

**UNIVERSITI TEKNOLOGI MARA**

**HANDOVER ALGORITHM WITH  
JOINT PROCESSING TECHNIQUE  
BASED ON COORDINATED  
MULTIPOINT (COMP)  
TRANSMISSION AND RECEPTION IN  
LTE-ADVANCED HETEROGENEOUS  
NETWORK**

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**PhD**

**October 2020**

## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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## ABSTRACT

In mobile network, mobility management plays an important role in order to support seamless handover in Long Term Evolution-Advanced (LTE-A) network. LTE-A is the new technology that has become one of the important parts of every day's life and for the future concerning heterogeneous network. It is predicted that in the near future there will be an increase demand of voice traffic and data traffic. One of the important parts in communication is handover execution. Currently, LTE-A network purely depends on the hard handover that may cause disconnection to occur if the handover is not fast enough. Thus, it is important to optimize some technique and specific service to the mobile users in order to improve the handover execution. There exist some limitations on the hard handover, such as high data loss, disruption time and high outages thus causing an unreliable handover procedure. In addition, by using hard handover technique, it will be difficult to maintain the QoS requirement due to the delay in handover that commonly occurs during eNB migration. The most promising technique in LTE-A network to cope with this problem is by using the Joint Processing (JP) Technique based Coordinate Multipoint (CoMP) Transmission and Reception. With this technique, each UE connected with the source eNB with a single connection for any time instant that restricted by the nature of hard handover mechanism. Therefore, when the concept of JP in CoMP allowing multiple data transmissions for each UE at any time instant comes in LTE-A system, it becomes conflicted with the concept of standard hard handover mechanism. To solve this problem, it is necessary to have a proper handover algorithm. When handover executes, it may experience failure because of the early handover, the late handover or handover to wrong cell. Thus, the cases of packet loss or communication interruption problems will occur. In this research, a JP based on CoMP handover algorithm in LTE-A network is proposed. Firstly, a formulation of analytical framework has been proposed to analyze the handover performance. Then, mathematical equations have been derived from the proposed framework by incorporating the value of user's speed and handover signaling delay in adaptive Reference Signal Received Power (RSRP) threshold. Under this framework, the probabilities of handover failure were analyzed in order to observe the relationship between both macro and femto handover when the speed of user increased. From the result, it has been found that with the proposed framework, an adaptive  $RSRP_{th}$  value for handover initiation has been identified. The numerical results show that the proposed framework able to reduce the probability of handover failure up to 98%. The JP technique based on CoMP handover algorithm has been proposed and the simulation results show a significant reduction in number of handover calls rate up to 68% when compared to other handover algorithm. This shows that the proposed JP based on CoMP handover algorithm was able to reduce the unnecessary handover within the LTE-A heterogeneous network.

## ACKNOWLEDGEMENT

*In the name of Allah. The Most Beneficent and The Most Merciful*

Assalamualaikum wbt

First of all, I would like to thank Allah swt because of His blessing and kindness has given me the strength to give my best in completing my PhD thesis. Alhamdulillah. I would like to express my sincere gratitude and appreciation to those who helped me directly or indirectly in completing this research. I would like to dedicate my deepest appreciation to my project supervisor, Assoc. Prof. Ir. Ts. Dr. Azita Laily Binti Yusof who has been giving me advice, encouragement, a lot of input and assistance, guide me and bear with my weaknesses for this study. On top of that, I would like to thank all my lecturers who have taught me and giving me vast knowledge from social life to the engineering field. Without all this, I believe I would not be able to complete this study well.

My warmest thanks and appreciation goes to my lovely wife Nurul Filzah Binti Bakhtiar, my beloved father Zainali Bin Hashim, my beloved mother Rozila Binti Mohd Noor for all their love, support and their prayers for my health and success for being patient in helping me to complete this work. Also not forgetting all my siblings especially Nur Syaza Binti Zainali for giving full support while completing my research, my daughter Nuha Nafeesa Binti Muhammad Aiman who gave me a high spirit for me to complete my research, friends and colleagues who had always understood and being with me through the hard times. Alhamdulillah .

Those whose name might have been inadvertently left out, I would like to extend my humble apologies as well as my sincere thanks for their invaluable contributions.

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