

UMP LIBRARY Wi-Fi ACCESS CONTROL SYSTEM
(ULWACS)

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ABSTRACT

The wireless technology was introduced to replace the wired connection and it is widely used in today's work and industry segment. Nowadays in wireless technology, user from outside are allowed to access the internet a private network in a wireless network area as they are not authenticated. This UMP Library Wi-Fi Access Control System (ULWACS) is develop to program the authentication system and usage-based system that include program for registering and activating user, detect for overdue day and log off the connection between users and access point. The method for implement hotspot is Software Prototyping that includes execution and testing for each step. A study has been conducted on types of access points, IP address and architecture that are suitable for ULWACS implementation. In order to make the development of system completed, the research and methodology has been prepared in term of data collected, software and hardware requirements needed. For the system architecture, it consists of user, access point, and access server only. The design is develop and construct the coding of the program and testing with the access point whether it is successful authorization or not when the system is completed. The success of implementation and development of this project is expected to increase the security in wireless network by requiring the user to register with administration and pay some fee based on time using the hotspot to access internet.

Keywords: Wireless technology, private network, authentication, usage-based system

ABSTRAK

Teknologi Jalur Lebar Wayarles telah diperkenalkan untuk menggantikan Teknologi Jalur Lebar Berwayar dan ia digunakan secara meluas dalam sektor pekerjaan dan juga dalam sektor industri. Dalam teknologi jalur lebar berwayar, pengguna dari luar dibenarkan untuk mengakses internet rangkaian persendirian di kawasan rangkaian wayarles tanpa pengesahan. Sistem Kawalan Akses Wi-Fi Perpustakaan UMP (ULWACS) adalah prototaip yang dibangunkan untuk mengawal akses pengguna wayarles di perpustakaan UMP dengan menggunakan teknik 'login authentication' dan skala kecil untuk struktur wayarles hotspot dibangunkan bagi pelaksanaan sistem prototaip ini. Satu kajian telah dijalankan ke atas jenis 'Access Points', alamat IP dan struktur yang sesuai untuk pelaksanaan sistem ULWACS. Penyelidikan dan metodologi telah disediakan dari segi data yang dikumpul, jenis perisian dan jenis perkakasan yang diperlukan. Bagi struktur sistem pula, ia terdiri daripada pengguna, 'access points' dan 'access server' sahaja. Kejayaan pelaksanaan dan pembangunan projek ini adalah dijangka untuk meningkatkan keselamatan dalam rangkaian jalur lebar tanpa wayar dengan memerlukan pengguna untuk mendaftar dengan administration dan membuat pembayaran berdasarkan masa menggunakan hotspot untuk mengakses internet.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	TITLE PAGE	i
	STUDENT’S DECLARATION	ii
	SUPERVISOR’S DECLARATION	iii
	DEDICATION	iv
	ACKNOWLEDGMENT	v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENTS	viii
	LIST OF TABLES	xii
	LIST OF FIGURES	xiii
	LIST OF TERMINOLOGIES	xv
	LIST OF APPENDICES	xvii
1	INTRODUCTION	
	1.1 Background	1
	1.2 Problem Statement	2
	1.3 Objectives	3
	1.4 Scope	3
	1.5 Thesis organization	4
2	LITERATURE REVIEW	
	2.1 Existing Systems	5
	2.1.1 HotSpotPA System	6
	2.1.2 Firstspot System	7
	2.1.3 Speed IT Hotspot System	8

2.1.4	Azotel SIMPLer Hotspot System	11
2.2	Technology	12
2.2.1	Wireless Access Point	12
2.2.1.1	D-Link DWL-1000 AP+ Access Point	12
2.2.1.2	Cisco Aironet Access Points	13
2.2.1.3	AVAYA Wireless Access Point-AP4	13
2.2.2	IP Addresses	14
2.2.2.1	Static and Dynamic IP Addresses	15
2.2.3	Network Address Translation	15
2.2.4	Wireless Standard (IEEE 802.11)	17
2.2.5	Hotspot	17
2.2.5.1	Hotspot Architecture	18
2.2.5.1.1	Small Hotspot	19
2.2.5.1.2	Medium-sized Hotspot	20
2.2.6	Captive Portal	21
2.3	Software and development tools	22
2.3.1	freeRADIUS	22
2.3.2	MySQL	23
2.3.3	Chillispot	23
2.3.5	Hypertext Preprocessor (PHP)	23
2.4	A Propose System for UMPLibrary Hotspot System	24

