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Firdaus Ghazali.

INTERNET ACCESS VIA LINUX WIRELESS ACCESS POINT

MOHAMAD FIRDAUS BIN GHAZALI

KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

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(HURUF BESAR)

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<u> </u>	TIDAK TERHAD	

Mohamad Fudays

(TANDATANGAN PENULIS)

Alamat tetap : BATU 10 1/4 KADOK,

16450 KETEPEN, KOTA BHARU, KEL

Tarikh : 25/11/2005

(TANDATANGAN PENYELIA)

ROBIAN BT. Yusof

Pensyarah

Fakulti Teknologi Maklumat dan Komunikasi

Kolej Universiti Teknikal Kebangsaan Malaysia

Nama Penyelia

Karung Berkunci 1200

Ayer Keroh, 75450 Melaka

Tarikh : 25/11/2005

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Tesis dimaksudkan sebagai Laporan Projek Sarjana Muda (PSM)

INTERNET ACCESS VIA LINUX WIRELESS ACCESS POINT

MOHAMAD FIRDAUS BIN GHAZALI

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

FACULTY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

2005

DECLARATION

I hereby declare that this project report entitled

INTERNET ACCESS VIA LINUX WIRELESS ACCESS POINT

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

STUDENT :  DATE: 25/11/2005
(MOHAMAD FIRDAUS BIN GHAZALI)

SUPERVISOR :  DATE: 25/11/2005
(PUAN ROBIAH BINTI YUSOF)

DEDICATION

Specially dedicated to my beloved parents,
my supervisor, Puan Robiah Binti Yusof
and lastly to all my lecturers and my friends
who have motivated, guided and inspired me
all over the journey of my learning.

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ABSTRACT

In recent years, wireless technology has been gaining popularity around the world with its sub standard 802.11b receiving major deployments in many indoor and outdoor environments. Various locations types ranging from the small business offices to the large multi-floored corporate building are having WLAN equipments to provide wireless local area network and internet access. The aim of the project is to develop and build an Access Point using Linux with open source and free software's then it be able to connect a wireless client computer to internet. This project will develop a Linux Wireless Access Point on a single Linux based PC that will function as Access Point. Then, the Linux Wireless Access Point can be used by user who use wireless computer such as laptop to access an internet. The development of this project will use Linux as main platform plus open source and free software's released under GNU General Public License.

ABSTRAK

Beberapa tahun kebelakangan ini, teknologi tanpa wayar semakin dikenali di seluruh dunia dengan piawaian 802.11b telah meraih banyak peningkatan dan banyak digunakan dalam pelbagai persekitaran. Di kebanyakan tempat samada syarikat kecil dan sederhana atau syarikat korporat yang terkenal memiliki perkakasan teknologi tanpa wayar bagi menyediakan rangkaian tanpa wayar dan capaian internet. Matlamat utama projek ini ialah untuk membangunkan dan membina satu Access Point menggunakan Linux perisian sumber terbuka dan percuma yang mampu menyambungkan komputer tanpa wayar klien kepada akses internet. Projek ini bakal menghasilkan Linux Wireless Access Point yang beroperasi pada komputer berasaskan Linux dan akan berfungsi sebagai Access Point. Linux Wireless Access Point ini kemudiannya akan digunakan oleh pengguna yang menggunakan komputer tanpa wayar seperti laptop untuk mendapatkan akses internet. Projek ini akan menggunakan Linux sebagai platform utama disamping perisian sumber terbuka dan percuma dibawah GNU General Public License..

