

**UNIVERSITI TEKNOLOGI MARA**

**IMPLEMENTATION OF HIGH AVAILABILITY  
CONCEPT BASED ON TRAFFIC SEGREGATION  
OVER MPLS-TE**

**FARAH ADWINA BINTI ALIAS**

Dissertation submitted in partial fulfilment  
of the requirements for the degree of  
**Master of Science in Telecommunication and Information Engineering**

**Faculty of Electrical Engineering**

July 2014

## ABSTRACT

This paper presented performance analysis of High Availability Concept Based on Traffic Segregation over Multi-Protocol Label Switching (MPLS) Traffic Engineering (TE). Recent years have seen the widespread deployment of Virtual Public Network (VPN) over MPLS where the main objective of VPN is to give an organization or group of business the benefits of private network at a much lower costs than traditional point-to-point private link. Hence, enterprise benefited from the VPN in reducing cost, increasing scalability and increasing productivity without costing the security of their network. The basic requirement of today systems on the design enterprise network is High Availability. Even though many approaches have been proposed, deployment of high availability in load balancing and redundancy on existing service provider backbone network is still a challenging task. The focus of this paper, ensuring the traffic immediately segregates and transparent to customer when the network edge device or access circuit was failures. We also evaluate and configure Virtual Router Redundancy Protocol (VRRP) to support high availability by providing two gateways at customer edge router, where one router elected as primary gateway, and another as a standby gateway. In this situation, the backup link does not fully utilize. Thus, by using traffic diversity concept, Policy Based Routing (PBR) will handle traffic segregation to utilize the traffic at both links. This paper will discuss and analyzes implementation of high availability concept based on traffic segregation over MPLS-TE.

## **ACKNOWLEDGEMENTS**

Foremost, I would like to express my deepest appreciation to my advisor, Prof. Ruhani Abd Rahman, for the continuous support of my Master Project, for his excellent patience, guidance, caring, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my Master Project.

I would also like to thank my parents, two elder sisters, and elder brother. They were always supporting me and encouraging me with their best wishes.

Last but not least, I would like thanks to my husband and son. They were always there cheering me up and stood by me through the good times and bad.

## TABLE OF CONTENTS

<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENTS</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF FIGURES</b>	<b>ix</b>
<b>LIST OF TABLES</b>	<b>xi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xii</b>
<b>CHAPTER ONE : INTRODUCTION</b>	<b>1</b>
1.1 PROBLEM STATEMENT.....	1
1.2 OBJECTIVE OF THE RESEARCH .....	2
1.3 SCOPE OF THESIS .....	2
1.4 LIMITATION OF THESIS.....	3
1.5 THESIS OUTLINE.....	3
<b>CHAPTER TWO : THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE</b>	<b>4</b>
2.1 MPLS VPN.....	4
2.2 HIGH AVAILABILITY .....	6
2.3 LOAD BALANCING.....	7

2.4	TRAFFIC SEGREGATION.....	8
<b>CHAPTER 3 :</b>	<b>ENTERPRISE NETWORK</b>	<b>10</b>
3.1	VIRTUAL PRIVATE NETWORK.....	10
3.2	MULTIPROTOCOL LABEL SWITCHING.....	11
	Traffic Engineering (TE) in MPLS Network.....	11
3.3	HIGH AVAILABILITY IN MPLS NETWORK.....	11
	VRRP Terminology.....	12
	VRRP packet.....	12
	Virtual IP address.....	13
	VRRP Master Router.....	13
	VRRP Backup router.....	14
	VRRP state transition.....	14
3.4	TRAFFIC SEGREGATION.....	15
	3.4.1 Policy Based Routing.....	15
	3.4.1.1 Policy Based Routing Mechanism.....	16
<b>CHAPTER FOUR :</b>	<b>RESEARCH METHODOLOGY</b>	<b>17</b>
4.1	RESEARCH FLOW CHART AND APPROACH.....	17
	4.1.1 Phase 1: Literature Review.....	18
	4.1.2 Phase 2: Experimental Lab Setup.....	18
	4.1.3 Phase 3: Analysis and Discussion.....	18
4.2	TEST BED SETUP.....	19
	4.2.1 Traffic Flow.....	20
	4.2.2 Hardware Specifications.....	21
4.3	NETWORK SITE-TO-SITE CONFIGURATION.....	23