BORANG PENGESAHAN STATUS TESIS*

JUDUL: Access Control List (ACL) Implementation and Simulation of UiTM Alor Gajah, Melaka Network Using OPNET Modeler.

SESI PENGAJIAN: 2007/2008

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ACCESS CONTROL LIST (ACL) IMPLEMENTATION AND SIMULATION OF UiTM ALOR GAJAH, MELAKA NETWORK USING OPNET MODELER

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

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2008

DECLARATION

I hereby declare that this project entitled

ACCESS CONTROL LIST (ACL) IMPLEMENTATION AND SIMULATION OF UiTM ALOR GAJAH, MELAKA NETWORK USING OPNET MODELER

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT:_____ Date: 20 JUNE 2008
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DEDICATION

Specially dedicated to
my beloved family members who have
encouraged, guided and inspired me throughout my journey of education
and not forgetting my friends and my colleagues.

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ABSTRACT

This project is about analyzed and suggestion to enhance the existing network at Universiti Teknologi Mara (UiTM) Alor Gajah, Melaka. The main objective of this project is to implement Access Control List (ACL) at UiTM Alor Gajah network. Currently, UiTM Alor Gajah network doesn't have any ACL or firewall and its only rely on the firewall at the main campus which is UiTM Shah Alam.The purpose of implementation of this ACL is to make firewall at UiTM Shah Alam easier where the application or unwanted program will be block earlier at UiTM Alor Gajah. ACL will be configured to control inbound and outbound traffic and it also will prevent application or unwanted program from running in the network there. A simulation software will be used to simulate the real data of UiTM Alor Gajah and will be configure through that. The rules of ACL will be configured based on the request form the administrator at UiTM Alor Gajah.

ABSTRAK

Kajian projek ini adalah mengenai analisis dan juga cadangan untuk meningkatkan rangkaian sedia ada di Universiti Teknologi Mara (UiTM) Alor Gajah, Melaka. Objektif utama projek ini adalah untuk melaksanakan *Access Control List (ACL)* pada rangkaian di UiTM Alor Gajah tersebut. Pada masa kini, UiTM Alor Gajah tidak mempunyai *ACL* atau *firewall* dan ianya hanya bergantung kepada *firewall* yang hanya terdapat di kampus utama iaitu di UiTM Shah Alam. Tujuan pelaksanaan *ACL* ini adalah untuk memudahkan *firewall* yang terdapat di UiTM Shah Alam di mana applikasi atau program yang tidak diperlukan akan disekat terlebih dahulu di UiTM Alor Gajah. Aplikasi simulasi akan digunakan untuk membuat simulasi mengenai data sebenar di UiTM Alor Gajah. *Access Control List* ini akan dilaksanakan berdasarkan permintaan daripada pentadbir di UiTM Alor Gajah.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

UiTM	-	Universiti Teknologi Mara
ACL	-	Access Control List
LAN	-	Local Area Network
IP	-	Internet Protocol
OPNET	-	Optimized Network Engineering Tool
FTP	-	File Transfer Protocol
HTTP	-	Hypertext Transfer Protocol
RAD	-	Rapid Application Development
VPN	-	Virtual Private Network
P2P	-	Peer-to-Peer
CSMA/CD	-	Carrier Sense Multiple Access / Collision Domain

CHAPTER I

INTRODUCTION

1.1 Project Background

As to fulfill the requirement for *Projek Sarjana Muda (PSM)*, one product has been chosen and the project is about to implement the Access Control List (ACL). ACL refers to a list of rules detailing service ports or network names that available on a host or other layer three (3) device. The ACL method is important to protect this network from outsider.

Upon completing this project, Universiti Teknologi Mara (UiTM) has been chosen as the organization that will be used as a place for a case study to make this project. It is a big organization which has about one thousand and seven hundred (1700) port and nine hundred (900) nodes. Currently UiTM Alor Gajah doesn't have any firewall and it just relies on firewall from UiTM Shah Alam. The main purpose for this project is to implement Access Control List (ACL) at this place. In this project, ACL will be configured to control inbound and outbound traffic. It also will prevent application or unwanted program from running in the network at this place.