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LIST OF ABBREVIATIONS

AP	Access Point
BER	Bit Error Ratio
BOOTP	Bootstrap Protocol
BGP-4	Border Gateway Protocol 4
BSS	Basic Service Set
CDROM	Compact Disk Read Only Memory
CSMA	Carrier Sense Multiple Access
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Server
DS	Distribution System
DSL	Digital Subscriber Line
DSS	Distribution System Services
DSSS	Direct Sequence Spread Spectrum
DVD	Digital Video Disk
ESS	Extended Service Set
FHSS	Frequency Hopping Spread Spectrum
FTP	File Transfer Protocol
GHz	Gigahertz
IBSS	Independent Basic Service Set
I/O	Input/Output
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
LAN	Local Area Network
Mhz	Megahertz
NIC	Network Interface Card
NTFS	New Technology File System
PC	Personal Computer
PF	Packet Filtering
PS	Power Saving
RAM	Random Access Memory
RFC	Request For Comments
SSL	Secure Socket Layer
TCP	Transmission Control Protocol

TCP/IP	Transmission Control Protocol/Internet Protocol
UDP	User Datagram Protocol
UTP	Unshielded Twisted Pair

CHAPTER I

INTRODUCTION

1.1 Project Background

The main idea of this project is to build a wireless access point using Linux that can be used by a wireless computer to get an access to the internet. The access point will be built on a standard PC running Linux. Although there have been talking about hardware so far, there are no reasons an access point can't exist entirely on a regular computer.

In addition to hardware-based access point, software-based access points are also available. It is possible to create an access point using one of the existing wireless NIC cards as the radio and a PC to run as an access point controller. The design seems like a good idea because of the computing power available in modern PCs.

An access point (AP) is a bridge or router that connects between the wireless network and wired network resources. These wired resources may be locally LAN-connected computer or they may be connections to the Internet, such as through cable modem or digital subscriber line (DSL) modem. Since sharing an Internet connection among multiple computers is the primary uses of most wireless network, an access point commonly offer an Ethernet port or

standard internal modem to facilitate attaching the wireless network to a wired or dial-up internet connection.

In this project, the main objective is to build a Linux Wireless Access Point and a wireless computer client will be able to connect to Internet through it. It will use Linux with an open source and free software and also wireless cards without a normally hardware-based access point.

1.2 Problem Statement

With a typically wireless access point, the main limitations are on the amount of processing power they have and how much room or storage there is for firmware upgrade. The capacity, range and throughput out of modern PCs are much better than a standalone access point device. The access point management functions probably run more rapidly in a fast PC.

According to this situation, the development of this project is to build a Linux Wireless Access Point that will provide a flexibility and customizability of access point. It will use a Linux-based system to build a Linux wireless access point with an open source or free software product and wireless cards.

1.3 Objective

The objectives of this project are:

- To build a Linux Wireless Access Point on a standard PC running Linux with a wireless cards.

- To configure related free and open-source access point software on Linux-based system.
- To provide a wireless network that enable the access the Internet from wireless PC connections through Linux wireless access point.

1.4 Scopes

This project will fulfill the following scopes:

- To build up a standard PC running Linux-based system to operate as access point.
- To enable wireless computer user use the Linux Wireless Access Point to access the Internet.
- The development of the project will use Linux as main platform along with related free and open-source software of access point functionality.
- The Linux Wireless Access Point can be managed by local and remote administrator.

1.5 Project Significance

The benefit from this project and the main advantage of Linux Wireless Access point is clearly cost. There are an options either purchase commercial access point or build own access point using Linux-based system, open-source and free software and wireless card. There are many hardware choices, old and new. Pentium-class machines are better, from P133 and up. Using an older PC means one less contribution to a landfill, and little of no cost for the hardware.

Stand alone wireless access point device has limited features and cannot do much with it except upgrading firmware from the manufacturer. With Linux, we can configure, add features to it and gain a deeper understanding of how it all works. For ultimate control and customizability, build an own Linux Wireless Access Point is the way to go.

1.6 Expected output

The expected output from this project is a Linux-based PC running that access point functionality and can route traffic on a wireless network and provide network connectivity for locally connecting wireless client such as laptops.

