WIRELESS AD-HOC ROUTING SYSTEM
(WARS)

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JUDUL: WIRELESS AD-HOC ROUTING SYSTEM (WARS)

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I hereby declare that this project report entitled

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(WARS)

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

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(MOHD FAIRUZ BIN HAMZAH)

SUPERVISOR : _____ Date: 12/11/2007

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DEDICATION

To my beloved parents, Hamzah bin Musip and Azizah bte Ali

To my siblings Mohd Fahmi and Siti Farida

Also I would like to dedicate this special thank to my friends and my colleagues

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First and foremost, my appreciation goes to my dear god, Allah SWT, for letting me go through Projek Sarjana Muda (PSM) with his blessings.

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ABSTRACT

Wireless Ad-Hoc Routing System (WARS) is a system for routing in multihop mobile wireless ad-hoc networks. AODV engine will be embedded to the system. An analysis module based on log file of the engine will be done to create a new interface of the system. The AODV engine is developing using C language and new analysis module is developing using Java Language. This system will allow connection of ad-hoc node that outranges using another ad-hoc node in the middle that is in ad-hoc signal coverage. Currently, there are limited resources of system to route mobile ad-hoc nodes in one ad-hoc network. User cannot connect to other node that outrange of ad-hoc signal range capability. It is impossible to connect to outrange node because ad-hoc capability one limit to one hop only. The project has many benefits, especially to anyone who concerned with the need of temporary networking to transfer data or other works on other user devices. They may be for students, lecturers, or personal users that need an easy and fast connection within critical time. This project is expected to develop a fully functional prototype system by embedding AODV engine and analysis module to the system therefore capable of connecting multihop mobile ad-hoc up to three hops and create a multihop mobile wireless ad-hoc networking.

ABSTRAK

Wireless Ad-Hoc Routing System (WARS) merupakan satu sistem yang akan membuat laluan dalam rangkaian berbilang ad-hoc. Enjin AODV akan diintegrasikan ke dalam sistem ini. Satu modul analisis melalui fail log enjin akan dibangunkan untuk membuat antaramuka pengguna baru. Enjin AODV dibangunkan menggunakan bahasa pemprosesan C manakala modul analisis baru akan dibangunkan menggunakan bahasa pemprosesan Java. Sistem ini akan menghubungkan komputer ad-hoc yang di luar jarak capaian signal menggunakan ad-hoc di tengah-tengah untuk menghantar maklumat. Pada masa ini, tidak banyak sistem yang sedia ada untuk membuat laluan dalam rangakaian berbilang ad-hoc. Pengguna tidak boleh menghubungi komputer ad-hoc di luar jarak capaian signal disebabkan jarak capaian signal yang terbatas. Adalah mustahil untuk menghubungi komputer ad-hoc di luar jarak signal kerana, secara umumnya ad-hoc hanya membataskan hubungan antara jarak sahaja. Projek ini mempunyai banyak kebaikan terutamanya untuk pengguna yang memerlukan hubungan rangkaian komputer sementara untuk menghantar maklumat pada komputer lain. Mungkin untuk pelajar, pensyarah mahupun pengguna biasa yang memerlukan hubungan rangkaian komputer dalam masa yang cepat. Project ini dijangkakan akan menghasilkan satu prototaip lengkap sistem menggunakan enjin AODV dan tambahan modul analisis maka adalah diharapkan sistem ini mampu membuat hubungan ke berbilang komputer ad-hoc di luar jarak signal melebihi 3 komputer ad-hoc.

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WARS	-	Wireless Ad-Hoc Routing System
MANET	-	Mobile Ad-Hoc Network
DSR	-	Dynamic Source Routing
AODV	-	Ad-Hoc On Demand Distance Vector
LAN	-	Local Area Network
DNS	-	Domain Name System
IP	-	Internet Protocol
DHCP	-	Dynamic Host Configuration Protocol
RREP	-	Route Reply Message
RREQ	-	Route Request Message
ESSID	-	Extended Service Set Identification
USB	-	Universal Serial Bus
KDE	-	K Desktop Environment (Linux Fedora Core 3)
GUI	-	Graphical User Interface
MAODDP	-	Mobile Ad-Hoc On Demand Data Delivery
SWANS	-	Scalable Wireless Network Simulator
RAD	-	Rapid Application Development
PC	-	Personal Computer
WLAN	-	Wireless Local Area Network
WAN	-	Wide Area Network
IR	-	Infra Red
RF	-	Radio Frequencies
GHz	-	Gigahertz
AP	-	Access Point

WEP	-	Wired Equivalent Privacy
WPA	-	Wi-Fi Protected Access
WNIC	-	Wireless Network Interface Card
BSS	-	Basic Service Set
ESS	-	Extended Service Set
PHY	-	Physical Layer

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

1.1 Project Background

This project is about developing a system for routing in mobile wireless ad-hoc network. This system will also call WARS (Wireless Ad-Hoc Routing System). The idea of this project is to connect ad-hoc node that is outrange using another ad-hoc node in the middle that is in ad-hoc signal coverage. Therefore, Access point is not required in this network. Wireless adapter that capable of doing ad-hoc mode will be used at three nodes in this project.