Based on the real network, one replicated server will be build to configure the access control list. The simulator software will be used to simulate the real data and networking diagram of UiTM Alor Gajah and will be configure through that. The rules of access control list will be configured based on the request from the administrator at UiTM Alor Gajah.

Simulation will be use to make the administrator more understand about the functionality of access control list. Software that will be used to build up the simulation is OPNET Modeler which this software will provide a comprehensive development environment for the specification, simulation and performance analysis of the network.

1.2   Problem Statement

There are three (3) problems that have been identified in progress to implement this project and the problem are:

- Network performance at UiTM Alor Gajah was slow.
  - ✓ The network performance there was slow because all applications that want to block must be point to UiTM Shah Alam. Network protection here is directly controlled by UiTM Shah Alam and it will cause high traffic.

- Many applications or unwanted program is running in this network at UiTM Alor Gajah.
  - ✓ Many applications or unwanted program are also is running in this network at this place. This is because there is no firewall or access control list being implemented here to prevent this application or unwanted program. UiTM Shah Alam only relies on the antivirus software to protect the network.

- Network at UiTM Alor Gajah is not too secure.
  - ✓ The other problem that has been identified is the network here is not too secure because it doesn't have any firewall or access control list. It means outsider can attack this network easily. All computers there also can communicate each other because there are no rules to prevent it. It will become danger if student or outsider can get any confidential data from here.

1.3   Objective

The objectives that want to achieve upon completing this project are:

- To improve the network performance by implementing Access Control List (ACL). The implementation of this ACL will make easier for firewall at UiTM Shah Alam because all the application or unwanted program that want to be block will be block earlier at UiTM Alor Gajah.

- To reduce application or unwanted program from entering UiTM Alor Gajah network. UiTM Alor Gajah only relies on antivirus software to protect their network and implementation of this Access Control List (ACL) will be make UiTM Alor Gajah more secure.

- To enhance the network design here by adding this Access Control List in order to make the network here more secure.

1.4   Scope

1.4.1 Scope user

The user that will be involved in this project is only the administrator of the network environment at UiTM Alor Gajah. The administrator here will be responsible to monitor the network and to decide the rules that want to be apply to make the network performance here will working properly.

1.4.2 Scope project

There are four (4) scope of this project which is:

1. Implementation of Access Control List at UiTM Alor Gajah.

   - This is the main purpose of this project. In this project, the implementation of this Access Control List (ACL) was implementing because UiTM doesn't have any ACL.

2. Configuring new rules of Access Control List based on request from administrator at UiTM Alor Gajah.

   - In implementation this project, the rules of this ACL will be configured. The rules that want to be configured are based on the request from the administrator at UiTM Alor Gajah. The administrator will decide the rules that want to be configured.

3. Making analysis on current network and new network at UiTM Alor Gajah.

   - In this project, analysis on the current network will be making to know more about the environment of the network at this place. The analysis on the new network also will be make after the implementation of this ACL.

4. Develop network simulation using OPNET Modeler.

   - Simulation will be developing to given more understanding about this project. Software that will be used in implementation this ACL is OPNET Modeler.

1.5   Project Significance

There is several significance of this project. The result of this project will be making easy for firewall at UiTM Shah Alam because all application or unwanted program will be block earlier at UiTM Alor Gajah. Besides that, it also will avoid high traffic at UiTM Shah Alam. This is because when the application or unwanted program was blocked earlier by Access Control List (ACL) at UiTM Alor Gajah, the network protection will be no more rely on UiTM Shah Alam and it will decrease the network traffic at UiTM Shah Alam. The other significance is when UiTM Alor Gajah has their own ACL, they can manage their network security without relying on UiTM Shah Alam anymore and their network also will be more security compare to their current network.