3 METHODOLOGY

3.1	Introduction	26
3.2	Project Planning	28
3.2.1	Gantt Chart	28
3.3	Analysis	28
3.3.1	Software Requirements	28
3.3.2	Hardware Requirements	29
3.3.2.1	Wireless Access Point	29
3.3.2.2	Server	29
3.3.2.3	Communication Media	30

3.4	System Design	30
3.4.1	Use-case Diagram	30
3.4.2	System Overview	33
3.4.2.1	Wireless User	34
3.4.2.2	Wireless Access Point	34
3.4.2.3	Access Server	34
3.4.3	Interface Design for Administration Account	35
3.4.3.1	Login Form	35
3.4.3.2	Billing plan	35
3.4.3.3	Change Password	36
3.4.3.4	User Information	36
3.4.3.5	System Interface (for Admin and Client)	37
3.4.3.6	User Friendly	37
3.4.3.7	Color Combination	37
3.4.3.8	Page Layout	37
3.4.3.9	Interface Security	38
3.5	Conclusion	38
4	IMPLEMENTATION	
4.1	Introduction	39
4.2	Implementation	39
4.2.1	Server Configuration	41
4.2.2	Get the Login Page	41
4.2.3	Flow of the system	41
4.2.4	Context Diagram of the system	43
4.2.5	A Data Flow Diagram of the system	43
4.3	Testing	44
4.3.1	ULWACS Process Flow	44
5	RESULTS, DISCUSSION AND CONCLUSION	
5.1	Introduction	46
5.2	Results	46

5.2.1	Admin Login Page	47
5.2.2	Admin System Info	48
5.2.3	Internal Captive Portal Management	49
5.2.4	Postpaid Setting	50
5.2.5	Billing Plan	51
5.2.6	Admin Management	52
5.2.7	Cashier Management	53
5.2.8	Postpaid Account Management	54
5.2.9	Voucher Management	55
5.2.10	Hotspot Statistics	56
5.2.11	Online Users	57
5.2.12	Change Password	58
5.2.13	Clients Login Page	59
5.3	Discussion	60
5.4	System Constraint	61
5.5	Further Research	61
5.6	Conclusion	62
REFERENCES		63-65
APPENDIX A (Gantt chart)		66-67
APPENDIX B (TL – MR3420)		68-70
APPENDIX C (PRINTED VOUCHER)		71-72

LIST OF TABLES

TABLE NO.	TITLE	PAGE
2.0	Wireless Standard Comparison 802.11b/a/g	17
3.0	Interface design for billing plan	34
3.1	Sample user information	36
3.2	Sample user information log	36

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
2.1	Interface of the Login form of HotSpotPA System	6
2.2	Interface of the 'My Account' of the HotSpotPA System	7
2.3	Interface of the Login Page Firstspot System	8
2.4	Login Page	9
2.5	User must key insert their username and password to Login	9
2.6	User Login status and Welcome message	10
2.7	User can access the Internet	10
2.8	Captive portal pages for Azotel SIMPLer Hotspot System	11
2.9	Location of NAT	15
2.10	Small Hotspot Network Topology	19
2.11	Medium Hotspot Network Topology	21
3.1	Software Development Life Cycle (SDLC) methodology	27
3.2	Use-case diagram of ULWACS	30
3.3	Sequence diagram login (User)	31
3.4	Sequence diagram logout (User)	32
3.5	Sequence diagram login (Administrator)	33
3.6	Interface design for login form	35
3.7	Interface design for change password form	36
4.1	Hardware Set Up	40
4.2	Flowchart of the system	42
4.3	Context Diagram of ULWACS	43
4.4	Data Flow Diagram of ULWACS	43
5.1	Admin Login Page	47
5.2	Admin System Info	48
5.3	Internal Captive Portal Management	49
5.4	Postpaid Setting	50
5.5	Billing Plan	51

5.6	Admin Management	52
5.7	Cashier Management	53
5.8	Postpaid Account Management	54
5.9	Voucher Management	55
5.10	Hotspot Statistics	56
5.11	Online Users	57
5.12	Change Password	58
5.13	Client Login Page	59

