REDUNDANCY OF LOAD BALANCING FOR WEBSITES

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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
KOLEJ UNIVERSITY TEKNIKAL KEBANGSAAN MALAYSIA
2006

THESIS APPROVAL STATUS FORM

JUDUL: **REDUNDANCY OF LOAD BALANCING FOR WEBSITES**

SESI PENGAJIAN: **2005/2006**

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ACKNOWLEDGEMENT

First of all, I would like to take this opportunity to express my gratitude to KUTKM for making this course a compulsory for each student. This course has given us hands-on discipline in project management and many skills that simply cannot be taught in the classroom. They can only be learned through practical experience-that is, working on a large project. I am very grateful to my PSM supervisor, Prof. Madya Dr. Shahrin B. Sahib, who freely gave me his time, energy and wisdom when I needed it most. He was there the whole way with great support and encouragement. In addition to providing indispensable moral support, he was the one who gave most of the idea in completing this project. His tireless labor was of inestimable help. I am very lucky to have his as our project supervisor. Thanks also for his kindness and willingness to teach and guide me will be remembered. I continue to be eternally grateful to Mr. Othman Mohammad as my project panel because freely gave me his time to teach and gave his idea to solve my project problem. Beside that, thanks also to Mr. Zainudin Salleh, Officer of Information System, Computer Centre, KUTKM for his unwavering support and guidance. He was immensely helpful and gracious. He explains to me all about the project development and gave me a note as my references. I would like to acknowledge his tremendous contribution of time and knowledge towards completing my project. Not forgetting, my mom and dad who had gave me all the support I need. Thank you for your guidance, love and care. I shall be forever indebted to all those individuals who generously gave me their time and insight. Finally, I also acknowledge the contribution to all my friends that gave me a moral support. Before I'm forgotten, I would like to thank to Mr. Bakhtiar Hamid, Network Manager, NSTP because he introduce me about this project. Without his guidance and support, I not know detail about the real networking environment. Last but not least, I would like to thank those who are not mention in here but have directly or indirectly helping and guiding me towards completing my PSM; your efforts and time are much appreciated. Thanks for all.

By Azmida Hj. Abd Aziz

Abstract

Networking technology and in particular, local area network (LAN) technology is one of the fastest growing technologies in our cultural today. Today, students wanting to understand the concepts and protocols of the network environment from a variety of academic and professional backgrounds. The computer networking is important for the day and the future because without network no communication will happen. According to my project, the main problem is unbalance data because of the loaded websites crawls when more requests avalanche in. For solution, implement the LB is a good way. LB is the distributing processing and communications activity evenly across a computer network so that no single device is overwhelmed. Load balancing is especially important for networks where it is difficult to predict the number of requests that will be issued to a server. Busy websites typically employ two or more Web servers in a load balancing scheme. The main purpose of the load balancer is to balance the loaded websites crawls when more requests avalanche in. All of part in this project can help the officer or staff of Information System to handle and manage the network system. This project will successfully because the LB project has achieved their objectives and goals.

Abstrak

Teknologi komputer dan sebahagiannya merupakan satu teknologi yang canggih pada masa kini. Hari ini, pelajar perlu memahami setiap konsep dan protokol yang terdapat pada persekitaran rangkaian dari segi latar belakang akademik dan profesional. Rangkaian komputer adalah penting setiap hari dan di masa depan kerana tanpa rangkaian, komunikasi tidak akan wujud. Berdasar kepada projek yang akan di bangunkan, masalah utama yang berlaku adalah ketidakseimbangan data disebabkan oleh limpahan laman web yang diminta oleh pengguna. Bagi mengatasi masalah ini, membangunkan LB adalah jalan yang terbaik. LB merupakan proses pembahagian secara sekata dan aktiviti komunikasi rangkaian komputer, oleh yang demikian tidak akan berlaku pemberatan ke atas satu peranti sahaja. LB, keistimewaannya penting pada rangkaian dimana ia sukar untuk menjangka bilangan permintaan yang terdapat pada server. Tujuan utama LB adalah untuk mengimbangi setiap limpahan laman web apabila terlalu banyak permintaan oleh pengguna. Kesemua bahagian yang dinyatakan dalam projek ini dapat membantu pegawai atau pekerja sistem maklumat dalam mengendali dan menguruskan sistem rangkaian. Projek ini akan berjaya dengan cemerlangnya kerana projek LB ini akan dapat mencapai objektif dan matlamatnya.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDIXES

