



**Faculty of Electronic and Computer Engineering**

**ENHANCEMENT OF MEDIUM ACCESS  
CONTROL PROTOCOL WITH VARIOUS SERVICES  
UTILIZING CAPTURE EFFECT**

**Nur Qalbi binti Jalaudin**

**Master of Science in Electronic Engineering**

**2019**

**ENHANCEMENT OF MEDIUM ACCESS CONTROL PROTOCOL WITH  
VARIOUS SERVICES UTILIZING CAPTURE EFFECT**

**NUR QALBI BINTI JALAUDIN**

**A thesis submitted  
in fulfillment of the requirements for the degree of Master of Science in  
Electronic Engineering**

**Faculty of Electronic and Computer Engineering**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2019**

## DECLARATION

I declare that this thesis entitle “Enhancement of Medium Access Control Protocol with Various Services Utilizing Capture Effect” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : Nur Qalbi Binti Jalaudin

Date : .....

## APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Master of Science in Electronic Engineering.

Signature : .....

Supervisor Name : Dr. Mohd Riduan Bin Ahmad

Date : .....

## **DEDICATION**

To my beloved mother, father, husband, our lovely daughter, son and my family.

## ABSTRACT

In recent years there has been considerable interest in the development of standards for Wireless Local Area Networks (WLANs). In particular, IEEE 802.11 standard has now been extended to several variants of WLAN standards. For this reason, much of the research work for the enhancement of MAC protocol for WLAN is generally based on the behaviour of the IEEE 802.11 standard. Hence, this thesis focuses on the enhancement of MAC protocols, particularly the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol for variants of WLAN standard. In this thesis, the protocols have been analysed in terms of throughput and transmission delay by using an improved analytical approach simulated in Matlab. The saturation throughput analysis of CSMA/CA is controlled by using slotted analytical model combined with capture effect probability model. The performances of MAC protocols with propagation loss and shadowing scenarios are analysed. The proposed modification significantly reduced the probability of collision and provide better performance. The capture effect 10dB and retransmission 5 times has been achieved for the overall performance of the protocol, which shows almost 0.69% improvement at the average transmission delay and 0.80% at the throughput. The maximum throughput of MAC protocols is dependent on the normalized propagation delay. In other word, smaller normalized propagation delay gives better performance of throughput. Moreover, shorter distance has higher throughput and lower transmission delay for both path loss and shadowing scenarios when compared to the longer distance. Furthermore, the performance of average transmission delay for MAC protocols with capture effect is better than the MAC protocols without capture effect. These results can be used as a useful guide to scientist and engineers before the communication network is deployed to transfer data to the gateway or control centre.

## ABSTRAK

*Dalam tahun-tahun kebelakangan ini telah banyak minat dalam pembangunan piawaian untuk Rangkaian Kawasan Tempatan Wayarles (WLAN). Khususnya, piawaian IEEE 802.11 kini telah diperluaskan kepada beberapa varian standard WLAN. Atas sebab ini, banyak kerja penyelidikan untuk peningkatan protokol MAC untuk WLAN pada umumnya adalah berdasarkan tingkah laku piawai IEEE 802.11. Oleh itu, tesis ini menumpukan kepada peningkatan protokol MAC, terutamanya protokol Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) untuk varian standard WLAN. Dalam tesis ini, protokol telah dianalisis dari segi celusan dan kelewatan penghantaran dengan menggunakan pendekatan analisis yang lebih baik yang disimulasikan dalam Matlab. Analisis ketepuan celusan CSMA/CA dikawal dengan menggunakan model analitik bergulung digabungkan dengan model kebarangkalian kesan tangkapan. Prestasi protokol MAC dengan kehilangan perambatan dan senario pembayang dianalisis. Pengubahsuaian yang dicadangkan dapat mengurangkan kebarangkalian pelanggaran dan memberikan prestasi yang lebih baik. Kesan tangkapan 10dB dan penghantaran semula 5 kali telah dicapai untuk prestasi keseluruhan protokol, yang menunjukkan peningkatan hampir 0.69% pada kelewatan penghantaran purata dan 0.80% pada celusan. Pemprosesan maksimum protokol MAC bergantung pada langkah perambatan normal. Dalam erti kata lain, langkah perambatan normal yang lebih kecil memberikan prestasi celusan yang lebih baik. Selain itu, jarak yang lebih pendek mempunyai celusan yang lebih tinggi dan kelewatan penghantaran yang lebih rendah untuk kedua-dua kehilangan laluan dan pembayang senario apabila dibandingkan dengan jarak yang lebih panjang. Selain itu, prestasi kelewatan penghantaran purata bagi protokol MAC dengan kesan tangkapan lebih baik daripada protokol MAC tanpa kesan tangkapan. Hasil ini boleh digunakan sebagai panduan berguna kepada saintis dan jurutera sebelum rangkaian perhubungan digunakan untuk memindahkan data ke get laluan atau pusat kawalan.*

## ACKNOWLEDGEMENTS

On this opportunity, I would like to state my gratitude to my supervisor, Dr. Mohd Riduan bin Ahmad for demonstrating a highly professional character in order to consult and guide me towards the completion of this project.