LIST OF TERMINOLOGIES

AP	-	Access Point
ADSL	-	Asymmetric Digital Subscriber Line
CAT5	-	Category 5
CISCO	-	Computer Information System Company
DHCP	-	Dynamic Host Configuration Protocol
DNS	-	Domain Name Service
HTML	-	HyperText Markup Language
HTTP	-	HyperText Transfer Protocol
IEEE	-	Institute of Electrical and Electronics Engineers
IOS	-	Internetwork Operating System
IP	-	Internet Protocol
IPSec	-	Internet Protocol Security
ISDN	-	Integrated Services Digital Network
ISP	-	Internet Service Provider
L2TP	-	Level Two Tunneling Protocol
LAN	-	Local Area Network
MAC	-	Media Access Control
NAT	-	Network Address Translation
NAPT	-	Network Address Port Translator
NIC	-	Network Interface Card
PAT	-	Port Address Translation
PC	-	Personal Computer
PCM/CIA	-	Personal Computer Memory Card International Association
PDA	-	Personal Digital Assistant
PHP	-	Hypertext Preprocessor
PPPTP	-	Point-to-Point Tunneling Protocol
QoS	-	Quality of Service
RADIUS	-	Remote Access Dial-In User Service

SDLC	-	Software Development Life Cycle
SST	-	Shiva Smart Tunneling
TCP	-	Transmission Control Protocol
UDP	-	User Datagram Protocol
UTP	-	Unshielded Twisted Pair
VLAN	-	Virtual Local Area Network
VPN	-	Virtual Private Network
WAN	-	Wide Area Network
WEP	-	Wired Equivalent Privacy
Wi-Fi	-	Wireless Fidelity
WISP	-	Wireless Internet Service Provider
WLAN	-	Wireless Local Area Network

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Gantt chart for Project Development Plan	66-67
B	TP-Link MR3420 3G/3.75G Wireless and Router	68-70
C	Printed Voucher	71-72

CHAPTER 1

INTRODUCTION

This chapter briefly describes the ‘**UMP Library Wi-Fi Access Control System (ULWACS)**’ that will be developed later. This chapter comprises five sections: The first section describes the background of the project. The second section describes the problem statement of the project. The third section describes the objectives for the project. The fourth section describes the scopes for the project. Finally the thesis organization is described in section five.

1.1 Background

Wireless is a term used to describe telecommunications in which infrared, radio, and some form of wire that carry signal over part or the entire communication path. It is also a type of networking technology using electromagnetic data waves to transmit data [1].

Wireless Local Area Networks (WLANs) technology was designed to replace the wired LAN connection. It showed that the wired connection LANs cost was becoming expensive especially in large office building. WLAN gives the functionality of traditional wired with more infrastructures with more flexibility. Users enjoy the freedom of being able to use their laptop anywhere in campus area to access an Internet [2].

The term hotspot is wireless-enabled areas offering users' access to broadband Internet connection using a Wireless Fidelity (Wi-Fi). Hotspot provides high-performance wireless Internet access connections in public locations where users with compatible wireless network devices such as notebook computers or smartphones that can access Internet, send and receive email and download files.

In general, 802.11 is the standard for WLAN connection as defined by IEEE. The 802.11 specification only defines the physical layer and MAC address portion of wireless Ethernet (Liska, 2003). However, wireless has inherent security risks like hacking and denial of service even through wireless is convenient to use.

Any user especially UMP student who has laptop with wireless network card is able to access the Internet as long as they can get signal from Library access point. However, there will a security issue in which attacker can easily gain access to the private network. Therefore, a prototype UMP Library Wi-Fi Access Control System (ULWACS) is developed to control the access of wireless user in a small wireless network.

1.2 Problem Statement

Nowadays, wireless technology can be known as a popular technology in networking environment. This is because it is easy and simple compare to wired connection. Wireless connection needs access point to connect device from server Local Area Network (LAN). Access Point is a hardware device for users of a wireless device to connect LAN.

But, a wireless technology has its own weaknesses in aspect of security. Any outside user can access to the private network and public network at any location of the wireless area as long as they can get the signal from the access point. Once they get the IP address distributed by the access point, they are allowed to access the Internet without any requirement for registration or payment for the Internet services.

