ANALYSIS THE PERFORMANCE BETWEEN DUAL STACK AND IPV6 TUNNELING MECHANISM

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TAN KEAN SIAK

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

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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2010

DECLARATION

I hereby declare that this project report entitled

ANALYSIS PERFORMANCE BETWEEN DUAL STACK AND IPv6 TUNNELING MECHANISM

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

STUDENT : TAN KEAN SIANG Date: 25 JUNE 2010

SUPERVISOR _____ Date: 25 JUNE 2010

DEDICATION

To my beloved parents and friends, thank you both of your support and consideration.

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ABTRACTS

IPv6 is the next generation of Internet protocol that will replace IPv4 in the nearly future. The exhaustion of IPv4 address will be approached in few years time and it is possible to migrate from IPv4 network into IPv6 network. Subject to this matter, there are many studies and researches have been conducted as the transition from IPv4 to IPv6 require high level of compatibility and clear procedure for easy and independent deployment of IPv6. However, the transition from IPv4 to IPv6 will be a long process and required to coexist with during the migration stage. There are several transition mechanisms which proposed by the IETF Next Generation Work Group, however, dual stack and IPv6 tunnelling is the most popular mechanism that is being practiced currently. Although performance aspects for both of these mechanisms are required for practical deployment, they have yet to be empirically evaluated. Upon evaluate which is a better mechanism; the experimental testbed of dual stack and IPv6 tunnelling respectively will be conducted and analyzed in certain performance metrics throughout the project.

ABSTRAK

IPv6 akan menggantikan IPv4 tidak lama lagi akibat daripada kehausan alamat IPv4. Dengan ini, terdapat banyak kajian dan penyelidikan telah dilakukan tentang peralihan dari IPv4 kepada IPv6. Namun demikian, peralihan dari IPv4 kepada IPv6 memerlukan proses yang panjang dan perlu berinteraksi dengan IPv4 selama tahap penghijrahan. Megikuti kajian daripada IETF (Badan Generasi Depan) dual stack dan tunneling IPv6 adalah mekanisme yang sering dipraktikkan. Walaupun prestasi aspek untuk kedua mekanisme ini ditunjuk secara praktikal, kedua-dua mekanisme tersebut masih belum dievaluasi secara empirik. Untuk menentukan mana mekanisme yang mumpunyai prestasi yang lebih baik, kedua-dua mekanisme ini akan dijalankan dalam projek ini dengan menggunakan prestasi ukuran yang sesuai dalam FTP dan streaming servis.

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IP	-	Internet Protocol
IPv4	-	Internet Protocol version 4
IPv6	-	Internet Protocol version 6
FTP	-	File Transfer Protocol
DTE	-	Data Terminal Equipment
DCE	-	Data Communication Equipment
PCs	-	Personal Computers
OS	-	Operating System
RTT	-	Round Trip Time
MTU	-	Maximum Transmission Unit

LIST OF ATTACHMENTS

CHAPTER I

INTRODUCTION

1.1 Project Background

The exhaustion of the remaining pool of unallocated IPv4 address is approaching within the next few years. It has been a concern by many network experts to overcome this problem. According to the survey from IANA (Internet Assign Number Authority), IPv4 addresses only provided for around 4 billion addresses only and estimated to reach exhaustion at the year of 2012. As the consumption of IPv4 addresses seems to be increase every day, it is ideal for users to migrate into IPv6 environment.

IPv6 is the next generation of Internet Protocol and has overcome IPv4 limitation such as addressing space, integration of application level protocol, quality of service and security. Migration to IPv6 completely is not a short term period. It has to coexist with IPv4 during migration stage in order to avoid breaking IPv4 networks and allow all the current services and applications to keep working without any disruption.

Basically, there are several mechanisms for the translation (AlJa'afreh et al, 2009). They are dual stack and IPv6 tunneling. IPv6 tunneling enables IPv6 host and routers to connect with other IPv6 host and router over IPv4 packets. The main purpose to deploy IPv6 is to maintain the compatibility between IPv4 hosts and router by encapsulating IPv6 datagram into IPv4 packet and de-capsulation back from Ipv4 packet into IPv6 datagram. On the other hand, Dual stack is a network that compatible with both IPv4 and IPv6 network. This mechanism allows the operating system or application to choose which protocol used for each communication.

1.2 Problem Statement(s)

From the past decade, IPv4 is most widely used Internet Protocol. IPV4 has 32 bits and can allocate 4294967296 addresses space. As the consumption of IPv4 gradually increases, it will encounter exhaustion in nearly future. According to RIRs (Regional Internet Registries) and IANA (Internet Assigned Numbers Authority), the pool of IPv4 address will run out between 2010 and 2012. The figure 3.2.1 illustrated the address space allocation for RIR pool and IANA pool. Base on the figure, the exhaustion of unallocated address for RIR pool and IANA pool is predicted on year 2011 and 2012 respectively. Hence, after year 2012, there is no more unallocated IPV4 addresses available from the RIR and IANA. As a result, migration into IPv6 is required to overcome this problem.

IPv6 tunneling and dual stack are the solution to overcome IPv4 exhaustion. Both of them can be used for migration into IPv6 environment. However, users might hardly make decision when comes to implement the migration mechanism, either in IPv6 tunneling or dual stack mechanism. In order to decide which mechanism is better, both of the mechanisms will be implemented and analyzed the traffic performance in terms of latency, throughput, packet loss and jitter.

1.3 Objective

The objectives of the project are listed as the following:

- To investigate the use of IPv6 tunneling and dual stack mechanism.
- To implement and analyze dual stack and IPv6 tunneling mechanisms with different performance metrics in Window's platform.
- To evaluate the performance of dual stack and IPv6 tunneling using FTP and streaming services.

1.4 Scope

The project is mainly about analyzing the performance traffic between IPv6 tunneling and dual stack in terms of network metrics such as network connectivity, RTT (Round Trip Time), throughput, packet loss and jitter. The main purpose of analyzing the performance traffic is to compare which method is better for users to migrate their IPs into IPv6 environment. The experiment will be conducted at wireless lab and required to complete within 3 months. During the implementation, there will be 2 workstations and 2 routers only. 1 PCs serve as clients and 1 PCs serve as servers. As the project related to IPv6 and IPv4, the router (Cisco 2800 and above) must be compatible with both of these environments. Lastly, the workstations must be implemented in Window's platform only.