

UNIVERSITI TEKNOLOGI MARA

**HANDOVER OPTIMIZATION IN
CROSS TIER LTE
HETEROGENEOUS NETWORKS**

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ABSTRACT

In this modern era, the current mobile network technology focuses on the Long Term Evolution (LTE) network deployment. The deployment concentrates on the design that further increases the optimization or parameter changes of network capacity and coverage. Since its early adoption within Malaysia, it has become one of the important parts for every mobile user that uses system consisting of heterogeneous network. Due to further increase in demand of traffic users recently, the risk of problems regarding LTE capacity will also increase and hence, it becomes one of the crucial issues for any operators that engages in wireless communication networks. In order to overcome this issue, an extensive research on femtocell network known as Home eNodeB has been investigated to improve the indoor network capacity and further extension of the coverage area in wireless communication networks. Furthermore, the deployment of femtocell network is expected to increase technological efficiency in terms of improving user's performance in highly congested areas while offloading user's traffic within macrocell network. However, the handover process in cross tier LTE heterogeneous network between macrocell and femtocell has become a major challenge due to an increase of handover failure probability. Therefore, the main objective of this research is to derive a mathematical formulation of the dynamic boundary area size by incorporating value of user's speed and signaling delay in handover threshold called as adaptive Reference Signal Received Power threshold ($RSRP_{th}$) to ensure the determination of the right handover initiation time for LTE macrocell and femtocell heterogeneous network. Dynamic boundary area size is the required distance between UE and border of cell edge coverage which depends on user's speed and signaling delay in order to initiate handover process. The derivation of the mathematical equation was based on the test bed measurement that was conducted in three different areas which are in urban area, rural area and combining of urban-rural areas. In order to observe the handover relationship between macrocell and femtocell, the user's speed and signaling delay were analyzed based on the probability of false handover initiation (p_a) and probability of handover failure (p_f). From the analysis, the values of adaptive $RSRP_{th}$ has been proposed and applied in LTE macrocell and femtocell handover scheme in order to enhance the handover performance. The simulation results show that the proposed value of adaptive $RSRP_{th}$ has improved the handover failure probability. The proposed handover scheme improved the numbers of handover about 30.69% to 67.76% for femtocell and 22.05% to 51.92% for macrocell as compared when the fixed value of $RSRP_{th}$ is used and hence, offload traffic from the heavily loaded macrocell network.

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TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xiv
CHAPTER ONE: INTRODUCTION	1
1.1 Introduction	1
1.2 Problem Statement	3
1.3 Research Objective	4
1.4 Research Motivation	5
1.5 Scope and Limitation of the Study	7
1.6 Thesis Contribution	7
1.7 Thesis Outline	8
CHAPTER TWO: LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Evolution of Mobile Network Technology	9
2.3 Long Term Evolution	13
2.3.1 Heterogeneous Networks	15
2.3.2 Macrocell in LTE	17
2.3.3 Femtocell in LTE	19
2.3.4 Challenges in LTE System	26
2.4 Related Work	32
2.5 Summary	42

CHAPTER THREE: TEST BED PERFORMANCE MEASUREMENT	44
3.1 Introduction	44
3.2 Test Bed Study Area	44
3.2.1 Nemo Outdoor	45
3.2.2 Nemo Analyzer	52
3.3 Test Bed Data Analysis	54
3.4 Test Bed Measurement Results in Urban Area	55
3.5 Test Bed Measurement Results in Rural Area	60
3.6 Test Bed Measurement Results in Urban and Rural Area	65
3.7 Summary	72
 CHAPTER FOUR: CROSS TIER HANDOVER OPTIMIZATION	 73
4.1 Introduction	73
4.2 Analytical Framework	73
4.2.1 Proposed of an Adaptive Reference Signal Received Power threshold (RSRP _{th})	78
4.3 Impact on Probability of False Handover Initiation (p_a)	81
4.4 Relationship between Probability of Handover Failure (p_f) and Speed (v)	83
4.5 Relationship between Proposed Adaptive Reference Signal Received Power Threshold (RSRP _{th}) and Speed	85
4.6 Handover in LTE Heterogeneous Networks	87
4.6.1 Simulation Parameters	87
4.6.2 Handover Framework of Propose Adaptive RSRP _{th}	88
4.6.3 Handover Algorithm Flowchart in LTE Heterogeneous Networks	89
4.7 The Effects on Number of Handovers for Different Scenarios	92
4.7.1 The Effect on Number of Handovers when the UE's in Urban Area and Movement of UE's in Random Movement for Femtocell Handover	93
4.7.2 The Effect on Number of Handovers when the UE's in Urban Area and Movement of UE's in Straight Line for Femtocell Handover	95
4.7.3 The Effect on Number of Handovers when the UE's in Rural Area and Movement of UE's in Random Movement for Femtocell Handover	97
4.7.4 The Effect on Number of Handovers when the UE's in Rural Area and Movement of UE's in Straight Line for Femtocell Handover	99