BORANG PENGESAHAN STATUS TESIS*

JUDUL: Ad-hoc network monitoring system

SESI PENGAJIAN: 2007

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AD-HOC MONITORING SYSTEM

LEE YEA FEI

This report is submitted in partial fulfillment of the requirements for the
Bachelor of Computer Science (Computer Networking)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
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DECLARATION

I hereby declare that this project report entitled

AD-HOC MONITORING SYSTEM

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

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DEDICATION

Specially dedicated
to my beloved parents and friends who had
encouraged, guided and inspired me throughout the journey of my education

ACKNOWLEDGEMENTS

I would like to expand my gratitude and heartfelt thanks to University Technical Malaysia Malacca (UTEM) and Faculty of Information and Communication Technology (FTMK) for providing such a good environment for students in gaining knowledge and skills.

First and foremost, I am particularly grateful to my supervisor, Mr Zulkiflee Muslim for his advising and encouragement from the earliest beginning. Thank you for his teaching, guidance and help during this final year project. Thanks for the support, cooperative in leading the way throughout the whole progress of the project.

With this opportunity, I would also like to express my sincere thanks to all Projek Sarjana Muda (PSM) committees. This project would not been completed without the guidance from them.

Special thanks my parents, siblings and friends for their support, thoughts and advices. Nothing is possible without their support and they really inspired me to move even further and ever.

Lastly, I would like to thank everyone who involve for helping in this project. Once again, I would like to grant all of them with my greatest respect because they really deserve it.

ABSTRACT

The title for this project is Ad-hoc network monitoring system. This is a project that apart from the traditional infrastructure network where ad-hoc mode is used. The operating system for this application is Windows XP and the language being used was Java. It was an application that enabled the ping and tracert to another node in ad-hoc network. It also can be used to perform some selected network commands. This project was intended to provide a solution for problems in using the command prompt to ping and tracert where there are no access authentication, difficult to copy the results and also difficult to trace records of using. Ad-hoc network monitoring system restricts access to the application by allowed only registered users to login and using the application. It shows the result to the user to be copy in a direct manner. It also kept the record in database for further analysis. This will enhance the security of system. Ad-hoc network monitoring system is expected to be used by network administrator and also network users in performing ping, tracert and network commands. In a company where the command prompt is disabled by the system administrator, this application is another solution for users and at the same time, network administrator can monitor the user's activities. This project was indeed a platform to make a better understanding regarding the wireless ad hoc network in term of the concepts and application in performing networking tasks.

ABSTRAK

Projek ini bertajuk Ad-hoc monitoring system. Ia adalah agak berlainan daripada rangkaian beralatan yang tradisional. Sistem pengoperasian di mana aplikasi ini digunakan ialah Windows XP dan bahasa Java telah digunakan sebagai bahasa pembangunan aplikasi. Aplikasi ini membolehkan ping dan tracert dijalankan ke atas komputer yang lain di dalam rangkaian ad-hoc yang sama. Ia boleh juga digunakan untuk melaksanakan beberapa arahan dalam rangkaian komputer. Ia adalah satu penyelesaian untuk masalah-masalah yang didapati tatkala mengunakan command prompt dalam sistem. Masalah-masalah yang cuba untuk diselesaikan termasuklah pengesahan pengguna, kesukaran untuk mencatat keputusan dan juga memantau aktiviti yang dijalankan. Dengan adanya aplikasi ini, masalah-masalah yang dinyatakan dapat diselesaikan dengan mengetatkan pencapaian aplikasi oleh pengguna di mana hanya pengguna berdaftar dapat menggunakannya. Ia memudahkan pengguna untuk mencatat dan menyimpan keputusan daripada aktiviti yang dijalankan. Rekod-rekod juga akan disimpan dalam pangkalan data. Ini meningkatkan keselamatan dalam sistem. Hasil projek ini dijangka boleh digunakan oleh pentadbir aplikasi dan juga pengguna yang lain untuk menjalankan ping, tracert dan arahan rangkaian yang tertentu. Dalam sesebuah syarikat yang mana command prompt telah disekat oleh pentadbir rangkaian, aplikasi ini memberi satu pilihan yang lain. Pada masa yang sama, pentadbir rangkaian juga dapat mamantau aktiviti pengguna. Projek ini sesungguhnya ialah satu pendekatan untuk lebih mamahami rangkaian tanpa wayar ad-hoc dari segi konsep dan aplikasinya dalam menjalankan tugasan rangkaian.