1.7 Conclusion

The activity on this chapter helpful in defines the subject of this project. It also useful in review the purpose and objective for project that will be perform and give the sufficient background to understand the rest of the report.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

Literature review is an activity of searching, collecting, analyzing and drawing conclusion from all debates and issues raised in relevant body of literature or relevant or selected sources such as books, journals, technical reports, proceeding conferences, anonymous references, publication of international bodies/agencies, web pages, e-books, CD-ROMs and DVDs.

Project methodology is about “How are you going to do to complete your project”. It is a way to use all available approaches, technique and tools used to achieve predetermined objectives.

2.2 Fact and finding

Wireless network access points, known as hotspots, are proving to be a cost effective and viable solution for ubiquitous access to the Internet. This has led to an explosive growth of wireless access point at homes and office (G. Manjunath *et al*, 2004).

A wireless access point lets wireless client connect and access a LAN, we could either purchase commercial access points, which are hardware boxes, or build our own using a Linux and a PCI wireless card. Since the last couple of years, number of wireless device manufacturers and models increased. Nowadays, IEEE 802.11 wireless network has become part of everyday life.

At the basic level, you need only two pieces of hardware for any wireless network, a central access point and a network adapter. Access points are usually standalone devices. In contrast, network card usually install inside a computer via all the standard methods you might expect-PC Card bay, PCI slots and custom slots-as well as some you might not expect, like CompactFlash and Secure Digital Cards. For computers that can't support any of these internal options, external adapters that plug into USB or Ethernet ports are also available (Adam and Glenn, 2003).

Somewhat similar in function to a network hub, an access point in a wireless network is a special type of wireless station. An access point can be a computer that contains a wireless network adapter as well as access point management software. More often, an access point is a dedicated standalone device whose purpose is to receive radio transmission from other stations on the WLAN and forward them to the rest of the (wired) network (Walter and Ron, 2002).

Linux is one of the most widely supported open source operating systems. Linux is not only stable but also low cost to ownership. Meanwhile, Linux makes it easy to build access point system, and port to Embedded System to make a real access point. (T.H. Tseng and F. Ye, 2004). HOSTAP, Linux driver for Prism 2/2.5/3 chipsets that handles all of the 802.11 management functions allowing the Linux PC to act as access point for other wireless clients. A free, open-source captive portal and authentication system, NoCatAuth, designed to handle public access to a wireless node, with various levels of

security (<http://wireless.gumph.org>). NoCatAuth is an access control and resource allocation solution for wireless client. It is implemented on Access Point and is written in PERL. It is a work progress maintained by the Sonoma Country Wireless Group in California, USA. NoCatAuth has two elements; a Gateway service and an Authentication service. The NoCatAuth gateway service is concerned with running what is called Captive Portal. With NoCatAuth installed, wireless clients connecting to the access point are blocked from using network resource until such time as they authenticated themselves. All web traffic from unauthenticated wireless client is redirected to a login page. NoCatAuth is capable of dynamically relaxing firewall rules for those clients that authenticate successfully (Simon Anderson, 2003).

Linux is a freely available UNIX-like operating system that runs on a wide variety of systems. Linus Torvalds and other programmers originally develop Linux for the Intel 80x86 processor. Red Hat Linux is a specific Linux distribution. A Linux distribution is essentially a package consisting of the Linux operating system and a collection of application, together with an easy-to-use installation program. All Linux distributions include the core Linux operating system (the kernel); the XFree86 X Window System for x86 systems; one or more graphical desktops, such as GNOME and KDE; and a large selection of applications. Everything comes on ready-to-run binary format, but the source code and documentation are also included. By now, each Linux distribution includes so much software that it comes on multiple CD-ROMs (Naba Barkakati, 2003).

2.3 Project Methodology

The approach or methodology that will be used in this project involved several important elements in managing a project from start to finish.

