

**UNIVERSITI TEKNOLOGI MARA**

**SELF-ORGANIZING NETWORK  
(SON) BASED HANDOVER  
MECHANISM FOR LONG-TERM  
EVOLUTION (LTE) NETWORK**

**ILINADIA BINTI MD ISA**

Thesis submitted in partial of requirement for the  
degree of **Master of Science**

**Faculty of Electrical Engineering**

January 2015

## ABSTRACT

The migration towards the LTE network technology meaning that many 3G, 2.5G and even for 2G (whether 3GPP or 3GPP2) network shall continue their operation for upcoming years. The advantages of LTE network are reducing the signalling overhead while sharing the common session data storage that shall enhance the resource usage and easing the network migration from previous network to LTE network. Most importantly it improve the mobility between difference access systems for examples 2G, 3G and 4G. Despite the advantages that help the network to communicate better, there is issue that often arises within the LTE network which is handover issue. Handover occurs when UE moves from one cell to another cell and sometime may cause drop calls and disrupt the communication. The main handover parameters in measurement report: Hysteresis (Hys) and Time-To-Trigger (TTT) play important roles to avoid the handover failure. Many solutions have been introduced to minimize the handover failure issues. One of the solutions is Self-Organizing Network (SON). SON mechanism comprises of three components of self-configuration, self-optimization and self-healing which can contribute to optimize the performance of the next generation broadband network such as the Long Term Evolution (LTE) networks. The aim of this study is to propose a self-organizing handover procedure based on the Self-Organizing Network (SON) concept for LTE network, The simulations scenario and analysis on the performance of the proposed SON-based handover were conducted using the QualNet software. The two main handover parameters that have been modified are the Hysteresis (Hys) and Time-To-Trigger (TTT). Several simulations were run with difference value of Hys and TTT value in order to perform good handover network performances. The outcome of the simulation shows the network performance is better after optimizing the Hys and TTT parameters value. In particular the LTE network shows remarkable improvement in the network throughput, as well as reducing the network delivery delay and network jitter thus lead to network less congestion. This study will be beneficial for future works as the next communication technologies are always changing rapidly and the self-manage mechanism will become essential for efficient network operations.

## ACKNOWLEDGEMENTS

In the name of Allah S.W.T with the deepest sense of gratitude of the Almighty ALLAH that gives me the strength and ability to complete my MSc project as it is today.

I would like to take an opportunity to express my special thank you and my gratitude to my supervisor Prof Dr. Mohd Dani Baba for his patience, his willingness to advice, guide, support and encouragement given to me during the time period of this project. Without his kindness, guide and encouragement the project may not achieve its goal. Besides that, I would like to thanks those that have indirectly contributed their opinion and effort to realize this project successfully. Special thanks to all my family for their full support, my dearest MSc classmates who's continued to provide help and encourage me all the time and to Prof. Madya Ruhani Abd Rahman for consultation regarding this project.

May Allah bless and reward them for their generosity.

Thank You.

**TABLE OF CONTENTS**

	<b>Page</b>
<b>CONFIRMATION BY PANEL EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>ix</b>
<b>LIST OF FIGURES</b>	<b>x</b>
<b>LIST OF ABBREVIATION/NOMENCLATURE</b>	<b>xii</b>
<b>CHAPTER ONE: INTRODUCTION</b>	
1.1 Background Of Study	1
1.2 Problem Statement	3
1.2.1 Handover Failure Cases	3
1.3 Objectives	5
1.4 Scope of Study	5
<b>CHAPTER TWO: LITERATURE REVIEW</b>	
2.1 Overview	6
2.2 Long Term Evolution (LTE), Network	6

2.2.1	Long Term Evolution (LTE) Network Architecture	7
2.1.2	Handover (HO) in Long Term Evolution (LTE) Network	10
2.3	Self-Organizing Network (SON)	11
2.3.1	Self-Configuring	11
2.3.2	Self- Optimizing	12
2.3.3	Self-Healing	12
2.4	Existing System	13
2.4.1	LTE Network Previous Work	13
2.4.2	Self-Organizing Network (SON) in LTE Network	18

### **CHAPTER THREE: METHODOLOGY**

3.1	Overview	21
3.2	Research Framework	21
3.3	Operational Framework	24
3.4	Handover Parameters	25
3.4.1	a3offset And Hysteresisa3 (Hys) Parameters Optimization Rules	27
3.4.2	Time-To-Trigger (TTT) Parameters Optimization Rules	28
3.5	Simulation Parameter Selection	30

### **CHAPTER FOUR: RESULT AND DISCUSSION**

4.1	Overview	32
4.1.1	Simulation Scenario	32
4.1.2	LTE Handover Execution in The Simulation	35