Due to these problems, it will result the UMP Library LAN network become more traffic and slow due to many users whether right parties or outsiders parties gain access to the network. Besides that, the network in a wireless LAN is not in secure mechanism since all the wireless user are not authenticated before they can access to the Internet. This will affect the network becomes unstable and not consistent.

1.1 Objective

The implementation of UMP Library Wi-Fi Access Control System (ULWACS) has some important objectives and functionality, there are:

- i. To control the wireless LAN users by implementing authentication method through a login page before access the Internet.
- ii. To create and implement a small wireless hotspot.
- iii. To provide usage-based billing system for user so that students and outsider can use this facilities with minimum cost.

1.2 Scope

The scopes of this project are:

- i. Register and activate user.
- ii. Program the prepaid/postpaid authenticator for prepaid/postpaid service.
- iii. To provide some possible billing scenarios including usage, time, and combination of usage and time.
- iv. To develop an authentication for a small wireless LAN network with using captive portal and login authentication method.

1.3 Thesis Organization

This thesis organized into 5 main chapters which consist of chapter 1 – Introduction, chapter 2 – Literature Review, chapter 3 – Methodology, chapter 4 – System Development and Testing, and chapter 5 – Contribution, Future Research, and Conclusion.

Chapter 1 explains about the project background of the system, and identifies the current system problems. With the problems occurred in previous system and technologies, the objective and scope for the system is well defined in the chapter.

In chapter 2, the background information that related to development of this project is studied and discussed. A studied is conducted on existing systems, types of wireless access point's technologies, IP addresses, Network Address Translation (NAT), wireless 802.11 standards and wireless Hotspot network architecture.

Chapter 3 explains the methods chosen to use as a guideline in the development of the system. The phases in developing and implementing system are project planning and requirements analysis, system design, implementation and testing of the prototype.

The system implementation and testing of the prototype are presented in the chapter 4. This phase explains how the prototype system is implemented by step-by-step and testing it after implementations is done.

Finally, chapter 5 explains about the results or outputs from the testing of the prototype. The strengths and limitations of the system are discussed as well as with the further research technique to enhance the prototype system, and conclusion of the UMP Library Wi-Fi Access Control System (ULWACS).

CHAPTER 2

LITERATURE REVIEW

This chapter briefly describes the review on existing techniques related with ‘**UMP Library Wi-Fi Access Control System (ULWACS)**’. This chapter comprises two sections: The first section describes the comprehensive review on existing related systems. The second section describes the review on method, equipment, and technology previously used in the same domain.

2.1 Existing Systems

Below is the few existing system that use the Hotspot system:

- i. HotSpotPA System
- ii. Firstspot System
- iii. Speed IT Hotspot System
- iv. Azotel SIMPLer Hotspot System

2.1.1 HotSpotPA System

This system is a Public Access Wi-Fi Systems. The objective of this system is to provide free web-based management tools to setup and brand the Wi-Fi hotspots, to monitor users' online time, and to view credit card and PayPal payment. The connection of the HotSpotPA Wi-Fi routers can be used with any Internet broadband connection. For the installation process, user only needs to connect to the Wi-Fi hotspot router and enter their login and password on a sign-in page branded with their own company's name and logo. Then, the Wi-Fi hotspot verifies login, password and payment status before letting user connect through to the Internet [3]. The Figure 2.1 and Figure 2.2 is the example of the interface of the HotSpotPA Systems.

HotSpotPA [Home](#) [News](#) [About](#) [Contact](#) [Sign Up](#)

HotSpotPA
Public Access Hotspot Systems
www.hotspotpa.com

[Purchase New Login](#)
[I Forgot My Password](#)

This site accepts:
MasterCard VISA PayPal

SPOTPA Public Access

Login
Enter your ID and password below in order to use the internet, purchase additional time, make changes to your account, or view your account statistics.
If you do not already have a Login ID and Password, click any of the [Purchase](#) links to set up your new account.

Login here if you already have an ID and Password

Login ID:
Password:

[Click here to purchase a new login.](#)

Server ID: 8th / Login from: 206.174.174.174

This is an ad
It is 120px by 240px

This ad is for placement only.
It is 120 pixels wide and 240 pixels tall. This is a standard ad size.

FAKE AD
Do you want to put a real one here?

