EFFECT OF WIRELESS MESH NETWORK ON SOCIAL NETWORK ACTIVITY

MUHAMAD HAFIZ BIN ABD AZIZ

Universiti Teknikal Malaysia Melaka (UTeM)

PENGARUH JARINGAN MESH TANPA WAYAR PADA KEGIATAN JARINGAN SOSIAL

MUHAMAD HAFIZ BIN ABD AZIZ

Laporan ini dikemukakan untuk memenuhi sebahagian daripada syarat penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Kejuruteraan Komputer) dengan Kepujian

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer

Universiti Teknikal Malaysia Melaka (UTeM)

Mei 2011

EFFECT OF WIRELESS MESH NETWORK ON SOCIAL NETWORK ACTIVITY

MUHAMAD HAFIZ BIN ABD AZIZ

This report is submitted in partial fulfillment of requirements for the award of Bachelor of Electronic Engineering (Computer Engineering) with Honours

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)

May 2011

UNIVERSTI TEKNIKAL MALAYSIA MELAKA

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN

PROJEK SARJANA MUDA II

Tajuk Projek : **EFFECT OF WIRELESS MESH NETWORK ON SOCIAL NETWORK ACTIVITY**

Sesi Pengajian :

1	0	/	1	1

Saya **MUHAMAD HAFIZ BIN ABD AZIZ**

mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.

2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.

3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.

4. Sila tandakan (√) :

☐ **SULIT***   *(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

☐ **TERHAD*** *   **(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐ **TIDAK TERHAD**

Disahkan oleh:

_____   _____

(TANDATANGAN PENULIS)   (COP DAN TANDATANGAN PENYELIA)

Tarikh: ……………………….   Tarikh: ……………………….

PENGESAHAN

"Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan
dan petikan yang tiap – tiap satunya telah saya jelaskan sumbernya."

Tandatangan :………………………….

Penulis: Muhamad Hafiz Bin Abd Aziz

Tarikh:……………………………….

DECLARATION

"I hereby declare that this report is the result of my own work except
for quotes as cited in the references."

Signature :………………………….

Author: Muhamad Hafiz Bin Abd Aziz

Date:………………………………….

"Saya akui bahawa saya telah membaca laporan ini dan pada pandangan saya laporan ini adalah memadai dari segi skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Elektronik (Kejuruteraan Komputer) dengan Kepujian."

Tandatangan: …….………………………..

Nama Penyelia: En. Nik Mohd Zarifie Bin Hashim

Tarikh: …………..……………………

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor Degree of Electronic Engineering (Computer Engineering) with Honours."

Signature: …………………………………

Supervisor Name: En. Nik Mohd Zarifie Bin Hashim

Date: …………………………………………

PENGHARGAAN

Projek dan kajian terhadap hasil kerja ini saya dedikasikan buat seluruh keluarga saya terutama sekali kepada kedua ibu bapa saya atas pengorbanan dan sokongan yang tidak pernah putus sepanjang hidup saya, adik-beradik saya dan juga rakan-rakan yang sentiasa memberi sokongan dan dorongan. Serta tidak dilupakan kepada tenaga pengajar yang banyak memberi tunjuk ajar kepada saya.

ACKNOWLEDGEMENT

This project and research work is dedicated to my beloved parents for their enthusiastic caring throughout my life, my loving siblings also my friends for their encouragement and love. Also, not to forget, to lecturers that shares their knowledge towards me.

.

