

BORANG PENGESAHAN STATUS TESIS*

JUDUL: ANALYSIS OF NETWORK PERFORMANCE IN MAJLIS
PERBANDARAN MANJUNG (MPM)

SESI PENGAJIAN: 2007

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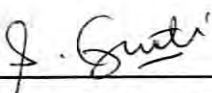
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**ANALYSIS OF NETWORK PERFORMANCE IN MAJLIS PERBANDARAN
MANJUNG (MPM)**

GUNAVATHI A/P SATHAPPAN

**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
2007**

DECLARATION

I hereby declare that this project report entitled

**ANALYSIS OF NETWORK PERFORMANCE IN MAJLIS PERBANDARAN
MANJUNG (MPM)**

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

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DEDICATION

To my beloved parents, you are the strength that keeps me walking. Thank you for all your support...

ACKNOWLEDGEMENTS

First and foremost, I thank God for giving me strength to pursue all tasks in order to complete Projek Sarjana Muda II (PSM II). I also would like to gratefully acknowledge the contribution of several people who helped me to complete this project. First, I would like to convey my grateful thanks to my supervisor En. Mohd Fairuz Iskandar Othman, and my evaluator En. Nazrulazhar Bahaman for their valuable contribution and assistance throughout the development of this project.

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Last but no least, I appreciate and thank all the parties who had supported me so much and helped me to complete my PSM II. Thank you.

ABSTRACT

This report is about analysis of network performance in Majlis Perbandaran Manjung (MPM) project. The purpose of this project is to study performance of existing network in MPM and to provide solutions to improve the network performance. This project will be developed using OPNET Modeler simulation tool. This report contains planning, analysis and design phases of the project. Planning phase is includes introduction chapter and literature review 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 ideas about developing this project. Project methodology selected is Waterfall Model for progress of project developed phase by phase. All project requirements also identified in this chapter. Next in analysis phase requirement analysis was conducted to characterize existing network infrastructure in MPM. In design phase, network architecture and functionality of technology and devices used in MPM's network were explained. This chapter also includes logical and physical designs for existing and suggested network of MPM. In implementation phase, detail steps to configure existing network design in OPNET software were explained. Next in testing phase existing network and suggested network designs were simulated in OPNET to characterize their respective performance. Based on the analysis of test results best network design was proposed for implementation in MPM. In summary, this project has met its goal to analysis and improve network performance of Majlis Perbandaran Manjung (MPM).

ABSTRAK

Laporan Projek Sarjana Muda I (PSM I) adalah tentang projek analisa prestasi rangkaian di Majlis Perbandaran Manjung (MPM). Tujuan projek ini adalah untuk mengkaji prestasi semasa rangkaian dan mencadangkan cara-cara untuk meningkatkan prestasi rangkaian di MPM. Projek ini dibangunkan dengan peralatan simulasi OPNET Modeler. Laporan ini mengandungi fasa perancangan, analisa dan rekabentuk. Fasa perancangan termasuklah pengenalan dan '*Literature Review and Methodology*'. Bab pengenalan menerangkan latar belakang projek seperti kenyataan masalah, objektif, skop, dan hasil diharapkan dari projek ini. Bab '*Literature Review and Methodology*' pula membincangkan kajian dan jurnal yang berkaitan dengan projek ini yang boleh memberikan idea untuk membangunkannya. Seterusnya, bab ini juga menerangkan methodologi yang dipilih untuk melaksanakan projek ini iaitu 'Waterfall Model' yang membangunkan projek fasa demi fasa. Seterusnya, dalam fasa analisa, analisa keperluan rangkaian dilaksanakan untuk mengetahui ciri-ciri rangkaian. Dalam fasa rekabentuk seni bina rangkaian, teknologi, dan peralatan yang digunakan di MPM dibincangkan. Bab ini juga mengandungi rekabentuk logikal dan fizikal bagi rangkaian MPM yang sedia ada dan rangkaian yang dicadangkan untuk meningkatkan prestasi. Seterusnya dalam fasa implementasi langkah-langkah untuk membina rangkaian MPM menggunakan perisian OPNET dibincangkan secara terperinci. Dalam fasa ujian, simulasi rangkaian sedia ada dan rangkaian dicadangkan untuk MPM dijalankan. Keputusan dari simulasi ini digunakan untuk menganalisis prestasi setiap rangkaian dan rangkaian yang paling optimum dicadangkan untuk MPM. Kesimpulannya, projek ini telah mencapai objektifnya untuk menganalisis rangkaian MPM dan untuk mencadangkan rangkaian baru bagi meningkatkan prestasi rangkaian di MPM.