1.6   Expected Output

The expected outputs that are going to obtained upon completing this project are to have the data on simulation that had been made. Besides that, UiTM Alor Gajah also will be having the Access Control List (ACL). This ACL will completely overcome all the problems by the blocking of application or unwanted program. UiTM Alor Gajah also will be have the rules of ACL and this rules will be improve the network performance here by make the earlier blocking without must be point to firewall at UiTM Shah Alam anymore. Another expected output is the data on analysis of the current network at UiTM Alor Gajah. UiTM Alor Gajah also will be having new network design. This network design will shown physical and logical design on the new network at UiTM Alor Gajah.

1.7 Conclusion

As a conclusion, this project is carried out in order to implement new features at UiTM Alor Gajah. The new feature is implementing Access Control List which will give more security at this place. Basically, the rules of this ACL will be configured based on the request from administrator at UiTM Alor Gajah.

This chapter is written mainly to give clearer understanding about this project. Besides that, it also describe about the current situation and the problem that have been facing there. By viewing this chapter, hopefully it can give more understanding about this project. The next chapter which is chapter II will be describe about literature review and the project methodology that want to be use in implementing this project.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

The literature review is conducted to identify important key points associated theory and previous completed research. Literature review usually precedes a research proposal, methodology and results section. All good research and writing is guided by a review of the relevant literature. An integral component of the scientific process, a literature review is the mechanism by which research is viewed as a cumulative process. The literature review has two components which are the actual literature search and the writing of the review.

The methodology is defined as a body of methods, rules, and postulates employed by a discipline or a particular procedure or set of procedures. Methodology is a way to use all available approaches, technique and tools used to achieve predetermined objectives. Many kinds to can be approached such as qualitative method such as analyst of interview, quantitative method such as forecasting, statistical and modeling and combined method. Therefore with have used applicable methodology project it can help, manage and maintain their system development.

2.2 Literature Review

2.2.1 Domain

The domain of this project is Information and Communication Technology (ICT) in Education and Training. It's because this project are about networking concept and simulation and will be implemented at UiTM Alor Gajah which is one of IPTA in Malaysia. To be specific, this project will be focusing on Access Control List simulation. It means this project will have output of simulation on how to implement the Access Control List (ACL). The simulation also will cover the problem that can occur in implementing this ACL and can be use as references to implementing the Access Control List (ACL).

2.2.2 Keyword

- Access Control List

John Carnal (2002) stated that "Access control list (ACL) is a table that tells a computer operating system which access rights each user has to a particular system object, such as a file directory or individual file. Each object has a security attribute that identifies its access control list. The list has an entry for each system user with access privileges. The most common privileges include the ability to read a file or all the files in a directory, to write to the file or files and to execute the file if it is an executable file or program".

In networking, Access Control List (ACL) refers to a list of rules detailing service ports or network names that are available on a host or other layer three (3) device, each with a list of hosts or networks permitted to use the service. Both individual servers as well as routers can have network Access Control List (ACL). ACL can generally be configured to control both inbound and outbound traffic and in this context they are similar to firewalls.

- Rules of Access Control List

According to John Stan (1999), "The rules of Access Control List can be describing as the rules that will give more security in the network. A better security system will require large number of access control list rules, but large number of access control rules will affect performance and manageability of the server". For example, the rules of Access Control List (ACL) are as followings:

i) In default, multicast messages with a multicast address as the destination address are not permitted to enter into the multicast network.

ii) If a multicast address in ACL corresponds to a multicast source address, multicast messages with the multicast source address as the source address and the multicast address as the destination address are permitted to enter into the multicast network.

The ACL is configured in the router on access layer and the switch of the multicast network, the switch and the router support ACL rules and filter off multicast messages sent from multicast sources not permitted to send multicast messages to specific multicast addresses in accordance with the ACL, or the switch and the router only forward multicast messages sent from specific multicast sources to specific multicast groups.

- Router

According to William Stalling (1993), "Router is a device that forwards data packets along networks. A router is connected to at least two networks, commonly two Local Area Connection (LAN) or Wide Area Connection (WAN) or a Local Area Connection (LAN) and its Internet