Figure 2.1: Interface of the Login form of the HotSpotPA System

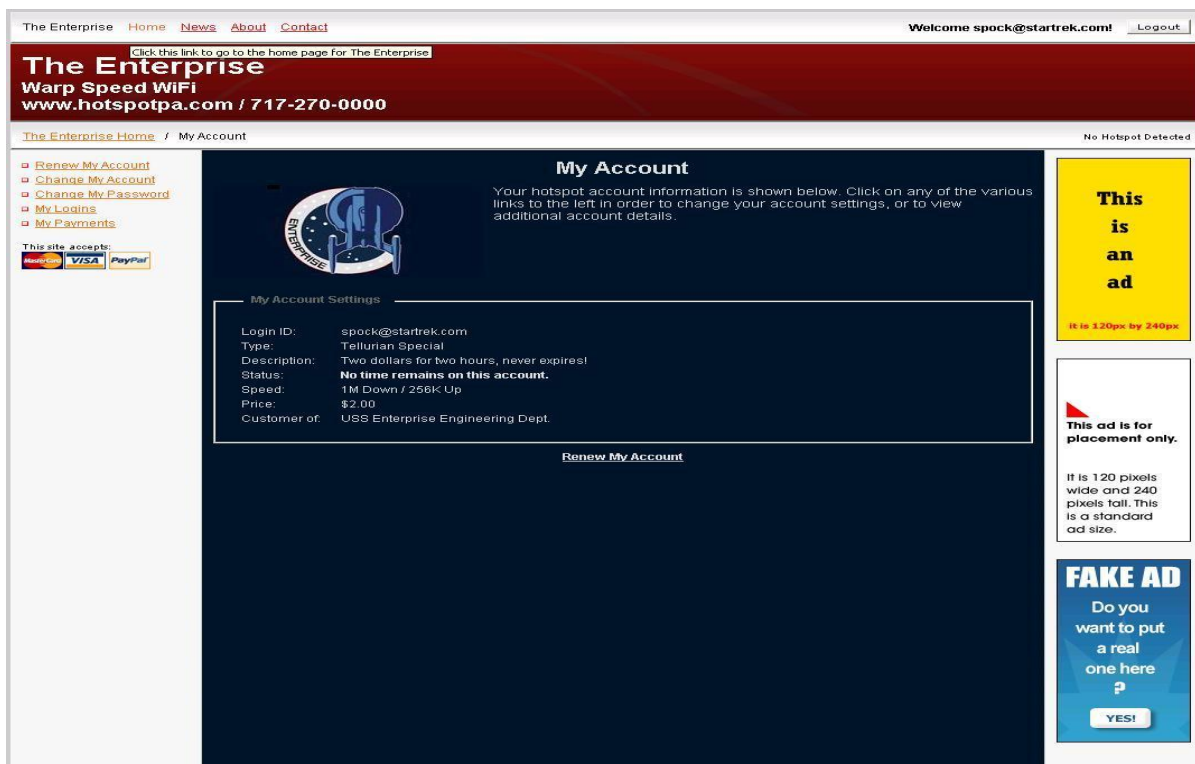


Figure 2.2: Interface of the 'My Account' of the HotSpotPA System

2.1.2 Firstspot System

Firstspot is Windows hotspot management software designed to track and secure user Wi-Fi Hotspot or visitor network in a centralized way. Based on captive portal technology, Firstspot let user hotspot login simply by using a web browser. Captive portal is the technology that forces user to see the login page before accessing the Internet [4]. User just needs to access a normal website such as facebook.com; user will be automatically forced to see the Firstspot login page. After entering the correct information, user will be able to surf the internet normally. Figure 2.3 shows a screen shot of a Login page of this system.