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LIST OF ABBREVIATIONS

Abbreviation	Definition
4G	4th Generation
AODV	Ad hoc on-demand Distance Vector Routing
AP	Access point
API	Application programming interface
AUT	Application under testing
BBS	Basic Service Set
DSR	Dynamic Source Routing
DSDV	Destination-sequenced distance-vector
ERD	Entity Relationship Diagram
ESS	Extended Service Set
FTMK	Fakulti Teknologi Maklumat dan komunikasi
Ghz	Gigahertz
IBBS	Independent Basic Service Set
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronics engineers
IP	Internet Protocol
IST	Information Society Technologies
IT	Information technology
J2SE	Java 2 Standard Edition
JAD	Joint Application Development
JDK	Java Development Kit

LAN	Local Area Network
MAC	Media access Control
Mb	Megabyte
Mhz	Megahertz
NIC	Network interface card
OOA	Object Oriented Analysis
OOD	Object-oriented Design
PC	Personal computer
PDA	Personal Digital Assistant
PDF	Portable Document Format
PDU	Protocol Data Unit
PING	Packet InterNet Groper
PSM	Projek Sarjana Muda
RAD	Rapid Application Development
RAM	Random Access Memory
SDLC	System Development Life Cycle
SSID	Service Set Identifier
TCP/IP	Transmission Control Protocol / Internet Protocol
TORA	Temporally ordered routing algorithm
TTL	Time-to-live
UTEM	Universiti Teknikal Malaysia Melaka
WEP	Wired Equivalent Privacy
Wimax	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network

CHAPTER 1

INTRODUCTION

1.1 Overview

The title for this PSM project that had been chosen was **Ad-hoc Monitoring System**. The term wireless ad-hoc network refer to a computer network in which the communication links are wireless. It is a radio-based system that allows transmission of information without a physical connection, opposed to transmission systems that require a physical connection, such as copper wire or optical fiber.

An ad-hoc network is typically a dynamic collection of nodes capable of communicating without the aid of pre-established infrastructure. For ad hoc network, each node is willing to forward data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. This is in contrast to older network technologies in which some designated nodes, usually with custom hardware and variously known as routers, switches, hubs, and firewalls, perform the task of forwarding the data.

Ad hoc networks differ from traditional networks in that the topology of interconnections between nodes is inherently dynamic and not fixed. A number of routing protocols like Dynamic Source Routing (DSR), Ad Hoc On-Demand Distance Vector Routing (AODV), Destination-Sequenced Distance-Vector (DSDV), Temporally Ordered Routing Algorithm (TORA) and Grid have been implemented. Generally, the routing protocols belong to two groups: proactive and reactive. Proactive protocols attempt to maintain correct and up-to-date routing information at every node. Reactive protocols, in turn, collect necessary routing information only if a pair of nodes is to establish a communication. Among the 4 protocols that had been mentioned above, only DSDV is proactive (table driven) protocol and the rest are all reactive (on-demand) protocol.

According to Uwe Herzog (2007), ad-hoc networks have already been specified in the early seventies, but there has not been a commercial breakthrough since then. Nevertheless, ad-hoc networks have received an increased attention recently. For example, among the topics where papers could be submitted to this year's IST Mobile Summit, the area of ad-hoc and sensor networks has received the highest number of submissions. One reason for the current uptake of ad-hoc networks are certainly the great advances in wireless technologies over the last years. Examples are the IEEE 802.11 series, the recent 802.16 WiMAX specification, which enables a significantly larger range of up to 10 km, or Bluetooth for shorter distances. Another focus of current researches is 4G mobile networks. 4G networks aim at integrating the various access and network technologies in order to implement ubiquitous services. Ad-hoc networks are one piece of this concept. Therefore the future of the ad hoc network seems to be very bright

This project intended to develop a monitoring system for wireless ad hoc network. As define by the name of the project, it is wireless and without any existing network infrastructure or centralized administration for the all the process. For example, there are 3 nodes, node A, node B and node C. Node A is the server and node B and C will be the clients. So, these 3 nodes must be able to connect to the entire ad-hoc network and can ping to each other. All the processes result from clients will be passed to server to store in database. Server can perform the functions that available in clients too. Packets can be sent and path can be trace. This can be done by using the TCP / IP tool which are traceroute or ping. Selected network commands can also be used to monitor wireless ad-hoc activities.

