Universiti Teknologi MARA

DEVELOPMENT OF STATUS MONITORING FOR ROUTERS AND SWITCHES

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APPROVAL

STATUS MONITORING FOR ROUTERS AND SWITHCES

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This thesis was prepared under the direction of thesis supervisor, Mr. Adzhar Abdul Kadir. It was submitted to the Faculty of Information Technology and Quantitative Sciences and was accepted in partial fulfillment of the requirements for the degree of Bachelor of Information Data Communication and Networking.

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In the event that my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree be subjected to the disciplinary rules and regulations of MARA University of Technology.

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"In the name of Allah, Most Gracious, Most Merciful"

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ABSTRACT

Status Monitoring for Routers and Switches (SMART) is a web based system which can display the status of all routers and switches that connected within the UiTM Shah Alam's internal network. The system will give an iconic status representative by displaying green light or red light for each device. Red light means the devices are down and green light means the devices are in the fully working state. The system also provides an easy access for remote telnet operation. The main objective of SMART is to provide a graphical interface for the entire routers and switches that connected to the network. This application also provides a real time status to ease the monitoring process done by the system administrator. The method for keeping the system make a contact with the routers and switches is by sending an ICMP request to each device. If the device is running without a problem, it will automatically reply the ICMP packet to the system and with this method the system can keep track for the status of the devices

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CHAPTER 1

RESEARCH OVERVIEW

1.0   Introduction

Nowadays, everybody and every organization need the internet service. Even though they are not directly connected to the internet, a networked computer and other shared devices such as printers are required for the small organization. The increasing network sizes means there are increasing in quantity of inter network devices required. Inter network devices can be a switches, routers, hubs, gateways, bridges or repeaters. Small organizations does not need too much of these device, but in a large network scale, they may be using a lot of these devices. The tasks of monitoring these network devices are very crucial where a downtime within the networks affect the entire organizations.

Some organization may have implemented a monitoring system that developed in house, to meet the requirement for specific network. There are a lot of commercial software and applications to choose in the market, but the price and requirements may become constraints. The use of network monitoring system is to improve quality of services, not only involving activities within organizations but also with clients and customers. In increasingly competitive and cost-conscious environment, a lack of network and internet connectivity can negatively affects quality and contributes to inefficiency and redundant efforts that, in turn, increase the operational costs (Barber et al., 1994; Kimberlee D. Snyder, Patrick Paulson and Patrick McGrath, 2005). Therefore, a network monitoring system does not only maintain the organizations network uptime or to achieve higher quality service but it also helps to reduce waste of resources or client's time.

1.1   Problem Background

A discussion had been conducted with Mr. Suliman Bin Abdul Rashid, an Assistant IS Officer (Network Division) in Pusat Sistem Maklumat Bersepadu (PSMB) to get an overview for the problem background. Current system is using manual system where system administrator saves the network plan in Microsoft Visio format in their hard disk. These files have their unique link to a batch file that contains a script to execute telnet command. If the system administrator want to check or making a remote telnet session, he have to locate the location for the desired device, and then he wills refer a network plan for finding the IP address for that device.

It is not practical since system administrator wasting their time to find a network device one by one. Therefore, with the implementation a system that can monitor and automatically initiate telnet session, it would assist and decrease the time taken to troubleshoot the failing device, thus increasing the network service availability.

1.2   Problem Statement

There are two common problems discovered by researcher during the first observation.

1.2.1 Tracking the Failures Devices

The first problem is to tracking the failures devices. It is very hard and time consuming job to tracks and identify the failures devices. Basically, the system administrator needs to know which building or faculty that encounters the network downtime. It is important to decrease the time needed to find the devices that have a problem. There are about 200 main routers and switches around UiTM Shah Alam, and it is impossible to find the specific failure devices within a short time.

1.2.2 Manual Telnet Operations

The second problem is all remote troubleshooting process is made via telnet service. Since the failure occurred, the system administrator needs to open the terminal or command prompt to access the telnet service. Then he needs to enter an IP address of the router or switch. A single action may not give any burden to the system administrator because he can remember the IP address for one router or switch, but if the system administrator needs to make a remote connection simultaneously to many routers and switches at a one time, the job for re-entering the IP address for each device may burdens the system administrator.