TERMS AND ABBREVIATIONS

	Description
PSM	Projek Sarjana Muda
ICT	Information Communication Technology
KUTKM	Kolej Universiti Teknikal Kebangsaan Malaysia
LB	Load Balancing
LVS	Linux Virtual Server
LAN	Local Area Network
DNS	Domains Name Server
NAT	Network Address Translation
VRRP	Virtual Router Redundancy Protocol
HA	High Availability
HTTP	Hypertext Transfer Protocol
HTML	Hypertext Markup Language
SDLC	System Development Life Cycle
VLAN	Virtual Local Area Network
IPVS	IP Virtual Server
SSH	Secure Shell
OS	Operating System
www	World Wide Web
UTP	Unshielded Twisted Pair
CPU	Control Processing Unit

CHAPTER I

INTRODUCTION

1.1 Introduction

In this chapter is all about the project of PSM 1 where it describe about the project background, problem statement that bring out this project, the project objectives to achieve project scope, scope, project significance, the expected output and the conclusion of this chapter. It is very important to understand this project before it will discuss more detail in next chapter. The most important part to be viewed clearly is the objectives and scope. Load Balancing is a technique used to spread work between many processes, computers, disks or other resources. This chapter will describe about the web server load balancing. One major issue for large Internet sites is how to handle the load of the large number of visitors they get. It is routinely encountered as a scalability problem as a site grows.

1.2 Project Background

"Load Balancing" is the distributing processing and communications activity evenly across a computer network so that no single device is overwhelmed. Load balancing is especially important for networks where it's difficult to predict the number of requests that will be issued to a server. Busy Web sites typically employ two or more Web servers in a load balancing scheme. If one server starts to get swamped, requests are forwarded to another server with more capacity. Load balancing can also refer to the communications channels themselves. The main purpose of the load balancer is to balance the loaded websites crawls when more

requests avalanche in. The concept of the load balancing project is when the load balancer goes down, automatically the hot- standby (backup) will take over. Make sure both the load balancer and hot-standby servers have the same configuration files, but in this project just one load balancer is build.

. This project will be used for Web server in KUTKM (as a client). The purpose of this project is to balance the requested website by client at KUTKM. Load Balancer is a good solution for control and balances the data in network. It uses an asynchronous non-forking/non-blocking model, and provides failover abilities. Failover is an important fault tolerance function of mission-critical systems that rely on constant accessibility. Failover automatically and transparently to the user redirects requests from the failed or down system to the backup system that mimics the operations of the primary system.

When a service is providing through, it will stay up and running as long as there is at least one active backend server. The load balancer will automatically detect temporary failures (network issues, system crashes, server overload, technical intervention) and remove the related servers from the pool. Then, at regular intervals, it will probe the servers that have been marked as down. As soon as they are back to life, they will get added to the pool again. It is a project started to create a full-featured virtual router for Linux, which includes load balancing through Linux Virtual Server, failover via VRRP and health checks to monitor real servers.

Linux Virtual Server will use in this project. The LVS is a highly scalable and highly available server built on a cluster of real servers, with the load balancer running on the Linux operating system. The real servers may be interconnected by high-speed LAN. Scalability is achieved by transparently adding or removing a node in the cluster. The goals of the LVS is to build a high-performance and highly available server for Linux using clustering technology, which provides good scalability, reliability and serviceability. Applications of the LVS as an advanced load balancing solution can be used to build highly scalable and highly available network services. In this project only focus for website services. The LVS and application is a very important point to build this project.

