

**UNIVERSITI TEKNOLOGI MARA**

**SINR BASED ALGORITHM FOR  
VERTICAL HANDOVER BETWEEN  
WIMAX AND WI-FI NETWORKS**

**AMMAR BATHICH**

Thesis submitted in fulfilment  
of the requirements for the degree of  
**Master of Science**

**Faculty of Electrical Engineering**

**June 2014**

## AUTHOR'S DECLARATION

I declare that the work in the 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 of 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.

Name of Student : Ammar Bathich

Student's ID No. : 2010683166

Programme : Master of Science in Electrical Engineering (Research)

Faculty : Faculty of Electrical Engineering

Thesis Title : SINR Based Algorithm For Vertical Handover Between WiMAX and Wi-Fi Networks.

Signature of Student :  .....

Date : June 2014

## ABSTRACT

The great increase in user demand to roam among various wired and wireless communications networks without affecting the signal quality has attracted many researchers to investigate about the best handover decision criteria that promote seamless handover. IEEE 802.21 Media Independent Handover (MIH) standard can be considered the best candidate for handling both horizontal and vertical handover. In this work, we propose a new decision criteria based on MIH signalling between WLAN and WiMAX networks, which depend on the received Signal to Interference and Noise Ratio (SINR) instead of the traditional Received Signal Strength (RSS) criteria. In order to provide QoS inside the integrated network environment, the proposed Vertical Handover Decision (VHD) provides the knowledge of the achievable bandwidth from both networks by using the received SINR. Simulated-based outputs along with the analytical results have confirmed that our proposal offer better performance during the handover stage.

## **ACKNOWLEDGMENTS**

I would like to express my deep and sincere gratitude to my supervisors: Professor Mohd Dani Baba and Assoc Prof Ruhani Ab Rahman for their support during my research.

I owe my thanks to my parents, wife and daughters. They have lost a lot due to my research abroad. Without their encouragement and understanding, it would have been impossible for me to finish this work. My special gratitude is due to my brothers and sisters for their loving support.

## TABLE OF CONTENTS

	<b>Page</b>
<b>AUTHOR'S DECLARATION</b>	ii
<b>ABSTRACT</b>	iii
<b>ACKNOWLEDGMENTS</b>	iv
<b>TABLE OF CONTENTS</b>	v
<b>LIST OF TABLES</b>	viii
<b>LIST OF FIGURES</b>	ix
<b>LIST OF ABBREVIATIONS</b>	xi
<b>CHAPTER ONE: INTRODUCTION</b>	<b>1</b>
1.1 Wireless Communications	1
1.1.1 Developments of Wireless Communications	2
1.1.2 4G Wireless Communications	6
1.1.3 4G Developments and Challenges	8
1.2 Motivations	11
1.3 Problem Statement	11
1.4 Research Objectives	12
1.5 Scope of Study	12
1.6 Significant Contributions	12
1.7 Thesis Outlines	13
<b>CHAPTER TWO: LITERATURE REVIEW</b>	<b>14</b>
2.1 Representative VHD Algorithms	15
2.1.1 An Adaptive Lifetime Based Handover Decision	16
2.1.2 A Hybrid (N/M) CHO Soft/Hard Vertical Handover Technique	18
2.1.3 A Traveling Distance Prediction Based Decision	19
2.1.4 A QoS Based Decision	21
2.1.5 A Wrong Decision Probability (WDP) Prediction Based Decision	23