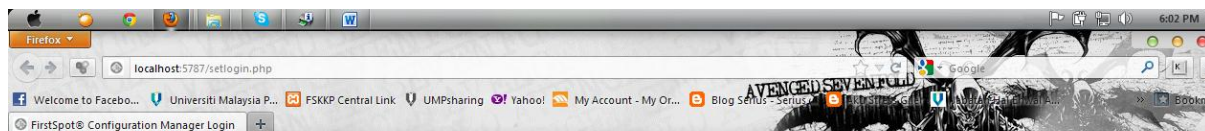


Figure 2.3: Interface of the Login page Firstspot System

2.1.3 Speed IT Hotspot System

This system is a Wi-Fi Hotspot Management Control System. Users can connect all hotspot in one network in the same database. Users will be able to use their remaining time in any of the hotspot locations. For example, large resort can provide wireless or UTP connection in every room. Speed IT Hotspot is windows-based system for Wi-Fi Hotspot billing. It can control time and bandwidth usage of wired and wireless laptops without any client software installation. User will be redirected to login page to pay before getting Internet access. This system also suitable in many purposes as user get fast login to system without client software installation. Once it connects to network by using wireless cards or UTP cable. Users will be prompted to type username and password to get access to Internet. Users will see their time and bandwidth and will be able to refill their time when needed [5]. Figure 2.4 until Figure 2.7 show the interface of the process of the Speed IT Hotspot System work.

