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IMPLEMENTATION OF DHCP IN THE IPv6 AND IPv4 NETWORK

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This report is submitted in partial fulfillment of the requirements for the

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2009

DECLARATION

I hereby declare that this project report entitled

IMPLEMENTATION OF DHCP IN THE IPv6 AND IPv4 NETWORK

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

STUDENT : _____ Date: 02/07/09

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SUPERVISOR : _____ Date: 2JULY2009

(EN. ERMAN BIN HAMID)

DEDICATION

To my dearest parents, your love and support are my greatest, for continuous love, and motivation.

To my friends, it is your sacrifices, support, and encouragement.

To my lecturer, for being respective and critical, and challenging me to be better student

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ABSTRACT

DHCP or Dynamic Host Configuration Protocol is one of the important network services in the network. It helps the administrator to assign dynamic and auto-configure IP address to the client workstation using a centralized DHCP server. Currently, there are two versions of DHCP which are the new DHCPv6 and the current DHCPv4. Both play the same role which is to assign dynamic and auto-configure IP address to the client workstation but only serves on different environment which are IPv6 and IPv4 respectively

Abstrak

Konfigurasi Protokol Pengguna secara Dinamik merupakan salah satu servis rangkaian yg penting di dalam satu rangkaian. Servis ini membantu pentadbir rangkaian untuk memberi alamat IP kepada komputer pengguna secara dinamik dan automatik menggunakan pelayan yang dihubungkan secara berpusat. Kini, terdapat dua versi Konfigurasi Protokol Pengguna secara Dinamik iaitu untuk internet protokol versi 4 dan juga internet protokol versi 6. Kedua-dua versi Konfigurasi Protokol Pengguna secara Dinamik mempunyai fungsi yang sama iaitu untuk memberi alamat IP kepada komputer pengguna secara dinamik dan automatik tetapi kedua-duanya digunakan di dalam persekitaran yang berbeza iaitu di dalam internet protokol versi 4 dan juga internet protokol versi 6.

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ACRONYM	WORD
IP	Internet Protocol
OS	Operating System
UTP	Unshielded Twisted Pair
PC	Personal Computer
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
DHCP	Dynamic Host Configuration Protocol
DHCPv4	DHCP version 4
DHCPv6	DHCP version 6
IETF	Internet Engineering Task Force
RFC	Request for Comment
BOOTP	Bootstrap Protocol
DNS	Domain Name System
ICT	Information and communication technology
CLI	Command Line Interface

CHAPTER I

INTRODUCTION

1.1 Project Background

IPv4 or Internet Protocol Version 4 has served internet community greatly since Request For Comments (RFC) 791 were published back in 1981 that help defines the internet protocol. RFC is a standard that has been reviewed and published by Internet Engineering Task Force (IETF) for internet standard. Since then, IPv4 have proved that it possess all the necessary requirements in terms of robustness, implementation and interoperability to help interconnect today's internet. As much as IPv4 has help internet community up until today, there has not been significantly change in its structure and technology since its first use. Taken that fact, internet users have drastically increased in the past few years. With the increasing numbers of internet users, there are many speculations among the experts on IPv4 capability to serve the internet community much longer. That is where IPv6 or Internet Protocol Version 6 was introduced to overcome the IPv4 limitations.

There were some weaknesses in IPv4 initial design that urged the introduction of IPv6 where the main issue is addressing. Even though the 32-bit addresses of IPv4 can allow up to 4, 294, 967, 296 totals addresses and seems like a large number for addresses, but not all this addresses can be allocated as current address practices limit the number of public IPv4 addresses to few hundred millions. This cause the public IPv4 addresses to be limited and insufficient as time passed by with the increasing numbers of internet users and also internet-connected devices and appliances. With the 128-bit addresses of IPv6, the address limitations in IPv4 addresses are solve as it can support numerous numbers of address up to $3.4x10^{38}$ addresses.

IPv6 is actually intended to replace IPv4 in many aspects especially regarding protocol, one of the protocol is Dynamic Host Configuration Protocol. The Dynamic Host Configuration Protocol (DHCP) is an IETF standard specifically designed to reduce the administration burden and complexity of configuring hosts on a Transmission Control Protocol/Internet Protocol (TCP/IP)-based network such as a private intranet. By using DHCP server to centrally manage IP addresses and using DHCP client computers to request and accept TCP/IP configuration information from DHCP servers and using DHCP relay agents to pass information between DHCP clients and servers, the process of configuring TCP/IP on DHCP clients is fully automatic. In the early days of its implementation, DHCPv4 was made with only IPv4 in mind and has been regularly modify following the internet protocol technologies. With the arrival of IPv6, a new DHCP specification for IPv6 has been designed known as DHCPv6. DHCPv6 are implemented using the same structure and technology as DHCPv4 but have been improve greatly in many aspects.

1.2 Problem Statement

The existing DHCPv4 that been implement in today's network are actually doing fine in terms of functionality as DHVPv6 are using the same structure and technology, but in terms of technical aspects such as configuration and design, DHCPv6 have been improved greatly compare to DHCPv4. As the transition from IPv4 to IPv6 is still ongoing process, the more reasons is there to why DHCPv6 are more preferable.