I would love to express my sincere acknowledgement to Assoc. Prof. Dr. Mohamad Zoinol Abidin bin Abd Aziz of Faculty of Electronic and Computer Engineering for their assistance for the analysis works.

Most importantly, I am proud to give my appreciation to my dearest husband, Mohd. Hishamuddin bin Abd Kadir for his continuous support and unconditional care which are indispensable source of my strength. I am also love to state my gratitude to my parents, Hj Jalaudin bin Hj Abu Bakar and Hjh Nafsiah binti Hj Husin, for raising me up unconditionally until I was able to achieve this level. Special appreciation to my parents in law, for loving me just like their own daughter, giving all love and care since the first moment we became family. To my siblings and family, I am indebted to them for their support in everything that I have done.

Special thanks to Pn. Haslina binti Mohd Nasir and Muhammad Haziq bin Mohammad Sabri, for their moral support in completing this degree. Lastly, thank you to everyone who had been associated to the crucial parts of completing this project.



## TABLE OF CONTENTS

	<b>PAGE</b>
<b>DECLARATION</b>	
<b>APPROVAL</b>	
<b>DEDICATION</b>	
<b>ABSTRACT</b>	<b>i</b>
<b>ABSTRAK</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS</b>	<b>iii</b>
<b>TABLE OF CONTENTS</b>	<b>iv</b>
<b>LIST OF TABLES</b>	<b>vi</b>
<b>LIST OF FIGURES</b>	<b>vii</b>
<b>LIST OF APPENDICES</b>	<b>xvi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xvii</b>
<b>LIST OF PUBLICATIONS</b>	<b>xviii</b>
<b>CHAPTER</b>	
<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Research background	1
1.2 Problem statement	4
1.3 Objectives	4
1.4 Scopes of research	5
1.5 Flow of research	6
1.6 Contribution	9
1.7 Thesis organization	10
<b>2. LITERATURE REVIEW</b>	<b>11</b>
2.1 Overview of hierarchy of protocol	11
2.1.1 Physical layer	13
2.1.2 Media Access Control (MAC) layer	15
2.2 MAC frame format	18
2.2.1 PHY layer frame format	19
2.2.2 DATA frame format	20
2.3 Overview of 802.11 standard	21
2.3.1 Pros and cons 802.11 standard	24
2.4 Classification of Medium Access Control (MAC) protocol	25
2.4.1 Random access contention protocol	28
2.4.2 ALOHA	28
2.4.3 Slotted ALOHA	29
2.4.4 Carrier Sense Multiple Access (CSMA)	31
2.4.4.1 1-persistent	31
2.4.4.2 Non-persistent	32
2.4.4.3 <i>p</i> -persistent	32
2.4.5 Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) mechanism	33
2.4.6 IEEE 802.11 DCF	35
2.5 Randomly backoff	36
2.6 Hidden terminal	37
2.7 Literature review	38

2.7.1	Related work on the analytical modelling of IEEE 802.11 DCF	38
2.7.2	Related work on the method of captured effect	40
2.8	Summary	43
<b>3.</b>	<b>METHODOLOGY</b>	<b>45</b>
3.1	Introduction	45
3.2	Enhancement of Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	46
3.2.1	Slotted analytical model	53
3.2.2	Capture effect ratio	57
3.3	Network model	57
3.3.1	Modelling of enhancement Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	59
3.3.2	Design specification	63
3.4	Performances	73
3.4.1	Throughput	74
3.4.2	Average transmission delay	74
3.5	Summary	75
<b>4.</b>	<b>RESULT AND DISCUSSION</b>	<b>76</b>
4.1	Introduction	76
4.2	Performance evaluation	77
4.2.1	Audio bit rate	77
4.2.2	Audio bit rate performance	77
4.2.3	IEEE 802.11	83
4.2.3.1	IEEE 802.11 performance	84
4.2.4	IEEE 802.11a	93
4.2.4.1	IEEE 802.11a performance	93
4.2.5	IEEE 802.11b	102
4.2.5.1	IEEE 802.11b performance	102
4.2.6	IEEE 802.11g	111
4.2.6.1	IEEE 802.11g performance	111
4.2.7	IEEE 802.11n	120
4.2.7.1	IEEE 802.11n performance	120
4.3	Discussion	129
4.4	Summary	130
<b>5.</b>	<b>CONCLUSION AND FUTURE WORKS</b>	<b>132</b>
5.1	Conclusion	132
5.2	Suggestions for future works	134
	<b>REFERENCES</b>	<b>136</b>
	<b>APPENDICES</b>	<b>144</b>

## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Address field contents (ISO, 1999)	21
2.2	Comparison standard of IEEE 802.11 a/b/g/n (Babiker et. al., 2015)	23
2.3	Pros and cons of IEEE 802.11 standard	25
4.1	Audio bit rate with the capture effect utilizing Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) protocol	78
4.2	IEEE 802.11 with capture effect in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	84
4.3	IEEE 802.11a with capture effect in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	93
4.4	IEEE 802.11b with capture effect in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	102
4.5	IEEE 802.11g with capture effect in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	113
4.6	IEEE 802.11n with capture effect in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	121

## LIST OF FIGURES

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Hierarchy of protocol	12
2.2	MAC frame format (ISO, 1999)	19
2.3	PHY layer frame format (ISO, 1999)	20
2.4	DATA frame format (ISO, 1999)	21
2.5	Classification of Medium Access Control (MAC)	27
2.6	The maximum throughput of ALOHA (Abramson et. al., 1970)	29
2.7	The maximum throughput of slotted ALOHA (Leonard et. al., 1973)	30
2.8	Two – way handshake mechanism (DATA/ACK)	34
2.9	Four-way handshake mechanism (RTS/CTS)	35
2.10	CW process in back off scheme	37
2.11	Hidden terminal	38
3.1	Flow of research	46
3.2	Collision of packet in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	48
3.3	Carrier Sense Access with Collision Avoidance (CSMA/CA)	48

3.4	The sender of proposed protocol (ISO, 1999)	50
3.5	The destination of proposed protocol (ISO, 1999)	52
3.6	The others of proposed protocol	53
3.7	The operation of nodes under different channel state (a) capture effect (b) non - capture effect	55
3.8	The flowchart of modelling in Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	63
3.9	Basic propagation loss	64
3.10	Network model used to evaluate CSMA/CA protocol	65
3.11	Modelling method of protocol using MATLAB	69
3.12	An ALOHA protocol	70
3.13	Throughput versus offered traffic of an ALOHA for varying of the propagation delay (a) capture effect (b) non-capture effect	72
3.14	Average propagation delay (packets) versus offered traffic of an ALOHA for varying of the access terminal (a) capture effect (b) non-capture effect	73
4.1	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 100 m, capture effect = 10dB) number of access terminal (a) Case 1(b) Case 2 and (c) Case 3	80
4.2	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 100 m and non –	81

	capture ) number of access terminal (a) Case 1 (b) Case 2 and (c) Case 3	
4.3	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 100 m and capture effect = 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	82
4.4	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 100 m and non - capture) (a) 0.01 (b) 0.02 (c) 0.03 and (d) 0.04	83
4.5(a)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 20 m, capture effect = 10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	87
4.5(b)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 20 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	88
4.6(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 20 m, capture effect = 10 dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	88
4.6(b)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 20 m, non – capture) (a) 0.01 (b) 0.02 (c) 0.03 and (d) 0.04	89

4.7(a)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 100 m and capture effect = 10dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	90
4.7(b)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance =100m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	91
4.8(a)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 100 m, capture effect = 10 dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	92
4.8(b)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 100 m, non – capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	92
4.9(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 35 m, capture effect = 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	95
4.9(b)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 35 m, non - capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	96
4.10(a)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 35 m, capture	97

	effect = 10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	
4.10(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 35 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	98
4.11(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 120m, capture effect = 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	99
4.11(b)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 120m, non - capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	99
4.12(a)	Throughput versus offered traffic of CSMA/CA for the varying of the propagation delay (distance =120 m, capture effect = 10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	100
4.12(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 120 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	101
4.13(a)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 35, capture	105



	effect = 10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	
4.13(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 35 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	106
4.14(a)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 140 m, capture effect = 10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	107
4.14(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 140 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	108
4.15(a)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 35 m, capture effect= 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	108
4.15(b)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 35 m, non – capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	109
4.16(a)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal	110

	(distance = 140 m, capture effect = 10 dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	
4.16(b)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 140 m, non – capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	110
4.17(a)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 38m, capture effect =10dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	114
4.17(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 38 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	115
4.18(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 38 m, capture effect = 10 dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	116
4.18(b)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance = 38 m, non - capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	117
4.19(a)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 140 m, capture effect =	118