1.3 Project Objective

The main objectives to the development of this project would be:

i.   To develop a web based application that provides a graphical interface for the entire routers and switches that connected to the network. This application also provides a real time status to ease the monitoring process done by the system administrator.

ii. To develop a system that can automatically connect the user to the router or switch via telnet protocol by clicking on the network representation diagram developed above.

iii. To fit the system into a portable Universal Serial Bus (USB) flash disk. The system will run totally from the flash disk with built in portable web server.

1.4   Project Scope

This web application called Status Monitoring for Routers and Switches (SMART) is concentrating in solving those identified network monitoring activities problems

    i.   This system will be used by the system administrator only.

   ii.   This system deployed for internal network of UiTM Shah Alam only, branches network will be not covered.

 iii.   This web application online can be used within internal network only.

 iv.   The portable web server only can be run under Microsoft Windows Operating System only.

1.5   Research Significance

The significance of this project is as follows:

i.   It provides the system administrator to view the overall routers and switches within the network in a graphical view and its current state.

ii.   It will assists system administrators to have early detection of failure device.

iii.   It provides a privileged user to telnet to the specific routers and switches with a single click.

1.6   Organization of Report

After an introduction regarding the problem statement, description, objectives, scope and significance of the problem, we should now have a rough idea of the sole purpose of this research paper.

In the next chapter or Literature Review, we will discuss in detail about all aspects that involves in designing the monitoring system.

In the third chapter or Research Methodology, we will look at several methods that are used in order to get the desired information for the accomplishment of this research project. A detailed look at the how the project will be created and configured will be discussed in here too.

All data that reflex to this project will be discussed in detail in Findings Chapter and finally the Conclusion and Recommendation chapter, which will summarize and conclude all the efforts and results of this research paper.

1.7   Conclusion

This chapter explains the overview of research in terms of research background, problem of the research, to completing this research and so forth. Hopefully, readers will have ideas on what this research is all about, why it needs to be conducted and what are the expectations from this research.

CHAPTER 2

LITERATURE REVIEW

2.0   Introduction

Network monitoring has become a crucial task for every network administrator or system administrator. Without a proper configuration and consistent monitoring, a network downtime caused by failures devices can take a long time to recover. The network must allow users to meet their job requirements and must provide user-to-user and user-to-application connectivity with reasonable speed and reliability requirements and needs. Thus, a network downtime must be reduced as low as possible.

2.1   Description of Problems

Current system is using manual system where system administrator waiting for calls or complaint if there is a network that lost its connectivity. The system administrator will have to state the location of the failing device, and then he wills refer a network plan for finding the IP address for that device. Then he will perform a basic connectivity test by using ping command that is available mostly in all Operating System. Once he locate the routers or switches that having a problem, he will try to troubleshoot it remotely via telnet. The problem with current situation is the task is very time consuming, and in the networked environment, every second of a downtime means a lost of productivity.

2.2   Terms of Terminology

2.2.1 Network Monitoring

The term network monitoring describes the use of a system that constantly monitors a computer network for slow or failing systems and that notifies the network administrator in case of outages via email, pager or other alarms. It is a subset of the functions involved in network management.

While an intrusion detection system monitors a network for threats from the outside, a network monitoring system monitors the network for problems due to overloaded and/or crashed servers, network connections or other devices.

For example, to determine the status of a web server, monitoring software may periodically send an HTTP request to fetch a page; for email servers, a test message might be sent through SMTP and retrieved by IMAP or POP3, and for monitoring the status of a host, a ICMP packet can be transmitted and wait for the reply.

2.2.2 Router

A router is a computer networking device that buffers and forwards data packets across an inter network toward their destinations, through a process known as routing. Routing occurs at layer 3 (the Network Layer) of the OSI seven-layer protocol stack. It runs based on the IP address.

2.2.3 Switch

A network switch is a networking device that performs transparent bridging (connection of multiple network segments with forwarding based on MAC addresses) at up to the speed of the hardware. Switching occurs at layer 2 (the Data Link Layer) of the OSI seven-layer protocol stack. It runs based on the MAC address.

2.2.4 MAC Address

Media Access Control address (MAC address) is a unique identifier attached to most network adapters. It is a number that acts like a name for a particular network adapter, so, for example, the network cards (or built-in network adapters) in two different computers will have different names, or MAC addresses, as would an Ethernet adapter and a wireless adapter in the same computer, and as would multiple network cards in a router.

