

HANDOVER ADAPTATIONS FOR LOAD BALANCING SCHEME IN MACROCELL/FEMTOCELL LTE NETWORK

**Thesis is presented in partial fulfillment for the award of the
Master of Science in Telecommunication and Information Engineering
UNIVERSITI TEKNOLOGI MARA (UiTM)**



**NURUL HUSNA MD YUSOH
FACULTY OF ELECTRICAL ENGINEERING
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM,
SELANGOR, MALAYSIA
JULY 2013**

ACKNOWLEDGEMENT

First and foremost, I wish to express my sincerest thanks to my supervisor, Dr Azita Laily Yusof, for the enthusiastic guidance and encouragement she has given me throughout the thesis work. I owe her high standard lifelong obeisance.

I would like to my sincere gratitude and heartfelt thanks to my beloved husband Mr. Mohd Ikhran Mohamad, for his understanding, support, expectations and love in nurturing me to be who I am today. Thanks a lot to both families through their caring, motivation and understanding; they taught me to have the courage to believe in myself even more. Henceforth, I am dedicating this thesis work to them.

Last but not least, thousand of thank to all my friends for their idea, support and expectation throughout the study. Special thanks to Prof Dr Mahamod for his assistance for the valuable information in MATLAB software. To my panels Dr Ramon Fakeh, Pn Nor Ayu and Pn Zuhani, thank you for their useful advice and comment during the presentation. Thank you so much.

ABSTRACT

In the purpose of offering extensively higher data rates, higher systems throughput, and lower latency, the femtocell systems in 3GPP LTE system has premeditate. In a large number of femtocells, there are too many prehandover and unnecessary handover processes frequently among femtocells may occur. Also, call failure due to handover may increase when the mobile moves from one serving cell to another cell. High number of switching load will occur due to the ping-pong effect. Handover procedures for existing networks are needed to support the macrocell/femtocell integrated network. This thesis proposes a modified handover procedure between macrocell and femtocell network. A handover algorithm is proposed based on Received Signal Strength (RSS) and speed of the User Equipment (UE) to improve the handovers between the macrocell and femtocell in LTE network. The result shows that unnecessary handover and handover failure can be optimized using modified handover in this macrocell and femtocell integrated network. Thus, the deployment of femtocell can increase the handover performance as well as offloading the macrocell traffic.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	TITLE	i
	APPROVAL	ii
	DECLARATION	iii
	DEDICATION	iv
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	TABLE OF CONTENTS	vii
	LIST OF FIGURES	x
	LIST OF TABLE	xii
	LIST OF ABBREVIATIONS	xiii
1	INTRODUCTION	
	1.1 Background	1
	1.2 Problem Statement	3
	1.3 Research Objective	3
	1.3 Scope of Project	3
	1.4 Outline of thesis	3
2	LITERATURE REVIEW	
	2.1 Introduction	5
	2.2 Related works	5
	2.3 Summary	9
3	THEORETICAL BACKGROUND	
	3.1 Introduction	10
	3.2 Evolution of mobile network	10
	3.2.1 WCDMA (UMTS)	13

CHAPTER 1

INTRODUCTION

1.1 Background

Mobile data communications has undergone significant evolution in recent years. The introduction of High Speed Downlink Packet Access (HSDPA) enabled mobile broadband internet for the first time. This resulted in an exponential increase in the traffic volume of the mobile data. In the future, it is expected that there will be more mobile data demand than there has been before. According to Nokia Siemens Networks and Ericsson, it is estimated that the data usage rate will increase 1000 percent from 2010 to 2020 [1].

The main reason for this is the increasing level of penetration of data-intensive devices, such as smart phones, and an increasing level of usage per device. The rapidly increasing mobile data traffic has resulted in a major challenge for the operators. Data volumes are growing at a rate that exceeds the operators' ability to increase capacity. Capacity growth typically comes from growth in the number of sites, increased spectrum resources and enhancement of radio technologies. The huge gap between the data demand growth and network capacity growth demanded further innovations. This resulted in the concept of heterogeneous networks in which some of the data traffic is offloaded onto other smaller networks using microcells, picocells, femtocells and Wi-Fi access points. It is expected that the deployment of