ABSTRAK

Gangguan Saluran Bertindih (CCI) dan Gangguan Saluran Bersebelahan (ACI) merupakan salah satu gangguan utama yang ada dalam Rangkaian Jaringan Tanpa Wayar (WMN). Namun Gangguan Saluran Bertindih diyakini boleh menjejaskan prestasi Rangkaian Jaringan Tanpa Wayar kerana setiap penghala jaringan harus beroperasi dalam saluran yang sama, untuk memastikan mereka dapat berkomunikasi antara satu sama lain. Rangkaian sosial sangat popular sekarang. Seperti kita ketahui, rangkaian sosial terbahagi kepada dua trafik tanpa pengaliran dan trafik pengaliran. Kajian pada tahun 2010 menunjukkan bahawa Gangguan Saluran Bertindih di Rangkaian Jaringan Tanpa Wayar di 2.4 GHz memberi implikasi yang teruk kepada aplikasi tanpan pengaliran. Punca utama kepada masalah ini disebabkan oleh kekurangan saluran di 2.4GHz. Masalah ini mungkin dapat dikurangkan bagi penghala yang beroperasi pada 5GHz. Oleh kerana itu, menarik untuk mempelajari pengaruh Gangguna Saluran Bertindih di Rangkaian Jaringan Tanpa Wayar pada pola trafik yang berbeza dalam rangkaian sosial di 5GHz band untuk mengamati apakah kekuranagn saluran sebenarnya memberikan sumbangan terhadap Gangguan Saluran Bertindih tinggi di 2.4GHz. Tujuan utamanya adalah untuk menyiasat apakah Gangguan Saluran Bertindih mempengaruhi prestasi daya pengukur pada protokol tanpa pengalir dan protokol pengalir di Rangkaian Jaringan Tanpa Wayar di 5GHz. Perbandingan harus dibuat dengan 2.4GHz keputusan. Dalam tesis ini, Rangkaian Jaringan Tanpa Wayar uji-tempat tidur dirancang dan dikembangkan dengan menggunakan 4 router mesh. Prestasi dari setiap pelanggan mesh dinilai dengan mengukur daya pengukur dari Rangkaian Jaringan Tanpa Wayar dan Rangkaian Kawasan Setempat Tanpa Wayar menggunakan perisian yang sesuai. Kemudian data throughput antara Rangkaian Jaringan Tanpa Wayar dan Rangkaian Kawasan Setempat Tanpa Wayar dibandingkan dan dianalisa. Keputusan yang diperolehi pasti berbeza dari 2.4GHz Rangkaian Jaringan Tanpa Wayar. Daya pengukur untuk Rangkaian Jaringan Tanpa

Wayar menggunakan 5GHz band ini jauh lebih baik dari 2.4GHz Rangkaian Jaringan Tanpa Wayar. Selain mengetahui berapa daya pengukur sangat dipengaruhi dari Gangguan Saluran Bertindih, hasil antara Rangkaian Jaringan Tanpa Wayar dan Rangkaian Kawasan Setempat Tanpa Wayar berbanding dan hasilnya tak terduga. Tidak ada yang lebih besar berbeza dalam jangka masa throughput di Rangkaian Jaringan Tanpa Wayar. Penelitian ini disimpulkan bahawa terdapat prestasi yang lebih baik dicapai dalam Rangkaian Jaringan Tanpa Wayar menggunakan 5GHz pada masa yang sama mengurangkan kesan Gangguan Saluran Bertindih di Rangkaian Jaringan Tanpa Wayar.

ABSTRACT

Co-Channel Interferences (CCI) and Adjacent Channel Interference (ACI) are among the major interferences exists in wireless mesh network (WMN). However CCI is believed to affect severely WMN because each mesh routers must operate in the same channel to make sure they can communicate each other. Social network is very popular now. As we know, the social network consist both non-streaming and streaming traffics. Study in year 2010 shows that CCI in WMN at 2.4GHz affected severely non-streaming applications. The main reason suggested for the problem is due to poor channelization at 2.4GHz. The problem is claimed may be reduced for devices operating at 5GHz. Therefore, it is interesting to investigate the effects of CCI in WMN on different traffic patterns in social network at 5GHz band to observe whether poor channelization was actually contributed to the higher CCI at 2.4GHz. The main objective is to investigate whether CCI affecting the throughput performance of both non-streaming and streaming protocols in WMN at 5GHz. Comparison shall be made with 2.4GHz results. In this thesis, WMN test-bed was designed and developed using 4 mesh routers. The performance of each mesh client was evaluated by measure the throughput/goodput of WMN and WLAN using suitable software. Then the throughput data between WMN and WLAN was compared and analysed. The results obtained are definitely differ from 2.4GHz WMN. Throughput for WMN using 5GHz band was much better than 2.4GHz WMN. In addition to know how much the throughput was affected from CCI, the results between WMN and WLAN were compared and the results were unexpected. There were no larger different in term of throughput in WMN. The research was concluded that there a better performance achieve in WMN using 5GHz in the same time it reduce the impact of CCI in WMN.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF TERMS