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LIST OF ABBREVIATIONS

CSMA/CD	Carrier Sense Multiple Access/Collision Detection
Gbps	Gigabit (one billion bits) per second
HTTP	Hypertext Transfer Protocol
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet Protocol
LAN	Local Area Network
MAN	Metro Area Network
MAC	Media Access Control protocols
Mbps	Mega bit per second
MPM	Majlis Perbandaran Manjung
NIC	Network Interface Card
OS	Operating System
TCP	Transmission Control Protocol
WAN	Wide Area Network

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CHAPTER I

INTRODUCTION

1.1 Project Background

The revolution in computer networking technology today demands for high bandwidth, short response time, reliable network, guaranteed application services and optimum LAN traffic flow. Organizations require optimum network performance to support their business operations and changing customer needs. Therefore, analysis of network performance is very important to maintain and improve network efficiency from time to time.

This project is about analyzing network performance in Majlis Perbandaran Manjung (MPM) which is located in Manjung , Perak. This municipal organization's building is divided to 2 blocks and has 10 departments. There are 188 from the total of 240 employees use computers or laptops to do their daily tasks. Backbone technology used here is multimode fiber optic cable that connects core switch from each block. Each department in the organization has a switch that connects to other switches in different department or connects to the core switch directly.

In few years time the number of computer and laptop users in MPM will be increased that each employee gets their own desktop computer or laptop. Besides that, application systems in MPM are also will be added or upgraded to support organization's business policy and user requirements. Therefore, network performance of the organization must be in good condition in order to provide appropriate quality of service and to satisfy demanding users.

In this project, network performance of MPM will be analyzed using OPNET Modeler simulation. Information regarding business issues and technical requirements will be gathered first to ease analysis of existing network infrastructure in MPM. The current applications, hosts, topology, network designs and number of workstations will be documented and tested using network simulation. Performance assessment gained from simulation will be used as bench marking to improve network efficiency of the organization using appropriate suggestions. Suggestions to improve network efficiency will be developed in prototype design and will be tested using network simulator. Lastly, both existing network design and suggested network design will be compared based on network characteristics, advantages and disadvantages of the network designs.

Analysis of network performance in MPM will focus more on bandwidth utilization, delay and packet loss rate. Distribution of critical resources and segment workload also will be considered because unreasonable network resources allocation leads to poor network performance.

1.2 Problem Statement

- a. MPM has no proper network documentation.

MPM did not document its network infrastructure for future use. Currently there is no proper network design is being used in this organization. MPM only manage to give intangible explanation about the network architecture. Implementation of new features in their network is done without any proper documentation.

In this project, existing network infrastructure in MPM will be documented using logical and physical network design. It also will include analysis for applications, hosts, and workstations that exist in the network.

- b. Network performance in MPM has never been analyzed before.

The network efficiency in MPM has never been analyzed and therefore existing problems could not be identified moreover could not find solutions to improve them. Whenever the network is down, there are no references to identify the problems. Future up gradation for the network cannot be done effectively because affects from new implementation could not be estimated.

Analysis of network performance will identify how healthy is the network and any problems detected can be solved using appropriate method. Thus, based on current network performance and requirements MPM's network can be upgraded effectively.

- c. Budget is another main problem faced by the organization.

High cost is required if the organization had to reconstruct its network infrastructure all over again. The budget has been a constraint for the organization to get professional service from networking consultancy to estimate and upgrade its network performance.

Suggestions proposed at the end of this project to improve the network performance will be in the range of considerable budget. If possible existing equipments will be reused to reduce the cost.

1.3 Objective

Objectives of this project are list out as below.

- a. To produce a proper documentation for MPM based on existing network infrastructure.

First objective of the project is to collect all data from the organization to characterize the existing network and produce a proper documentation. This documentation will include analysis of applications, hosts, workstations and network designs.

- b. To analyze network performance of existing network using network simulator.

Using information gathered previously, network design, application services and other technical information will be mapped in OPNET Modeler simulator to assess current network performance in MPM. Network performance will be analyzed on bandwidth utilization, delay (response time), packet loss rate, application performance and distribution of critical resources.

- c. To propose suggestions to improve network performance in the organization and test the proposed network design using network simulator.

Based on organizations requirements and performance of existing network, suggestions will be proposed to improve network efficiency. Proposed design will be mapped in network simulator to test the network performance. Solutions to solve existing problems or at least to improve them will be identified at the end of the project. Existing network and proposed network characteristics will be compared and analyzed.

1.4 Scope

This project is developed for Majlis Perbandaran Manjung (MPM) which is located at Jalan Pinang Raja, Manjung, Perak. This project will focus on Local Area Network (LAN) connections in MPM. All suggestions to improve network efficiency dependent on cost and physical limitations exist in the organization. The network simulation will be developed using OPNET Modeler in Windows XP Professional operating system.

