

UNIVERSITI TEKNOLOGI MARA

**DEVELOPING A LABORATORY EXERCISE USING
VIRTUALIZATION TECHNOLOGY FOR A
SYSTEM ADMINISTRATION COURSE:
CASE OF KOLEJ UNIVERSITI ISLAM
ANTARABANGSA SELANGOR
(KUIS)**

KHAIRIL ASHRAF ELIAS <*m*> MAYAH

IT Project submitted in partial fulfillment of the requirements

for the degree of

Master of Science (Information Technology)

Faculty of Computer and Mathematical Sciences

July 2012

ABSTRACT

System Administration is a field that demands understanding in computer and network system such as operating system, application, networking, hardware, security and troubleshooting technique. Real-time and hands-on practical exercise will give students the opportunity to apply and integrate system administration skills they have learned during lecture class. However it is impractical and expensive to setup a dedicated and conventional hardware based lab especially for institution with limited monetary budget. The alternative way of teaching Linux System Administration course is Virtual Based Lab where specific tools are used to represent real IT infrastructure. The Virtual Laboratory (VLAB) project was initiated at Kolej Universiti Islam Antarabangsa Selangor (KUIS). The main aim of this project is to develop a laboratory exercise using virtualization technology for System Administration Course which is currently taught at KUIS as a part of Diploma in Computer Science program. It will provide a safe platform for the student to learn basic system administration. The project objective is achieved by doing critical analysis on different types of virtualization technology before choosing one that best meets the requirements. User Centered Design Approach has been a guide line in project development methodology to ensure that every phase involved will primarily focus on user requirement. Apart from the development of VLAB web application, the project uses Proxmox VE; an open source virtualization solution as the virtualization core engine to provide virtual machine instances to the students. Students can now perform laboratory experiment on KUIS VLAB using web browser from any computer connected to the Internet. As a result the project has successfully encouraged students to explore Linux operating system and motivate them into using KUIS VLAB as a training platform for their System Administration activities.

ACKNOWLEDGEMENT

First and foremost, I thank Allah with Whose blessing this project finally came to fruition and through Whom also this gratitude can be forwarded. Praise and Peace be upon the Prophet Muhammad (PBUH), the leader of mankind, the best of all creations, the ones who combines all the excellent characters and the beautiful way of life.

I would like to express my deepest gratitude and appreciation to my supervisor, Mr. Abdul Hamid Othman for all the guidance, suggestions and support he had given me throughout the development of this project. His precious advice and encouragement has pushed me through the tough times.

All the lecturers of Faculty of Computer and Mathematical Sciences (FSKM) UiTM who have played a significant role in my intellectual development, other colleagues and friends, also deserve my deepest appreciation.

Also a special thanks to the staff of Fakulti Sains & Teknologi Maklumat (FSTM) and Bahagian Teknologi Maklumat (BTM) KUIS. They have assisted me in giving idea and technical supports to this project development.

Finally I dedicate this work to my family especially my beloved parents, whose constant encouragement and love I have relied throughout my life and to my wife , and my children whose love, patience and sharing made my days and hours of hardship and constraints pass almost unnoticed.

TABLE OF CONTENT

	Page
STUDENT'S DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER ONE: INTRODUCTION	
1.1 Project Background	1
1.2 Problem Statement	2
1.3 Project Objective	2
1.4 Research Questions	3
1.5 Significance of Project	3
1.6 Scope and Limitation of Project	3
1.7 Report Outline	4
CHAPTER TWO: LITERATURE REVIEW	
2.1 System Administration Lab	6
2.2 Hardware Based Lab	7
2.3 Virtual Based Lab	8
2.4 Comparison of Hardware Based Lab vs Virtual Based Lab	9
2.5 Virtualization Technology	11
2.5.1 Full Virtualization	11
2.5.2 Paravirtualization	12
2.5.3 Operating System Virtualization	13
2.5.4 Hybrid Virtualization	13
2.6 Virtualization Technology as Learning Platform	14
2.7 Related Works	15

2.8	Teaching Environment - KUIS	17
2.8.1	System Administration Course in KUIS	18
2.8.2	System Administration Lab Activity in KUIS	18
2.9	Summary	19

CHAPTER THREE : METHODOLOGY

3.1	Methodology	20
3.2	VLAB Project Development Methodology	23
3.2.1	Planning Phase	24
3.2.2	Analysis Phase	24
3.2.3	Design Phase	25
3.2.4	Implementation Phase	25
3.2.5	Evaluation Phase	25
3.2.6	Report Writing	25
3.3	Research Instrument	26
3.4	Sampling Design	26
3.5	Summary	26

CHAPTER FOUR: ANALYSIS AND FINDING

4.1	Requirement Analysis	27
4.2	Functional Requirement	28
4.2.1	Functional Requirement - Student	28
4.2.2	Functional Requirement - Lab Instructor	28
4.3	Non - Functional Requirement	28
4.3.1	Usability	29
4.3.2	Satisfaction	29
4.3.3	Maintainability	30
4.4	Student Feedback	30
4.5	Use Case Diagram	31
4.6	User Roles	32
4.7	VLAB Architecture	33
4.8	Choosing Proxmox VE	36