

REAL TIME SUPPORT SYSTEM

A thesis submitted to the Graduate School in
partial fulfillment of the requirements for degree

Master of Science (Information Technology),

University Utara Malaysia

By

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ABSTRAK (BAHASA MALAYSIA)

Dengan perkembangan pesat dalam merangkaikan komputer, setiap komputer yang dijalankan dengan cara tradisional untuk mengawasi rangkaian supaya dapat menyemak penyelarasan bagi mengawasi trafik rangkaian di dalam infrastruktur rangkaian mungkin tidak efektif dan efisien lagi dan peratusan kesilapan yang dibuat oleh manusia adalah besar.

Tujuan projek ini adalah menyampaikan sistem yang efisien dan efektif untuk menggantikan cara tradisional dalam mengawasi rangkaian. Dengan “Real Time Support System” ini, ia membolehkan orang yang terlibat dalam sumber komputer dan rangkaian khususnya “the Network Administrator” untuk mengawasi prestasi rangkaian dan membuat perubahan yang sesuai terhadap prestasi rangkaian justeru menjimatkan sumber.

Selain itu, projek ini bertujuan untuk membangun satu sistem yang berkos rendah, senang untuk menyenggara, “user-friendly window” berasaskan “Real Time Support System” untuk perusahaan kecil dan sederhana di Malaysia.

ABSTRACT (ENGLISH)

With the huge grow of networked computer, the traditional way of network monitoring by walk to each computer to check the configuration may not be effective and efficient to monitor network traffic on the network infrastructure and there are highly percentages of human error.

The Project aim to deliver an efficient and effective system to replace the traditional way of network monitoring. With this Real Time Support System enable the person in charge of computer resources and networking especially the Network Administrator to monitoring the network performance and make the necessary changes to tune the network performance hence save the resources.

Beside that, this project also aims to develop a low cost, easy to maintain and user-friendly windows based Real Time Support System for Small Medium Enterprise (SMEs) in Malaysia.

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to my supervisors, Associate Professor Nazib Nordin and Mr. Zhamri for their constructive suggestion, guidance, and consistence support during the developing project process.

Secondly, I would like to thank Graduate School of University Utara Malaysia for giving me a chance to pursue my master degree at University Utara Malaysia.

For information or for reviewing and evaluation of this thesis, I would like to thanks to Mr. Teoh Chin Howe and Mr. Sivaraj for their sincere support.

Lastly, I am greatly indebted to my family for their sacrifice during my study.

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LIST OF ACRONYMS

ADT	Active Directory
ADSI	Active Directory Service Interfaces
CIM	Common Information Model
DNS	Domain Name System
FTP	File Transfer Protocol
IMAP	Internet Message Access Protocol
IT	Information Technology
MNC	Multi National Company
NIC	Network Interface Card
OEM	Original Equipment Manufacturer
POP3	Post Office Protocol
SME	Small and Medium Enterprise
SMTP	Simple Mail Transfer Protocol
TCP/IP	Transport Protocol/ Internet Protocol
UML	Unified Modeling Language
WBEM	Based Enterprise Management
WMI	Windows Management Instrument
WWW	World Wide Web

Chapter 1

INTRODUCTION

This project is initiated upon the request of course TZ6996 as one of the graduate requirements of MSc (IT). The purpose of this project is to develop a Real-time Support System for the Small and Medium Enterprise (SME) in Malaysia. This Real-time Support System enable the person in charge of computer resources and networking especially the Network Administrator to monitoring the network performance and make the necessary changes to improve the network performance hence save the resources.

A prototype is developed to monitor and control the workstation under Windows NT domain, hence it provided the tools to monitor the FTP, Telnet, WWW, DNS, POP3, SMTP, and IMAP. Consequently, hardware and software requirements, scope and limitation, and the significant of this project are discussed.

1.1 Background

Network monitoring is the information collection functions of network management. Real-time Support System is created to monitor the network

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the thesis is for
internal user
only

Bibliography

Andrew S. Tanenbaum, "Computer Network", Prentice Hall;1996.

Greg Nunmacher, "LAN Primer : An Introduction Local Area Network", M & T books:1990.

Jim Conallen, "Modelling Web Application With UML", White Paper, Conallen Incorp., 1999.

"Introduction to WMI", Microsoft Corp. . Retrieved July 13, 2001 From URL http://msdn.microsoft.com/library/default.asp?url=/library/en-us/kmarch/wmi_5a1z.asp

"ADSI Open Interfaces for Managing and Using Directory Services", Microsoft Corp. . Retrieved July 23, 2001 From URL <http://www.microsoft.com/technet/treeview/default.asp?url=/TechNet/prodtechnol/windows2000serv/deploy/w2kadsi.asp>

Les Cottrell and Connie Logg, SLAC "Network Monitoring for the LAN and WAN", Retrieved September 01, 2001 From URL <http://www.slac.stanford.edu/grp/scs/net/talk/ornl-96/ornl.htm>

Cisco Systems Inc, "Network Management Basics", Retrieved August 27, 2001 From URL <http://www.cisco.com>

Bill Heldman, "Network Management Basics", Windows 2000 Magazine. Retrieved September 10, 2001 From URL <http://www.win2000mag.com/Articles/Index.cfm?ArticleID=8407>

Teresa Fishburn, Chris Kostick "Network Monitoring In Windows NT" , Miller Freeman, Inc: April 1998. Retrieved September 10, 2001 From URL http://www.ntsistemas.com/db_area/archive/1998/9804/204c3.shtml

"Network Monitoring with Windows 2000" labmice.ne. Retrieved September 20, 2001 From URL <http://www.labmice.net/networking/Netmon.htm>

"Ping Monitoring", WeManageServers.com Retrieved September 12, 2001 From URL http://www.wemanageservers.com/monitoring/ping_monitoring/ping_monitoring.html

Local Area Networks, Market Forecast, Document Code: NETW-NA-MS-9404 Copyright 1994, Dataquest Incorporated

Dorothy Cady, Drew Heywood, Debra Niedermiller-Chaffins, Cheryl Wilhite,
“Netware Training Guide: Networking Technologies”, New Riders: 1994.

Richard Puckett, “Windows NT Automated Deployment and Customization”,
MTP/New Riders Professional: 1998

“Malaysian SMI/SME Community”, [Http://smisme.com.my](http://smisme.com.my)