Traceroute or tracert is a utility that traces a packet from computer to an Internet host, showing how many hops the packet requires to reach the host and how long each hop takes. It works by sending packets with low time-to-live (TTL) fields. The TTL value specifies how many hops the packet is allowed before it is returned. Each route along the path decrement the TTL in an IP packet by at least 1 before forwarding it. When the TTL on a packet reaches 0, the route is expected to return an ICMP Time Exceeded message to the source computer.

Ping program works much like a sonar echo-location, sending a small packet of information containing an ICMP ECHO_REQUEST to a specified computer, which then sends an ECHO_REPLY packet in return.

At the end of this project, each computer will install with this ad-hoc monitoring system. This application use tracert or ping as the tools in sending packets and trace the path of sending packet. Without any additional devices such as router or switch, ping and tracert and also network commands can be done among the node installed with this application. This is the function that expected to achieve from the wireless ad hoc network monitoring system.

1.2 Problem Statements

There are couples of reasons that carry out the intention to develop wireless ad-hoc monitoring system. Usually, when users need to test connectivity between two nodes or desired to perform any network activities, command prompt will be used. The results will show to the users but, in case of keeping the records for further analysis, not all of the users will notice the correct way to copy the entire results. This is the personal experience during internship program when one of the staff in IT business unable to copy the results from command prompt and send it to the network provider when network is down.

Some network related activities that had been performed are unable to trace records. Whoever using the command prompt to perform what kind of activities is unable to trace if do not have any recording system. If those activities would harm the system or the entire network, there are no people in charge that can be referring for the responsibilities.

For some reason such as sending reports for network administration, it is troublesome to gather the results one by one.

For device internetworking in an easy deployment condition without any additional installation of access point and to be fast, traditional network is not suitable.

1.3 Objective

The reasons for developing ad-hoc monitoring system are driven by the desire to provide a simple, easy and reliable application in performing network activities. It also provides solutions for the problems that had been carried out. The aims of this project are:

- Authenticate users in the login page of the system in order to control and trace access of users.
- Monitor the process being carried out by keeping records in database.
- Test for connectivity between nodes.
- Trace the paths of packets sent.
- Perform some selected network commands as in command prompt

1.4 Scopes

Ad-hoc monitoring system can involved more than 2 nodes but limited to 10 nodes at once. It can be only used by registered users for some security reasons. The records of using and the results will be stored in database.

In this prototype, there are 3 nodes which are node A, node B and node C. All these nodes must connect to the entire ad-hoc network that had been created. One node, for example node A must be the server and the rest 2 nodes are all clients.

This system enables the authentication of users based on data stored in database. Only user that exists in database can use this system. All the nodes either server or clients can perform the basic functions such as ping, tracert or some selected network commands like ipconfig. The additional privilege that the server acquired is the administrative task. Server maintains the database tables that will decide the users and monitor the history records.