Currently, operating systems that are provided for user did not have a system to route mobile wireless ad-hoc network. There are no tools to do such kind of connection in wireless ad-hoc network. This system can be use by user that has computer or laptop that capable of wireless ad-hoc networking. This system is not only connecting one ad-hoc node to other, but it will keep connecting other user that already in one Extended Service Set Identification (ESSID) within ad-hoc coverage.

Ad-hoc On-demand Distance Vector (AODV) routing protocol will be use in this system. Others ad-hoc routing protocols are also identified and analyzed in details to choose the right routing protocol to use in this system. User requirements are carefully prepared to make sure this system develop well and have the most appropriate interface for user.

1.2 Problems Statements

In an ad-hoc network, nodes communicate with each other using multi-hop wireless links. There is no stationary infrastructure such as base stations like Access Point. Ad-Hoc network is a temporary and short range networking. Each node in the network also acts as a router, forwarding data packets for other nodes.

The process of routing is unknown to user because the engine does not have output to user. We do not know which neighbor is up or down except by doing manually ip route or ping command to check it. There is no system embedded to the engine to analyze and interact with user.

There are limited resources of system to route mobile ad-hoc nodes in one ad-hoc network. User cannot connect to other node that outrange of ad-hoc signal range capability. It is impossible to connect to outrange node because ad-hoc capability one limit to one hop only. Even the mobile ad-hoc nodes are in range, it is hard to connect between each other because user does not know to use existing tools in their pc.

Existing system does not have interfaces for user. The engine does it jobs transparently and did not have interfaces for user to input data. User mainly just started the engine and let it be throughout the day. User cannot have any input to interact with the engine. It is important for user to see neighbors around them in their networking environment.

1.3 Objective

The objectives of this project are to develop a system for routing in multihop wireless ad-hoc network. Upon completing this project, it is expected that the following objectives will be achieved:-

1.3.1 Establish connection between outrange ad-hoc node using middle ad-hoc node to divert transmission.

Available ad-hoc routing protocols will be identified and researched in details to make sure the routing protocol chosen capable of mobile ad-hoc networking.

1.3.2 To integrate system with existing wireless network adapter.

In this project, three D-Link DWL-G122 vB1 wireless USB network adapter will be used to run in Ad-Hoc mode in Linux using kernel 2.6.9. Firmware from Ralink Tech Inc. will be use with this hardware to integrate with the system.

1.3.3 Create interface for user.

A simple interface will be created for user to interact with the system. The user will have enough choices to know the available nodes around.

1.3.4 To make Linux as a suitable platform to develop the system in fully open source codes.

All tools will be used are open source and free to use. Interface using java codes will be integrated with the system. More controls and development are hoped to be done in Linux environment.

1.4 Scope

WARS is target to wireless ad-hoc user to use at their company or home. The scopes of this system are:

(1) It is limited to three nodes. Computers used in this mobile wireless ad-hoc network will have to use the same wireless USB network adapter with the exact firmware given by the manufacturer.

(2) This system is limited to Linux environment. It will be running on Linux Fedora Core 3 with kernel 2.6.9. Java 1.5 SDK will be use to run the interface module.

(3) There are no GUI interfaces for this system. User will have to interact with the system with the interfaces running on Terminal, command line.

(4) User of the system must know Linux environment. KDE session used for desktop interface.

1.5 Project Significance

This project is very important as a breakthrough to mobile wireless ad-hoc networking environment. The analysis has done can be bring forward to create a better routing protocols for wireless ad-hoc networking. Problems are identified and requirements are analyzed to know the current situation and ways to overcome it. This project are developed to let people know that mobile wireless ad-hoc networking are possible to do in the right way and suitable for normal user.

The project has many benefits, especially to anyone who concerned with the need of temporary networking to transfer data or other works on other user devices. They may be for students, lecturers, or personal users that need an easy and fast connection within critical time.

The cost of the network devices for organization or workgroup can be reduced by implementing this system. Access Point, Router, and other wired devices can less used in their networking environment. User can now connect to mobile wireless ad-hoc nodes without having to move around near them.

1.6 Expected Output

In this project, there are some expected outputs when this system is fully developed. This project is expected to develop a fully functional prototype system by embedding AODV engine and analysis module to the system. This system capable of connecting mobile ad-hoc up to three hops and creates a multihop mobile wireless ad-hoc networking. User can route messages betweens nodes if each node have this system. Analysis module will be done to analyze the wireless ad-hoc routing activities based on log files of AODV engine. It will be shown to user via interface developed in JAVA language programming.

The information and analysis will be used to find the right routing protocol to implement with the system. The existing wireless network hardware can integrate with the operating system and WARS itself to run the system smoothly and without error. The configurations provided with the hardware devices are compatible with the system and enough to do the development of WARS.