2.2.5 Ping

Ping is a computer network tool used to test whether a particular host is reachable across an IP network. Ping works by sending ICMP "echo request" packets to the target host and listening for ICMP "echo response" replies. Using interval timing and response rate, ping estimates the round-trip time (generally in milliseconds) and packet loss (if any) rate between hosts.

2.2.6 ICMP

The Internet Control Message Protocol (ICMP) is one of the core protocols of the Internet protocol suite. It is chiefly used by networked computers' operating systems to send error messages. One protocol that use ICMP packet is the ping tool, which sends ICMP Echo Request messages (and receives Echo Response messages) to determine whether a host is reachable and how long packets take to get to and from that host.

2.2.7 Portable Application

A portable application, or portable app for short, is a software program that does not require any kind of formal installation onto a computer's permanent storage device to be executed, and can be stored on a removable storage device such as a CD-ROM, USB flash drive, flash card, or even a floppy disk, enabling it to be used on multiple computers. This does not mean that it can be taken and used on a different operating system, processing platform, or another computer with completely different hardware (i.e., those that are not compatible with the software as stated by its requirements), so it is not to be confused with the concept of software portability, which is the ability for software to be run or compiled with little modification on diverse computing platforms. Ideally it can be configured to read its configuration files from the same storage location as the software program files.

Another term sometimes used for portable applications is standalone.

2.2.8 Portable Web Server

Portable web server is a stripped down web server that containing a basic web server application suite such as Apache web server, PHP, and MySQL. It is small and mobile to download or move around and can also be used or setup as a production or live server. It can be copied to a USB drive and easily start by clicking the batch files. For this project, researcher have been studied and experimenting several portable web server such as xamplite, server2go, Uniform Server and WOS portable. Researcher decide and prefer to use Uniform Server as a web server because it is does not depend on Windows service, can be moved and copied without altering the configuration files, small in sizes and the unique features is it will creating a ram disk as a temporary storage to run all the necessary programs.

2.3 Requirements in deploying SMART

2.3.1 Uniform Server

The Uniform Server is a free open source WAMP package for Microsoft Windows, comprising a pre-configured setup of complementary open source web server tools, the Apache HTTP Server, the MySQL database engine, and scripting languages PHP and Perl. It is released under the BSD license.

It can be activated without any installation, is self-contained, and the package itself is under 10iB. For these reasons, it is commonly used to test web applications on Windows, and can also be set up on removable media for a portable web server. However, it is also designed for security, so is also used for actual websites.

The Uniform Server was first developed by Taras Slobodskyy as an application for his clients, but later on, moved to becoming this free and open source project. It is now maintained by Olajide Olaolorun.

2.3.2 Apache Web Server

Apache web server is an open source software and widely used by all system developers. It is free software and that can be downloaded from its main website (http://www.apache.org/) and can be used at many platforms such as UNIX, Windows, and Novell NetWare and so on.

It was created by Rob McCool from National Center for Supercomputing Applications web server or in other name is NCSA httpd. It was not only Rob McCool involved in the creation of Apache, but there were several people who were also gave efforts towards the Apache project. It then now known as Apache Software Foundation (ASF).

2.3.3 PHP: Hypertext Preprocessor

PHP is among the popular programming languages behind C, Java and Windows programming. Most system developers preferred PHP to develop their web application. PHP is open-source software and can be downloaded at its main website (http://www.php.net/). It is used to develop server side applications or any dynamic web application. Normally used with Apache Web Server, MySQL and phpMyAdmin.

PHP was created by Rasmus Lerdorf in 1995 with an original name was Personal Home Page Tool/Form Interpreter (PHP/FI). After facing many revolutions, PHP 3 was released in 1997. It was a baseline of all PHP versions nowadays.

2.3.4 MySQL

MySQL is a relational database and widely used by system developers all over the world. MySQL is available as free software for public under GPU General Public License (GPL) and can be downloaded at http://www.mysql.com/.

MySQL has a strong combination with Apache Web Server and PHP in web applications development. Therefore, MySQL has become the most popular open source database among system developers.

2.3.5 phpMyAdmin

phpMyAdmin is open source database administration tool. It is used together with MySQL in order to manage the database. It provides a web-based interface to communicate with MySQL.

2.3.6 USB Flash disk

NAND-type flash memory data storage devices integrated with a USB (universal serial bus) interface. They are typically small, lightweight, removable and rewritable. (USB Memory card readers are also available, whereby rather than being built-in, the memory is a removable Flash memory card housed in what is otherwise a regular USB flash drive, as described below.)