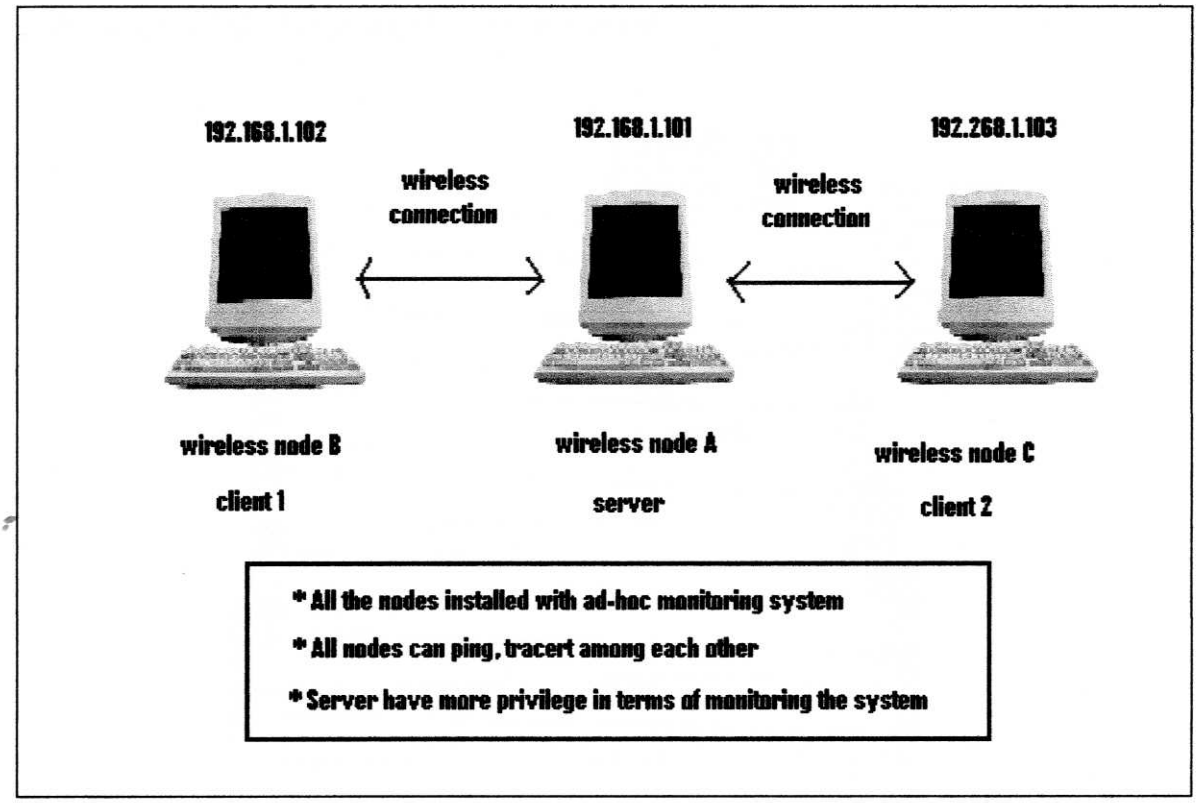

Figure 1.1 Preview design for ad-hoc monitoring system

Refer to figure 1.1, once two nodes are aware of each other presence, they should be able to exchange data in a very spontaneous way. A single node can successfully carry messages across the network with minimal assumptions and should be able to adapt to different conditions of density and total connectivity and still aim for a variable percentage of packet delivery and expected latency with the resilience that could be expect from an ad hoc network.

Node does not need to be aware of a specific state to successfully exchange data. In a mobile environment where contact with others is intermittent, each node attempts to propagate their local data pool based on a gossiping mechanism. The local data pool is references by fields like end destination, last recipient and last propagation time. The gossiping mechanism decides what piece of data should be the next one to be promoted on the basis of least recently promoted data not sent to current contact. This mechanism avoids complex selection criteria (and associated overheads), but it is able to take advantage of identifying neighbors in its vicinity.

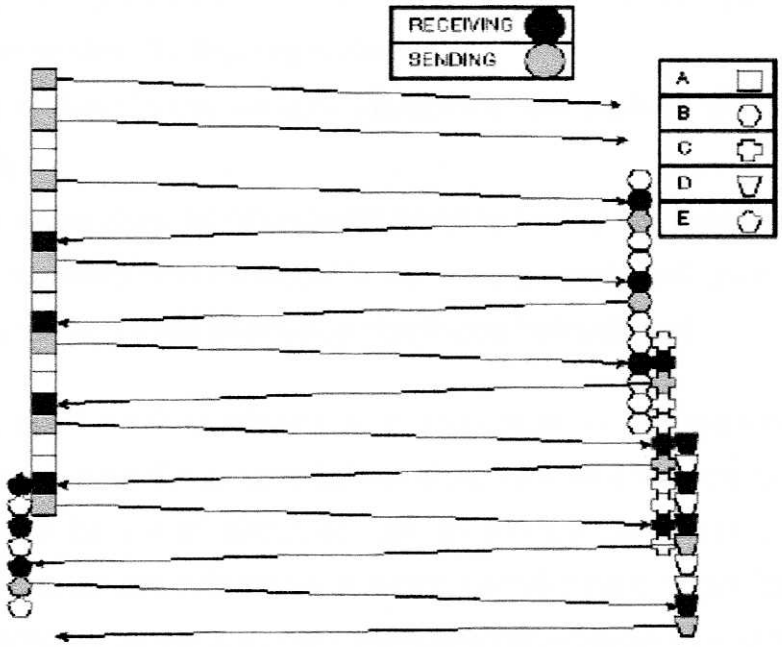

Figure 1.2 Ad hoc communications

In the figure above, node A is broadcasting useful messages (data record + id) at pre-selected intervals. When B meets A; B will respond by promoting a record to A, A will then send a new record to B. The conversation continues till no response is received because B is out of range. Other nodes (C, D) can join the conversation at any time, providing they are within range, by sending packets to A and B. Conflicts are minimized by giving each node a random response time interval (which is there are small gaps that can be exploited by nodes entering the conversation), and also by disabling the transmitter when there is a signal at the receiver.