1.3 Problem Statements

The following problems have been identified with KUTKM technicians:

i. Loaded websites crawls when more requests avalanche in. The requested websites by client can not balance in network.

ii. Cost. Problem in costing also happen when buy the hardware of load balancer because the hardware is very expensive.

iii. Difficult to manage the request websites. Managing the data cycle is so difficult to do. If the data cycle is not clear, data was slowly delivery to clients because it is not balance. The project objective is to determine the loaded websites in network and implement of the load balancer is a solution.

1.4 Project Objectives

This project will develop to balance the web server because of the loaded websites. The following are the objectives will result of this project:

i. To solve the problem of loaded websites crawls when more requests avalanche in the network.

ii. To optimize the functions to give an advanced flexibility- Huge variety of balanced traffic.

iii. To minimize cost because to buy the load balancer hardware is very expensive. So, build this load balancer with use free software can minimize the cost.

1.5 Scopes of Project

This project will support the following scopes:

i. **Balance and manage the request websites by client.**
When many request website at the one time, the data will be unbalance. So, from that case, to implement a load balancer is an important in network. The main scope of this project is to solve the loaded websites crawls when more requests avalanche in network.

ii. **Configure a high availability architecture or design.**
The components of high availability have two. One is the *Director* and the other one is a *Real Server*. The director will provides load balancing and HA services. All requests from clients are the first processed by the director which decides which real server to forward requests to base on algorithms configured. The real server is an actual server providing services; web servers and DNS. Normally at least to or more real servers are configured.

iii. **Control the websites services.**

iv. **Monitoring a high availability services.**
It will monitoring the health checks status on load balancer (director) and on the real servers.

1.6 Project Significance

The significance of this project will solve the problem of loaded websites crawls when more requests avalanche in. It also can reduce the cost because to buy the load balancer hardware is more expensive. It will be more efficient to use in KUTKM which has an integrity the features of manage and balance the entire requested website by client. So, for the solution was implement the load balancing using the Linux platform and configure it. From this project, they may be able to get

benefit to manage and balance the data in network. This project is important to implement, especially in big organization because staff in their organization use the Internet. When many client requests a websites may be in the same time, the problem of loaded websites will happen. So, from this project, the problem will solve and the request website will balance. More benefit will realize from this project such as experiences, knowledge, and new skill. This project is interesting and important to implement because it have advantage for balance data in network and minimize the cost.

1.7 Expected Output

From this project, the expected output to overcome when the network connections between LB, Real Server and user successful. The DNS server must running and can detect the host of the default html. Then, user must browse the name server or the IP address of that host and user will see the default html of both real server (web server) interfaces. When the interface one of the real server appears, user must click refresh button to see interface of another one of the real server. If change interface, it is mean the project was successful. The entire requirement will need to implement this project.

1.8 Conclusion

As a conclusion in this chapter will make us to understand what the project background, scope of project and the problem statement clearly before started the project because it can help you to implement it. The Load Balancer is all about how to balance and manage the request data by client. When many request website at the one time, the data will be unbalance. The purpose of my project is to balance the requested website by client at KUTKM. It is a good solution for control and balances the data website in network. In the next chapter, I will explain about literature review and project methodology.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

A literature review is the chapter will introduce the idea of develop this project. The review forms an important chapter in thesis where it is purpose to provide the background to and justification for the research undertaken. In all areas of research are used to inform the researcher of the project methodology and briefly discuss about the fact and finding from journal, reference book or website and project requirement include the software, hardware and network requirement. Fact and finding is a formal process of using research, interviews, questionnaire, sampling and other techniques to collect information. The project schedule and milestones also show in this chapter to see the process of project follow by the duration and term. The focus of the literature review is to summarize and synthesize the arguments and ideas of the others.