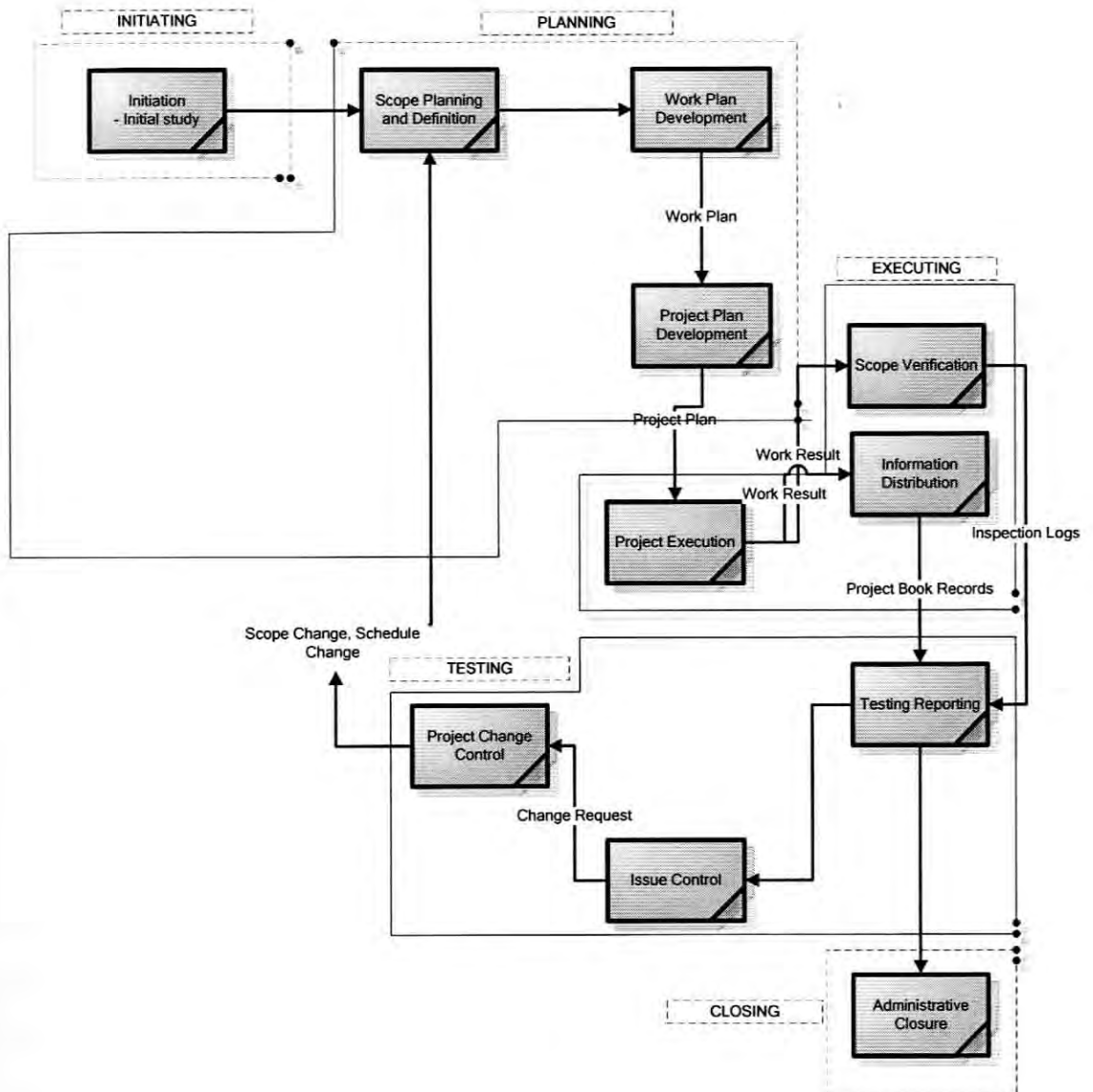


Figure2.1: Project Methodology