approaches which is being used in developing a project. The purpose of project methodology is to describe the activities in every stage and apply a systematic way for the project development.

Chapter II also involves project schedule and milestones. These two subtopics are important for developers to monitor and guide the project to make it finished on time. The other subtitle in this chapter is project requirements. This subtopic is including software requirement, hardware requirement and other requirement of this project.