

**UNIVERSITI TEKNOLOGI MARA**

**PERFORMANCE CHARACTERIZATION OF IEEE  
802.11g IN A SMALL OFFICE HOME OFFICE  
(SOHO) FOR CONDOMINIUM ENVIRONEMENT**

**MOHD RAFIEI DAUD**

**2006667094**

**Thesis submitted in partial fulfillment of the requirements for the  
degree of Master of Science (Computer Networking)**

**Faculty of Information Technology and Quantitative Sciences**

**MAY 2008**

## ACKNOWLEDGEMENT

First and foremost I offer my sincerest gratitude to my supervisor, Tuan Haji Mohd Izani Mohamed Rawi, who has given invaluable support, encouragement, supervision and useful suggestions throughout this research work, which made him a backbone of this research and so to this thesis. His truly outstanding intuition has made him as a constant oasis of ideas and passions in wireless study, which exceptionally inspire and enrich my growth as a student. I am indebted to him more than he knows.

I wish to thank my best friend during this postgraduate course Murad, Kamal and Amin for helping me get through the difficult times, and for all the emotional support, entertainment, and caring they provided. Their moral support enabled me to complete my work successfully. Their encouragement and effort and without them this thesis, too, would not have been completed or written.

Words fail me to express my appreciation to my wife Naterah bt Mohd Lazim@Mohd whose dedication, love and persistent confidence in me, has taken the load off my shoulder. I owe her for being unselfishly let her intelligence, passions, and ambitions collide with mine. And thank to God with you precious gift, ours 47 days baby girl Hannah Balqis, her presence bring more cheerful to me and my wife.

Finally, I would like to thank everybody who was important to the successful realization of thesis, as well as expressing my apology that I could not mention personally one by one.

## ABSTRACT

### **Performance Characterization of IEEE 802.11g in a Small Office Home Office (SOHO) for Condominium Environment**

**Keyword: Wireless LAN, IEEE 802.11g, Network Performance, Throughput**

With the growing popularity of the wireless local area networks (WLAN) based on 802.11 a/b/g standards, it provides an alternative solution where communication is no longer restricted by wires and can be operate at any location. Despite the convenience of this mobility, the performance of a WLAN must be addressed carefully before it can be implemented and deployed. In this paper, we address the performance of IEEE 802.11g by changing the various key parameters on the actual performance of IEEE 802.11g. The focus is on observing the measured throughput when the network is flooded with a continuous stream of data. A series of controlled experiments are carried to assess the performance of 802.11g to find the maximum throughput under realistic conditions with the presence of interference. The impact of co-channel to throughput performance was discussed. In addition changing the adjacent channel and transmitted power level to throughput performance was exposed. Overall, the effective application level throughput was conducted under three sets of experiments. The analysis result and measurement campaign provides insights into the required provisioning for 802.11g WLAN to ensure it provides the needed coverage and capacity to intended users

## TABLE ON CONTENT

CHAPTER 1 .....	8
INTRODUCTION .....	8
1 INTRODUCTION .....	8
1.1 BACKGROUND OF PROBLEM (WIRELESS DATA NETWORK).....	11
1.2 PROBLEM STATEMENT .....	11
1.3 OBJECTIVES OF THE RESEARCH.....	12
1.4 SCOPE OF THE RESEARCH.....	13
1.5 SIGNIFICANCE OF THE RESEARCH.....	14
1.6 SUMMARY.....	15
CHAPTER 2.....	17
LITERATURE REVIEW .....	17
2 INTRODUCTION .....	17
2.1 Wireless LAN Propagation Research .....	17
2.1.1 Radio Frequency (RF) Coverage Measurement Techniques.....	17
2.1.2 Continuous Wave (CW) Transmitter and Power Meter .....	18
2.1.3 Broadband Pulse Transmission .....	19
2.1.4 Wireless LAN Card Reported Signal Strength.....	20
2.1.5 Network Analyzer tools.....	21
2.2 Wireless LAN Related RF Propagation Research.....	21
2.2.1 Indoor Propagation Measurements .....	21
2.2.2 Wireless LAN Measurements with non-overlapping channel.....	22
2.3 Wireless LAN Network Performance Research .....	23
2.3.1 Network Performance Statistics .....	23
2.3.2 Delay: Latency and Inter Packet Delay .....	23
2.3.3 Throughput .....	24
2.3.4 Data Bandwidth .....	25
2.4 Network Protocols .....	25
2.5 Network Performance Measurement Techniques.....	26
2.5.1 Command line based on UNIX software.....	27

2.5.2	File Transfer Using FTP .....	28
2.5.3	Test Packet Based Software with IxChariot 4.3 and AirMagnet 4.0.....	29
2.6	Wireless LAN Related Performance Research.....	30
2.6.1	Early Wireless LAN Network Performance Measurements.....	30
2.6.2	Idealized Wireless LAN Performance Measurements.....	31
2.6.3	IEEE 802.11g Throughput Measurement in a Home Wireless Network 31	
2.6.4	Cause of throughput Variation in IEEE 802.11 Networks .....	32
2.6.5	Wireless LAN Performance Issues.....	33
2.6.6	Multiple AP interference of a Wireless LAN.....	33
2.6.7	Impact of Using Overlapping Channels in Closed Proximity .....	34
2.7	Summary of Prior Research.....	35
CHAPTER 3 .....		36
METHODOLOGY .....		36
3	INTRODUCTION.....	36
3.1	GATHERING INFORMATION.....	39
3.2	PLANNING AND SOFTWARE SETUP .....	40
3.2.1	Software Architecture Planning.....	40
3.2.2	LanTraffic V2.....	40
3.2.3	NetStumbler as RSSI Measurement Software.....	41
3.2.4	Related Software.....	42
	▪ Operating System .....	42
	▪ Antivirus .....	42
	▪ Widows Firewall.....	43
3.3	PLANNING AND HARDWARE SETUP.....	43
3.3.1	Hardware Specification for TEST Segment .....	44
3.3.2	Hardware Specification for INTERFERENCE Segment .....	44
3.3.3	Network Design.....	46
3.4	EXPERIMENTAL SCENARIO.....	47
3.4.1	Measurement Case.....	47
3.4.2	Measurement Scenarios.....	50