NETWORK LOAD BALANCING CLUSTER SERVICE

POOVANESAN A/L MUNANDY @ MUNIANDY

KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

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NETWORK LOAD BALANCING CLUSTER SERVICE

POOVANESAN A/L MUNANDY @ MUNIANDY

This report is submitted in partial fulfillment of the requirements for the
Bachelor of Information and Communication Technology (Computer Network)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA
2004

ADMISSION

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ABSTRACT

The developed honor's project is regarding Network Load Balancing (NLB), a technology offered in cluster service. The purpose of clusters is to preserve client access to applications and resources during failures and planned outages. If one of the servers in the cluster is unavailable due to failure or maintenance, resources and applications move to another available cluster node. This title is chosen as the failure of servers is a major problem resulting in delay of work. The routine will be disrupted until the server is recovered. After conducting some research on how to solve the problem and a solution is found, that is by using NLB cluster service. A few methodologies are chosen to implement this project. The chosen methods are the FAST (framework for the Application of Systems Technique) methodology, Model-driven development (MDD) route/technique, Gantt chart, and Milestone schedules. This project took a total of 3 months to complete, completing at the end of September 2004. The concept of a cluster service is to take two or more computers and organize them to work together to provide higher availability, reliability and scalability than can be obtained by using a single system. On the whole, NLB cluster service is expected to solve the network and server failure in small or big organization and e-commerce business sectors.

ABSTRAK

Projek Sarjana Muda yang dibangunkan ini ialah berkaitan dengan *Network Load Balancing (NLB)*. Tujuan *cluster* adalah untuk memastikan akses daripada klien ke aplikasi dan sumber sentiasa wujud walaupun ketika kejadian yang tidak diingini berlaku ataupun dalam keadaan ketidakfungsian *server*. Apabila salah satu daripada server dalam *cluster* tidak boleh diakses akibat daripada kegagalan atau kerja-kerja pembaikpulih, aplikasi dan sumber akan dipindahkan ke nod *cluster* yang masih aktif. Tajuk ini dipilih kerana kegagalan *server* merupakan masalah utama yang sering berlaku menyebakan kerja-kerja penting.terpaksa ditangguhkan. Hasil daripada kajian yang dilakukan, satu cara yang sesuai dikenalpasti iaitu dengan melaksanakan *NLB cluster service*. Beberapa kaedah digunakan untuk membangunkan projek ini. Antaranya, metodologi *FAST (Framework for the Application of Systems Technique), MDD (Model Driven Development), Carta Gantt dan Milestone*. Secara keseluruhannya, projek ini mengambil masa selama 3 bulan untuk disiapkan, iaitu pada akhir bulan September. Konsep servis cluster ialah untuk menggabungkan dua atau lebih komputer dan menyusunnya untuk bekerjasama dalam menyediakan kebolehpercayaan menggunakan satu sistem. Secara kesimpulannya, kaedah ini dijangka dapat mengatasi masalah yang sedia wujud dalam orginasasi kecil mahupun besar serta bidang e-bisnes.

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ACROYMN	DESCRIPTION
[A]	
ACL	Access Control List
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CMS	Cluster Management Suite
[D]	
DNS	Domain Name Service
DHCP	Dynamic Host Configuration Protocol
[F]	
FAST	Framework for the Application of System Techniques
FDDI	Fiber Distributed Data Interconnect
FIFO	First In First Out
FTP	File Transmission Protocol
FQDN	Fully Qualified Domain Name
[H]	
HLC	Hardware Compatibility List
HTTP	Hyper Text Transfer Protocol
[I]	
IOS	Internetworking Operating System
IP	Internet Protocol
IPX	Internet Packet Exchange

ISO   International Organization for Standardization

ISP   Internet Service Provider

IIS   Internet Information Server

[K]

Kbps   Kilo bit per second

KUTKM   Kolej Universiti Teknikal Kebangsaan Malaysia

[L]

LAN   Local Area Network

[M]

MAC   Media Access Control

MB   Megabyte

Mbps   Mega bit per second

MDD   Model-Driven Development Route/Technique

MSCS   Microsoft Server Cluster Service

MTA   Module Test Application

[N]

NIC   Network Interface Controller

NLB   Network Load Balancing

NTFS   New Technology File System

[P]

PSM   Bachelor Project

PC   Personal Computer

PWS   Personal Web Server

[Q]

QOS   Quality of Service

[R]

RAM	Random Access Memory
RFC	Request for Comments
RPC	Remote Procedure Call
RRDNS	Round Robin Domain Name Service

[S]

SMTP	Simple Mail Transfer Protocol
SNA	System Network Architecture
SOW	Statement of Work
SQL	Structure Query Language
SSL	Secure Sockets Layer

[T]

TCP/IP	Transmission Control Protocol / Internet Protocol
TFTP	Trivial File Transfer Protocol
TOS	Type of Service

[U]

UDP	User Datagram Protocol
UTP	Unshielded Twisted Pair
URL	Uniform Resource Locator

[V]

VPN	Virtual Private Network

[W]

WAN	Wide Area Network
WBS	Work Breakdown Structure
WINS	Windows Internet Name Service
WLBS	Windows Load Balancing Service
WWW	World Wide Web
W3C	World Wide Web Consortium

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CHAPTER I

INTRODUCTION

1.1 Preamble/Overview

This bachelor project is completed based on Network Load Balancing (NLB). Cluster service is substantially enhanced in the Windows 2000 Advanced Server and Datacenter Server operating systems. Cluster service enables to connect multiple servers to create server clusters that provide high availability and easy manageability of data and applications running in the cluster. Windows clustering is a feature of Windows 2000 Advanced Server that provides multiple clustering technologies such as NLB and Server Cluster.

