PERFORMANCE COMPARISON OF PACKET TRANSMISSION OVER IPV6 NETWORK ON DIFFERENT OPERATING SYSTEM

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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
2011

DECLARATION

I hereby declare this project report entitled

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

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DEDICATION

Dear Allah

I devoted my life for Allah and May my life is within Your guidance.

Dear my parents

Thank you for your sacrifice and love. No such compensate except from Allah.

Dear Teacher

Thank you for all the knowledge. May your knowledge are beneficial and useful for all humanity.

This work is dedicated to my beloved family and siblings, who passed on a love of reading and respect for education.

To my supportive friends and my supervisor, thank you so much for assist and help.

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ABSTRACT

This report is about to analysis the comparison performance of packet transmission over IPv6 network on different operating system platforms. The purpose of this project is to study performance of packet transmission over IPv6 network on Windows 7, Windows Server 2008 and Fedora 14. This project implement a fully IPv6 network environment. Traffic generator is used in this project to monitor network traffic between two computers. This report contains planning, analysis and design phases of the project. Planning phase includes introduction chapter, literature review chapter and methodology chapter. Introduction chapter provides background information about this project such as problem statements, objective, scope and expected output from this project. Next in literature review and methodology chapter, studies and research done by other people and scholarly journals that are related to this project are explained to get basic idea about developing this project. All project requirements also identified in this chapter. Next in analysis phase requirement analysis was conducted to characterize existing network infrastructure of the project. This chapter also includes logical and physical designs for new network that will be use to test the project. In summary, this project has met its goal to analysis comparison performance of packet transmission over IPv6 on different operating system platforms.

ABSTRAK

Laporan ini menerangkan mengenai analisis perbandingan prestasi penghantaran pakej melalui rangkaian IPv6 pada platform sistem operasi yang berbeza. Tujuan projek ini dibangunkan adalah untuk mempelajari mengenai prestasi penghantaran pakej melalui rangkaian IPv6 pada Windows 7, Windows Server 2008 dan Fedora 14. Projek ini akan dilaksananakan sepenuhnya dalam persekitaran rangkaian IPv6. Traffic generator akan digunakandalam projek ini untuk memantau lalu lintas rangkaian a ntara dua komputer. Laporan ini mengandungi perancangan, fasa analisis dan rekabentuk projek. Tahap perancangan meliputi bab pendahuluan, bab tinjauan pustaka dan bab metodologi. Bab pendahuluan memberikan latar belakang maklumat tentang projek ini seperti rumusan masalah, tujuan, ruang lingkup dan output yang diharapkan dari projek ini. Selanjutnya dalam tinjauan pustaka dan bab metodologi, kajian dan penyelidikan yang dilakukan oleh orang lain dan jurnal ilmiah yang berkaitan dengna projek ini akan dijelaskan untuk mendapatkan idea asas tentang pembangunan projek ini. Semua keperluan projek juga dikenalpasti dalam bab ini. Selanjutnya dalam bab analisis, tahap keperluan analisis dilakukan untuk mengarakterisasi infrastruktur rangkaian yang terdapat dalam projek. Bab ini juga merangkumi rekabentuk secara fizikal dan logikal untuk rangkaian baru yang akan digunakan untuk menguji projek ini. Ringkasnya, projek ini telah memenuhi tujuannya iaitu untuk menganalisis perbandingan penghantaran pakej di dalam rangkaian IPv6 pada platform sistem operasi yang berbeza.

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ABBREVIATION	WORD/DESCRIPTION
IP	Internet Protocol
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
ICT	Information and Communication Technologies
LAN	Local Area Network
OS	Operating System
RFC	Request For Command
PDF	Packet Delivery Fraction

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Internet Protocol Version 6 (IPv6), the replacement protocol for Internet Protocol Version 4 (Ipv4), is well known for a couple of reasons. IPv6 provides the ultimate solution for the problem of running out of IPv4 addresses in the global Internet by using a 128-bit address. IPv6 not only increases the address space, it also includes unique benefit such as scalability, security, simple routing capability, easier configuration, support for real-time data and improved mobility support.

This project is about to analyzing performance of packet transmission over IPv6 network on different operating system platforms. Performance is an important criterion for the wide acceptance of IPv6 stack implementations. Three operating systems choose in this project namely Windows 7, Fedora 14 and Windows Server 2008. This project conducted in real-time situation to understand the impact of operating systems in IPv6 stack performance. IPv6 will configure manually in this project.

Three standard metrics for protocol evaluation will be analyzed in this project are;

- Throughput in megabytes per second (MBps) in TCP and UDP.
- Jitter in megabytes per second (MBps) in UDP.
- Packet loss in megabytes per second (MBps) in UDP.

Traffic generator is an application software use to measure performance metrics. Maximum efforts are taken to minimize the number of processes running while the testing applications are run to give better access to the resources for the testing applications. The experiments are repeated to get consistent measurements. The test for each metric is carried out at least for 3 times for any given payload size and the average is taken.

1.2 Problem Statement

a. Few study on analyzing performance of packet transmission over IPv6 network in different operating system platforms.

The worldwide migration from IPv4 to IPv6 will not be an event, or even a year on the calendar. Rather, it will be a long process, a process that has already begun. Network engineers have a growing need to learn more about IPv6. Whenever the network is down, there are no references to identify.

b. Less knowledge to identify which operating system efficiency in term of IPv6 network.