	10 dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	
4.19(b)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance =140 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	119
4.20(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of the access terminal (distance =140 m, captured effect 10dB) (a) 0.01 (b) 0.02 (c) 0.03 and (d) 0.04	119
4.20(b)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance =140 m, non – capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	120
4.21(a)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 70 m, capture effect = 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	123
4.21(b)	Average propagation delay (packets) versus offered traffic of basic CSMA/CA for varying of the access terminal (distance = 70 m, non - capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	124
4.22(a)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 70m, capture	145

	effect = 10dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	
4.22(b)	Throughput versus offered traffic of basic CSMA/CA for varying of the propagation delay (distance = 70 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	126
4.23(a)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of access terminal (distance = 250 m, capture effect = 10dB) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	126
4.23(b)	Average propagation delay (packets) versus offered traffic of CSMA/CA for varying of access terminal (distance = 250 m, non - capture) (a) 0.01 (b) 0.02 (c) 0.03 (d) 0.04	127
4.24(a)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 250 m, capture effect = 10dB) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	128
4.24(b)	Throughput versus offered traffic of CSMA/CA for varying of the propagation delay (distance = 250 m, non – capture) number of access terminal (a) Case 1 (b) Case 2 (c) Case 3	129

## LIST OF APPENDICES

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	IJEAT Journal	144

## LIST OF ABBREVIATIONS

ACK	-	Acknowledgement
CSMA	-	Carrier Sense Multiple Access
CSMA/CA	-	Carrier Sense Multiple Access with Collision Avoidance
CTS	-	Clear to Send
dB	-	decibel
FCS	-	Frame Check Sequence
GHz	-	Giga Hertz
IEEE	-	Institute of Electrical and Electronic Engineering
LLC	-	Logical Link Control
m	-	meter
MAC	-	Medium Access Control
MATLAB	-	Math Works Computer Programming software
MAN	-	Metropolitan Area Network
MPDU	-	Medium Access Control Protocol Data Unit
MAPs	-	Mesh Access Points
MHz	-	Mega Hertz
PHY	-	Physical
PLCP	-	Physical Layer Convergence Procedure
RTS	-	Request to Send
WLAN	-	Wireless Local Area Network
WAN	-	Wide Area Network
WMN	-	Wireless Mesh Network

## LIST OF PUBLICATIONS

The research papers produced and published during the course of this research are as follows:

1. Jalaudin, N. Q., Ahmad, M. R., Aziz, M. Z. A. A., Esa, M. R. M., 2019. The Performance of IEEE 802.11g with Capture Effect for Lightning Remote Sensing. *International Journal of Engineering and Advanced Technology (IJEAT)*. Letter of Accepted is shown in Appendix A.[Scopus][Accepted]
2. Jalaudin, N. Q., Ahmad, M. R., Aziz, M. Z. A. A., Esa, M. R. M., Isa, A. A. M., 2019. The Performance of Medium Access Control Protocol with Capture Effect for Lightning Remote Sensing. *IOP Conference Series : Earth and Environmental Science*, Vol : 228.[Accepted]
3. Vigneswara, R. G., Tuani, A. F., Zakaria, Z., Othman, A. R., Jalaudin, N. Q., 2014. A Review on Various of Software Defined Radios (SDRs) in Radio Communication. *International Journal of Research in engineering and Technology (IJRET)*, 3(12), pp.1-6.[Accepted]

# CHAPTER 1

## INTRODUCTION

This chapter presents an overview on the research background of the project, problem statements, objectives and scopes of the project. This chapter briefly describes the flow of this research. The organization of this thesis is also briefly described at the end of this chapter.

### 1.1 Research background

In a telecommunication or computer network where participants communicate through a common physical medium, how we should coordinate their action so that certain performance goals can be met? In the literature, this is known as the multiple access, with the corresponding protocols and mechanisms called as medium access control (MAC). The problem of multiple access arises when the underlying medium is broadcast in nature, where messages from a station can be heard by other station that are in the listening area (Gummalla. Ajay Chandra Limb. John O, 2000).

In physical layer technique, when more than one stations starts a transmission at the same time, all the transmitted frames will be lost. While, MAC layer protocols is to coordinate transmissions by competing stations to allow for sharing the common medium (Litwin, 2001). The communication between two nodes is to deploy a point-to-point link between the nodes such as connecting them with a cable is the most basic method. There is no interference between nodes and resource sharing is not required at the point-to-point channels. However, setting point- to point is not always possible. In wireless medium is