NLB clusters provide high scalability and availability for TCP/IP based services and applications by combining up to 32 servers running Windows 2000 Advanced Server into a single cluster. The Windows Load Balancing Service (WLBS) enables Network Load Balancing clusters.

The purpose of NLB cluster is to preserve client access to applications and resources during failures and planned outages. If one of the servers in the cluster is unavailable due to failure or maintenance, resources and applications move to another available cluster node.

Cluster Networking is architecture for pervasive peer-to-peer network connectivity of PCs, wireless hosts, and intelligent appliances of all forms. It is

designed to bring easy-to-use, flexible, standards-based connectivity to ad-hoc or unmanaged networks whether in the LAN/WAN, ISPs, or the public network.

Cluster networking is a conceptual idea of distributed, open networking architecture that leverages TCP/IP, Web and the Peer to Peer technologies to enable seamless proximity networking in addition to control and data transfer among networked hosts in the home, office, and public spaces. A server cluster is a group of independent servers running NLB and working collectively as a single system.

The benefits of NLB cluster are:

i. Scalable performance

a) Load balances requests for individual TCP/IP services across the cluster.

b) Supports up to 32 computers in a single cluster.

c) Optionally load balances multiple server requests from a single client.

d) Fully pipe-lined implementation ensures high performance and low overhead.

ii. Fault tolerance

a) Automatically detects and recovers from a failed or offline computer.

b) Automatically rebalances the network load when the cluster set changes.

c) Recovers and redistributes the workload within 10 seconds.

d) Handles inadvertent sub netting and rejoining of the cluster network.

1.2   Problem Statement

During Industrial Training in Tenaga Nasional Berhad Petaling Jaya, all works are done via web application. This service is not only used for official jobs, it's also widely used to communicate with each other. Once a server is fails, all the work in progress will be suspended or stopped. This is impractical as the cost, time and effort increases.

During the implementation of the project, the hardware needed for the project arrived late. On top of that, few hardware and software problems arise, involving the network card. Regarding the network card, it did not perform according to its functionality. There were defects resulting in failure of private network connection, thus creating delay in progress of the project.

Finally is the time constraint. Lack of time available makes the implementation of the final project delayed. Besides that, other project also makes it impossible to gather the required time to finish the project according to the schedule.

1. 3   Objective

Objective of this project are: -

i.   When a server fails, the group of resources configured on that server pass over to another server

ii.   Ability to add resources and computers to improve performance (scalability)

iii.   To reduced system failure (reliability)

iv.   To provide a better and quick service

v.   Reduce traffic in network channel

vi.   Distributes traffic among available nodes

vii.   Provide satisfaction in quality of service to the user

1.4   Scopes

The concept of a cluster service is to take two or more computers and organize them to work together to provide higher availability, reliability and scalability than can be obtained by using a single system. In this project, a computer and two servers are used to setup a system. When failure occurs in a cluster, resources can be redirected and the workload can be redistributed.

The NLB also provides a backup in case of server failure in a web server. This project will take a total of 6 months to complete. It'll be completed at the end of September 2004.

The software requirements to install the cluster server are Microsoft Windows 2000 Advanced Server or Windows 2000 Datacenter Server installed on all computers, Windows XP for client, a name resolution method such as Domain Naming System (DNS), Windows Internet Naming System (WINS), and HOSTS, and Terminal Server to allow remote cluster administration.

While a well-designed solution can guard against application failure, system failure and site failure, cluster technologies do have limitations. Cluster technologies depend on compatible applications and services to operate properly. The software must respond appropriately when failure occurs. Cluster technology cannot protect against failures caused by viruses, software corruption or human error. To protect against these types of problems, organizations need solid data protection and recovery plans.

1.5 Contributions

The bachelor project is very important for every KUTKM students because in order for a student to finish the bachelor program at KUTKM, it is compulsory for the student to pass the bachelor project before being awarded the degree.

This project uses cluster service which enables multiple servers connect each other to create server clusters that provide high availability and easy manageability of data and applications running in the cluster.

Besides that, this project is mainly developed to overcome the failure of servers. If a server is down or fails, users cannot use the services provided till the

server recovers. This results in services temporarily not available. By using the cluster service, all the services will be passed over or taken over by the other server.

Clusters can be used to solve three typical problems in a data center environment, which includes need for high availability, reliability and scalability.

1.6   Expected Output

On whole, this project focuses on the functionality of cluster and NLB. At the end of the project, when a node fails, another node should be able to take over the operations of the failed node. For example, when node1, which is the primary node, fails, node2, the secondary node should be able to retrieve and take over the ongoing tasks of node1, thus enabling the user to continue with his/her task.

Other than that, NLB should distribute the packets in a network channel by controlling the traffic. As such, if a channel is congested or loaded with packets queuing to be transmitted, the NLB should be able to distribute the packets evenly.