First and foremost, DHCPv6 support IPv6 addressing and configuration needs as IPv6 support 128-bit addresses compare to 32-bit addresses in IPv4. Secondly, DHCPv6 has cleaner and well-develop design compare to DHCPv4. One of the improve design is new optimized packet format where backward compatibility with Bootstrap Protocol (BOOTP) have been dropped. BOOTP is an UDP protocol that allows diskless client machine to discover its own IP address and the address of the server host. Other improvement is that DHCPv6 are able to manage multiple addresses for each interface and at the same time allows the use of link-local, site-local and global addresses on the same interface. DHCPv6 also uses a new format for protocol message where it uses a 16-bit options length that allows many more options and accommodated more data in each option than DHCPv4. Based on the DHCPv6 description above, this project will be undertaken to provide a reliable comparison data between DHCPv4 and DHCPv6 respectively as to help identify which from these two versions DHCP are better.

1.3 Objective

There are few objectives that have to be achieved in this project which are:

- Implementation of DHCPv4 services in IPv4 network environment using both server and router configuration.
- Implementation of DHCPv6 services in IPv6 network environment using both server and router configuration.
- To provide testing data for DHCPv4 and DHCPv6 services in both IPv4 and IPv6 network environment.
- Enhanced the network services by adding DNS server

1.4 Scope

The scopes involved in this project are:

- This project will be carry out in the lab where both services will be tested in real-environment using two workstations as a server and a client that connected to each other using a Cisco switch and connected to a Cisco router.

- For DHCPv4 services in IPv4 environment using server configuration, the server will run in Windows Server 2008 Operating System and the client will run in Windows Vista Operating System. For DHCPv4 services using router configuration, Cisco 2800 series router will be used as server and two workstations as a client.

- For DHCPv6 services in IPv6 environment using server configuration, the server will run in Windows Server 2008 Operating System and the client will run in Windows Vista Operating System. For DHCPv6 services using router configuration, Cisco 2800 series router will be used as server and two workstations as a client.

- For additional network services which are DNS server. It will run in Windows Server 2008 and provide forward and reverse lookup for both environment.

1.5 Project Significance

This project provides important and useful information for the near future as our current network are still in ongoing process with the transition from IPv4 to IPv6 environment. There are many improvements and changed in IPv6 compared to IPv4 as IPv6 are intended to replace IPv4. One of the major changes is addressing and it is directly related to DHCP. This project will cover and focus on the implementation of the current DHCPv4 in IPv4 environment and also the new DHCPv6 in IPv6 environment where a comparison data between these two DHCP versions will be used as a guide to determine which is better.

1.6 Expected Output

The expected output for this project is a success implementation for both DHCPv4 and DHCPv6 in IPv4 and IPv6 environment respectively where comparison data will be used to determine which versions are better. Theoretically, DHCPv6 are better than DHCPv4. Based on this, the main expected output is to prove and show by experiment data that theory is basically true.

1.7 Conclusion

This project is mainly about implementation of the current DHCPv4 in IPv4 environment and the new version DHCPv6 in IPv6 environment. This project will be undertaken using two pc as a server and a client connected to each other using a switch. As the project are carry out, comparison data will be gather to determine which DHCP version is better and at the same time to prove that theoretically DHCPv6 are better than DHCPv4. In the next chapter, it will cover about the literature review and project methodology where it will discuss about domain, keyword, previous research and project schedules and milestones.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

In this chapter, both literature review and project methodology will be discussed thoroughly for the project. Some journals, books and articles either in written form or online source will be used as a cited overview about the current research for this project. As for the project methodology, a selected methodology will be chosen based on the previous research and will be carry out for the rest of the project activities until completion where it includes the techniques, hardware and software requirements that will be used to develop the project.

2.2 Literature Review

Literature review is an overview of the search and analysis from other sources that include survey of articles, books, conference papers, theses, journals, reports, web pages and many more about particular topics by certified scholars and researchers. Other purposes of literature review are to describe, summarize, evaluate, clarify or integrate the primary content of the original sources with our own point of view.

2.2.1 Domain

The domain for this project is ICT in Network Application Development and Internet. Network is rapidly become more and more advance in its technology to support the needs for the Internet user. As time passes by, the Internet started to have a problem in terms of address space especially as the global Internet user increase drastically in past years that urged the introduction of IPv6. One of the new features in IPv6 is a new protocol for DHCP which is DHCPv6 that are developed from the existing DHCPv4. This new DHCPv6 promises to be better compare to DHCPv4 as the design and technical aspect such as configuration has been improved.

2.2.2 Keyword

There are few terms that being used in this project which are:

I. Internet Protocol Version 4 (IPv4) - The current version of internet protocol and are widely used in today's network. IPv4 used 32-bit addresses.

II. Internet Protocol Version 6 (IPv6) - The newer version of internet protocol that been developed from IPv4. Several new features have been implemented in IPv6 to overcome the limitation of Ipv4. IPv6 used 128-bit addresses.

III. Dynamic Host Configuration Protocol (DHCP) - One of the network application protocol where its main purposes is to distribute IP addresses to network devices.

2.2.3 Previous Research

DHCP really come in handy when it comes to managing the network. It automates the process of configuring new and existing devices in the network that previously been done manually by network administrators. According to Lemon perspective (2002, p. 39), back in the days where DHCP are still not around, all the network administrators have to updated the host table everytime a new computers been added to the network and changed the entries as the computers name and address changed.