2.2 Fact and Finding

The task of searching the published literature is made immeasurably easier these days through the existence of the computerized catalogues and special gateways on the Internet like Yahoo Homepage Search Engine (http://www.yahoo.com), Google Homepage Search Engine (http://www.google.com.my) and reference book or journal. All this materials

present alternative solutions to the problem and then recommend a proposed solution. The following are a material of the searching:

i. **Load Balancing Your Web Site**

Practical Approaches for Distributing HTTP Traffic

"When it comes to handling lots of visitors, high-volume sites like Yahoo!, Netscape, and Microsoft have learned that the actual quality of service a Web server provides to end users typically depends on two parameters network-transfer speed and server-response time. This involves an attempt to distribute the traffic onto a cluster of back-end Web servers. Aside from the technical hurdles, this is an interesting approach, because the back-end servers don't need to be large-scale machines -- medium-scale hardware works just fine". (By Ralf S. Engelschall, 2004)

ii. **Load Balancing Web Applications**

"This article offers an overview of several approaches to load balancing on Web application server clusters. A cluster is a group of servers running a Web application simultaneously, appearing to the world as if it were a single server. To balance server load, the system distributes requests to different nodes within the server cluster, with the goal of optimizing system. Of the many methods available to balance a server load, the main two are DNS round robin and hardware load balancers". (By Vivek Viswanathan, September 28, 2001)

iii. A Cluster System to Achieve Scalability and High-Availability with Low TCO

The authors describe a commercialized version of the Linux Virtual Server. "In this article, a commercial implementation of the Linux Virtual Server (LVS), developed by Wensong Zhang (see Resources), is discussed. The management cost of a web farm is a dominant portion of its total cost of ownership (TCO). In our product, numerous management features were added to the LVS to lower the TCO and to improve fault tolerance. Such additions included automated configuration, automated updating, failure recovery and integration with the Coda file system for content replication. The LVS architecture consists of one or more load balancers and multiple web servers that are loosely integrated. LVS comes in three options, NAT, tunnel and direct routing. The direct routing option is especially noteworthy because the load balancer does not become a bottleneck. In this architecture, both load balancers and web servers share the same virtual IP address and must be on the same subnet. The virtual IP address is a real IP address given to a single virtual server that may actually consist of one or more machines". (By Nan Tang and Zen Kishimoto on Wed, 2002)

iv. The Design and Performance of an Adaptive CORBA Load Balancing Service

(A subset of this paper will appear in the Distributed Systems Engineering Journal's "online" edition).

Motivation: "The growth of online Internet services during the past decade has increased the demand for scalable and dependable distributed computing systems. An increasingly popular and cost effective technique to improve networked server performance is *load balancing*, where hardware and/or software mechanisms determine which server will execute each client request. Load balancing mechanisms distribute client workload equitably among back-end servers to improve overall system responsiveness. These mechanisms can be provided in any or all of the following layers in a distributed system". (By

Ossama Othman, Carlos O'Ryan, and Douglas C. Schmidt fossama, coryan, schmidtg@uci.edu, Department of Electrical and Computer Engineering, University of California, Irvine,USA, February 3, 2001)

2.3 Project Methodology

Project Methodology is an important part to design and develop project. It will show what the methodology and method will use in this project step by step. A methodology is the realization of a software process model in a project. SDLC methodology provides a guideline to follow completing every activity in the project. The SDLC can be grouped into five major phase; planning, analysis, design, implementation and maintenance. Methodology ensures that project is conducted in a disciplined, well-managed and consistent manner that promotes the quality products and results in project that is completed on time. The advantages of using this methodology are that it identifies system requirements long before the project begins and that minimizes changes to the requirements as the project proceeds.

2.3.1 Step 1: Project planning, feasibility study

The main objective of the project planning phase are to identify the project title, scope, ensure that the project is feasible and develop schedule. Find the project title and referred to PSM AJK. Discuss the project title with draw out a logical diagram of the network project, either by hand or with a tool like Microsoft Visio. All data used in this project were just a sample to demonstrate the usability and functionality of this project. The interview with KUTKM technician was doing to get information (notes were included in this project report as an attachment). Planning the network saves hassle and time later.