With the increasing popularity in recent years, many popular operating system venders worldwide have incorporated IPv6 into their operating systems. The performance of the IP stack, together with the behavior of the operating systems greatly affects the efficiency of network applications built on top of it. Like any other protocols, the acceptance of various IPv6 implementations heavily relies on the end-user performance. Hence with the availability of a variety of IPv6 implementations, it is essential to evaluate their performance under different operating systems.

c. Understanding the performance metrics.

Not all standard metrics will be analyzed in this project. Only several performance metrics is choose to be analyze in this project. Non-related standard metrics will not be analyzed in this project. Understanding why the well-chosen metrics are measured in this project.

1.3 Objective

Objectives of this project are list out as below.

a. To produce a proper documentation about performance of packet transmission over IPv6 network on different platforms.

There is no proper documentation about performance of packet transmission over IPv6 network on different platforms. This project will produce a proper documentation about the study. The documentation will briefly explain in detail about the IPv6 network performance on Windows 7, Windows Server 2008 and Fedora 14.

b. To analyze performance metrics over IPv6 on different operating system platforms in detail.

The performance metrics that will be study in this project consists of throughput, packet loss and jitter. Traffic generator will monitor network traffic between two workstations in order to measure the performance metrics. All the performance metrics performance will be analyze in detail.

c. To propose suggestions to improve IPv6 performance in the future.

Based on the analysis and the documentation gather from this project, suggestion will be proposed to improve IPv6 performance in the future. Information or case study gather from this project can be a guide to improve IPv6 performance in different operating systems platform.

1.4 Scope

This project will focus on measure performance metrics over IPv6 network on different operating systems platform. It is implementing on different operating systems namely Windows 7, Windows Server 2008 and Fedora 14. Three performances metrics in this project are throughput, packet loss and jitter.

1.5 Project Significance

Analysis of performance packet transmission over IPv6 network on different platforms will produce a network documentation that can be used as reference by people especially in networking field to understand more about the impact of implement IPv6 at each operating system platforms. This documentation includes performance metrics result and comparative analysis of the performance metrics over IPv6 network.

This project will be analyzed based on real-time network environment. Assessment of network performance metrics will focus on throughput, packet loss and jitter. These results will be then used to make comparative analysis in order to understand which operating system are efficiency to implement IPv6 network in the future. Next, the documentation will include briefly explanation about the IPv6 network performance on different operating system platforms in real-time situation.

Furthermore, IPv6 will be the next generation of Internet protocol. This project will be an alternative for the Internet user in the future. It will be a great reference for the users to be familiar with the IPv6 implementations. IT organization also can use this documentation as a guide for better understanding about the IPv6 network performance on different operating system platform.

1.6 Expected Output

Expected outputs from this project are comparative table that include last result of the analysis. This table contains operating systems platform and performance metrics at each operating systems platform. It also include table of performance metrics over IPv6 network at each operating systems platform.

Besides that, traffic generator application is use in this project. This network generator gathered information about the performance metrics measurement in detail. The performance metrics result will be calculated to draw the graph.

1.7 Conclusion

As a conclusion, this project wills analysis about performance packet transmission over IPv6 network on different platforms namely Windows 7, Windows Server 2008 and Fedora 14. Three performances metrics evaluate in this project are throughput, packet loss and jitter. Information about the performance will be gathered and analyzed in real-time network performance. Lastly, comparative analysis is made in order to understand the impact of operating systems in order to implement IPv6 network in term of performance. This project will provide documentation about the analysis to be used as references for better understanding of IPv6 performance in the future.

In next chapter, literature review and project methodology will be discussed. Literature review will analyze past researches and project conducted that is related to this project. Project methodology will explain technique that will be used to complete this project. Activities involved in each stage of the project also will be explained in the next chapter.

CHAPTER II

LITERARUTE REVIEW

2.1 Introduction

This chapter will briefly discuss on the literature review of the project. Literature review discusses published information in a particular area and sometimes information in a particular subject area within a certain time period. It can be a simple summary of the sources, but it usually has an organizational pattern and combines both summaries. Literature review can be use as reference for the project. All information relating to the project will be provided throughout this chapter. The project schedule and project milestone will also be included in this chapter to determine the overall course of the project.

2.2 Literature Review

Literature review is the process of reading, analyzing, evaluating and summarizing about specific topic. The results of a literature review may be compiled in a report or they may serve as part of a research article or thesis. The following sections will discuss the components of literature review to get ideas of the whole project. The components of literature review are domain, fact and findings and previous research.

2.2.1 Facts and Findings

Information or data related to the project needs to be gathered as a guideline for the project. There are many ways of gathering data. The main resources are from web sites, journals, reference books and many others. The collected data will be analyzed to get some idea of the whole project. The below sub topics will discuss all the fact and findings about the project.

2.2.1.1 Internet Protocol Version 6 (IPv6)

IPv6 is the newest version of Internet Protocol that is the replacement for Internet Protocol Version 4 (IPv4). IPv4 is a fine protocol, but with the overwhelming expansion of the Internet, it is insufficient to keep up with the demand for addresses (S. Miller, 1998). This deficiency needed to be resolved; otherwise there would not be enough room for all of the various domain structures which exist on the Internet. IPv6 is the next generation protocol to alleviate the congestion that version 4 encounters.

IPv6 have many new features to be explored. The new features of the IPv6 protocol are:

- New header format
- Large address space
- Stateless and stateful address configuration
- Built-in security
- Better support for prioritized delivery
- New protocol for neighboring node interaction
- Extensibility