WLAN	Wireless Local Area Network
WMN	Wireless Mesh Network
CCI	Co-Channel Interferences
ACI	Adjacent Channel Interferences
TCP	Transmissions Control Protocol
UDP	User Datagram Protocol
EMI	Electromagnetic Interferences
AP	Access Point

Chapter 1

Introduction

1.1   Project Background

This research was done in order to measure the performance of Wireless Mesh Network (WMN) and Wireless Local Area Network (WLAN) for non-streaming and streaming protocols that exist in social networking under Electromagnetic Interference (EMI) influences. The measurement was performed in UTeM. The performance was measured in term of throughput and Receive Signal Strength Indicator (RSSI).

1.2   Problem Statement

In WMNs, the major problem that always occurs and cannot be removing is Co-Channel Interference (CCI). Besides of that, the Adjacent Channel Interference (ACI) also occurs but it is just a minor problem. This CCI occurred because in the way of WMN configuration, the channel between routers should be the same in a way to make them communicate with each other. Little is known whether this configuration will affect the performance of streaming and non-streaming applications in social networking. A comprehensive study to investigate the impact of CCI on the non-streaming and streaming protocols in social networking is really useful to assist any protocol modification if needed in future design of social networking.

1.3 **Objectives**

- To investigate the effects of CCI on streaming and non-streaming protocols.
- To compare the performance between WMN and WLAN in terms of throughput and RSSI.
- To compare network performance at 2.4 and 5 GHz.

1.4 **Contribution**

- A paper with title "Analysis of Lightning-induced Transient in Wireless Communication System" has been published.
- A WMN test-bed has been setup for this research that covers FEKK building.

1.5   Thesis Organization

This thesis contains five chapters that explain in details about the project to provide the understanding of the whole project.

Chapter 1 is introduction of the project which is the effect of wireless mesh network on social network activity. This chapter presents the project background, problem statement, project objectives, motivation, contribution and thesis organization.

Chapter 2 is focusing on the literature review of project. In this chapter, the interference issue in WMNs and WLANs will be discussing together with the traffic characteristic of streaming and non-streaming applications. Explanation about interference effect on all 802.11 technology also been discussed on this chapter.

Chapter 3 describes in details the methodology to setup WMNs and WLANs test-bed by using router WRT610N v2 and the procedures to measure throughput and RSSI for both WMNs and WLANs.

Chapter 4 is about network performance analysis. All results from the measurement is analysed in this chapter. Analysis covered RSSI, non-streaming throughput and streaming throughput.

Chapter 5 concludes the thesis and projects future work that can be continued form this research.

Chapter 2

Literature Review

2.1 Introduction

In this chapter we describe literature study about 802.11 Wireless Local Area Network (WLAN) and Wireless Mesh Network (WMN). Both of them experiencing Electromagnetic Interference (EMI) problem namely Adjacent Channel Interference (ACI) and Co-Channel Interference (CCI). Those EMI affects the performance of 802.11 WLAN and WMN whether operating at 2.4 GHz or 5 GHz frequency.

2.2 Wireless LAN [2,5]

2.2.1 Technology

WLANs give an access to network communication with specific range using 2.4 GHz or 5 GHz radio frequency. This method is more conventional than using RJ 45 cable. WLANs are used to extend the coverage of local area network without having mess up with RJ 45 cable. WLANs coverage are expand using a device called Access Point (AP) that connected to the RJ 45 cable. Client connected to AP using wireless network card. Using IEEE term, WLAN is described as 802.11 technologies. Four technologies that been used in wireless network are 802.11a, 802.11b, 802.11g and 802.11n. Each technology is differentiating by term of radio frequency, bandwidth