1.5 Project Significance

Analysis of network performance in Majlis Perbandaran Manjung (MPM) will produce network documentation that can be used as reference by the organization to implement new features in existing network. This documentation includes analysis of technical information and business policy that affects network infrastructure of MPM.

This project provides insight on existing network performance in MPM. The network performance will be simulated based on information gathered from the organization. Assessment of network performance will focus on bandwidth utilization, delay, packet loss rate, distribution of critical resources and segment workload. These results will be then used to identify problems and weaknesses of the existing network. Next, new network design that can produce better network performance and solve the problems will be proposed and tested in network simulator.

Based on network simulation results, ways to improve network efficiency in MPM will be discussed. Existing network characteristics and proposed network characteristics will be compared and justified for better understanding.

This project also will provide the chance to improve network efficiency in MPM. This will definitely benefit users and customers of MPM because with better network performance users can perform well their tasks and provide better service to customers. IT officers of the organization also will gain more knowledge about network analysis and design for optimum network performance.

Furthermore, using OPNET Modeler simulation software saves cost and provides opportunity to correct mistakes that can be made when designing new network for the organization.

1.6 Expected Output

Expected outputs from this project are requirement analysis tables that provide information about applications, hosts, and user requirements. Besides that, diagrams of network architecture, topology model, physical and logical design for existing and proposed network will be produced.

Besides that, network simulation will be generated using OPNET Modeler based on information gathered from the organization. These network simulations will provide values that can be used to generate graphs. Based on the values and graphs bandwidth utilization, delay and packet loss rate will be analyzed.

1.7 Conclusion

As a conclusion, this project will analysis network performance in Majlis Perbandaran Manjung (MPM). Information about existing network infrastructure will be gathered and analyzed before mapping the design in simulation. Suggestions will be proposed to improve network efficiency in MPM. The proposed design will be tested in simulation and will be compared with existing network characteristics. The project will use OPNET Modeler simulation software and Windows XP Professional operating system. Suggestions to improve network performance depend on the cost and physical limitations in MPM. Main outputs of this project are network simulations, graphs, network designs and network flow diagrams.

In next chapter, literature review and project methodology will be discussed. Literature review will analyze past researches and projects 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 next chapter.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter will discuss about literature review and project methodology. First part of this chapter focuses on facts and findings about the project. Facts and findings reviews approaches used in past researches, case studies, references or other findings that similar to this project. These sources provide idea about techniques can be used in this project.

Project methodology discuss about approaching method will be used and activities involved in each stage of this project. Waterfall model from System Development Life Cycle (SDLC) methodology will be used in this project. This is because this methodology suits well the flow of the project to ensure the project meets the goals.

Project requirements will discuss about all necessary things needed to complete this project successfully. The requirements include software, hardware and other requirements to do this project.

Lastly project schedule and milestone will be included in this chapter which will list out all the activities involved and estimated time frame taken to complete each activity. Project schedule and milestone is very important because it provides guidelines to follow in each phase of the project.

2.2 Facts and Findings

Network performance analysis is very important in every organization to ensure that business requirements and technical goals of the organization is fulfilled. Organizations are adding users, applications, additional sites, and external network connections at a rapid rate. Thus, network performance of the organizations must be in good state to operate well and to support the customer needs.

Network performance of Majlis Perbandaran Manjung (MPM) will be analyzed using network simulation. Based on Abeysundara and Kamal (1991) the three most commonly used performance measures are information throughput, channel utilization, and (various forms of) delay. Information throughput can be defined as the total number of information bits transmitted per unit time. Few of important parameters which will be focused on to assess network performance are as follows.

a. Bandwidth utilization

Bandwidth refers to data-carrying capability of a circuit or network, usually measured in bits per second (bps). "Bandwidth utilization is a measurement of how much bandwidth is used during a specific time period (Oppenheimer, 2000)". Utilization is commonly specified as a percentage of capacity. For example, a network-monitoring tool might state that bandwidth utilization on an Ethernet segment is 30 percent, meaning that 30 percent of the capacity is in use.

Network analysis tools use varying methods for measuring bandwidth usage and averaging the usage over elapsed time. Usage can be averaged every millisecond, every second, every minute, every hour, and so on. Furthermore, Oppenheimer (2000) also said a typical "rule" for shared Ethernet is that average utilization should not exceed 37 percent, because beyond this limit, the collision rate allegedly becomes excessive. The 37 percent limit comes from studies done by the Institute of Electrical and Electronics Engineers (IEEE) comparing carrier sense multiple access collision detection (CSMA/CD) to token passing. In the case of token