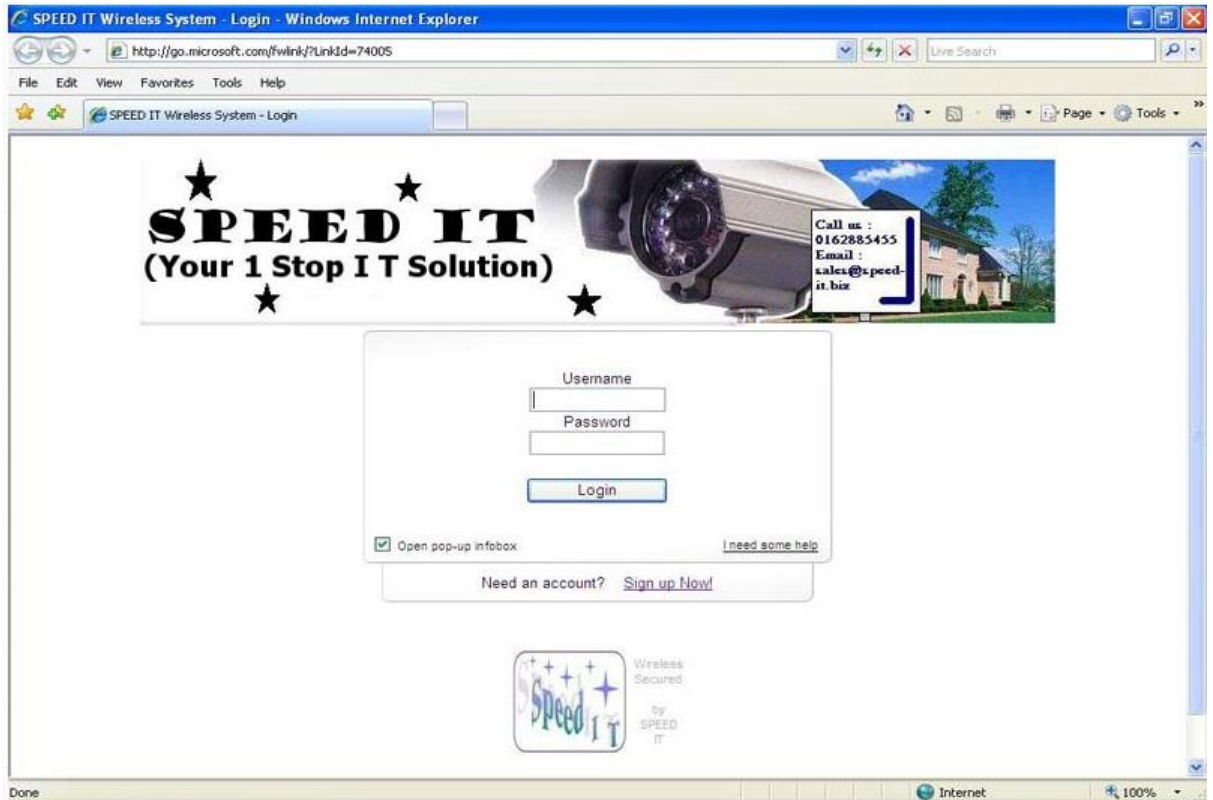


Figure 2.4: Login Page



Figure 2.5: User must key insert their username and password to Login



Figure 2.6: User Login status and Welcome message

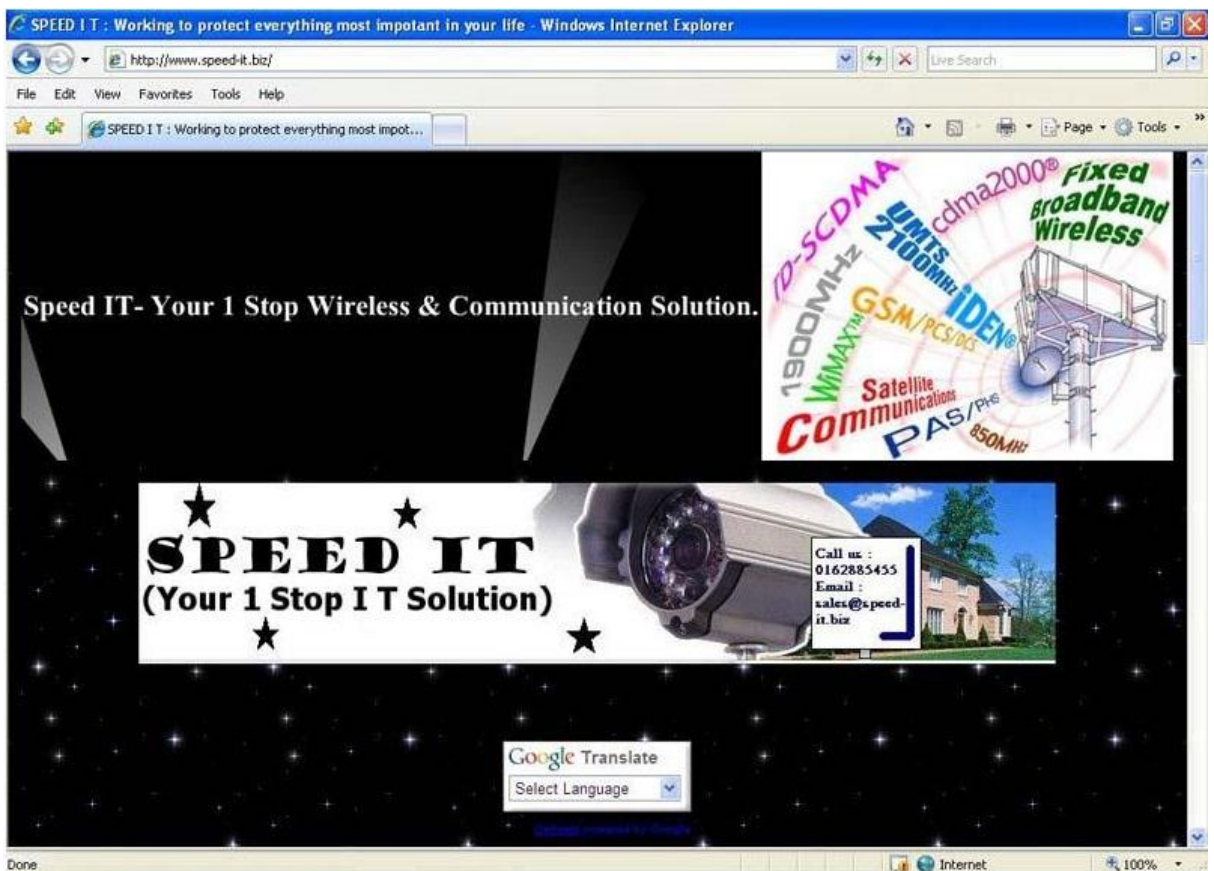


Figure 2.7: User can access the Internet

2.1.4 Azotel SIMPLer Hotspot System

Azotel SIMPLer Hotspot is a system that provides a complete hotspot management solution, including the ability to create and manage tokens, and to integrate with external payment gateways to process electronic payments. This system consists of four components which it is include SIMPLer server to manage the system and issue tokens, RADIUS server for authentication and accounting, Hotspot controller which sits between the access network and the Internet, and Access Network like Wi-Fi Access Points, metro MESH network, wired network and point-to-multipoint RF network [6]. The hotspot system provides the following functionality, for example ability to define tokens based on time and data limits. It is also provide free trial service for limited time periods and ensure that the same customer doesn't repeatedly use the free trial. Figure 2.8 is the example of the screen shot of Azotel SIMPLer Hotspot System portal pages.



Figure 2.8: Example of hotspot portal pages for Azotel SIMPLer Hotspot System

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