CONTENTS

APPROVAL PAGE

SELF DECLARATION AGAINST PLAGIARISM

ABSTRACT **iv**

ACKNOWLEDGEMENTS **v**

PREFACE **vii**

CONTENTS **viii**

LIST OF FIGURES **x**

LIST OF TABLES **xii**

I INTRODUCTION **1**

1.1 Background 1
1.2 Statement of Problem 2
1.3 State of the Art 3
1.4 Objective 4
1.5 Research Method 4
1.6 Hypothesis 5
1.7 Research Methodology 5

II BASIC CONCEPT **7**

2.1 Programming Protocol-independent Packet Processors (P4) 7
2.2 P4 Forwarding Model 8
2.2.1 Defines the Header Format 8
2.2.2 Parser 8
2.2.3 Match+action 8
2.2.4 Deparser 9
2.3 Fast rerouting 9
2.3.1 Multiprotocol Label Switching (MPLS) - fast rerouting . . . 9
2.3.2 Data plane - fast rerouting 11

2.4 Performance Measurement . . . 12
2.4.1 Round Trip Time (RTT) . . . 12
2.4.2 Throughput . . . 13
2.4.3 Routing Overhead . . . 13

III THE PROPOSED METHOD 14
3.1 Network Elements . . . 14
3.1.1 P4 switch . . . 14
3.1.2 Legacy Router . . . 15
3.1.3 Client-Server . . . 15
3.2 The Proposed Method . . . 15
3.2.1 P4AFR Data Plane . . . 16
3.2.1.1 Defined header packet and Parser . . . 17
3.2.1.2 RTT calculation . . . 17
3.2.1.3 Rerouting action . . . 18
3.2.2 Controller Program . . . 19
3.2.2.1 Probing Packet . . . 19
3.2.2.2 Route Discovery . . . 20
3.2.2.3 Cost Calculation . . . 21
3.2.2.4 Update Route . . . 22
3.2.2.5 P4AFR Cost Calculation . . . 22
3.3 Action Table P4AFR . . . 23
3.4 Scenario and Evaluation . . . 25
3.4.1 First Scenario . . . 25
3.4.2 Second Scenario . . . 26
3.4.3 Third Scenario . . . 27

IV PERFORMANCE EVALUATIONS 29
4.1 First Scenario . . . 29
4.2 Second Scenario . . . 32
4.3 Third Scenario . . . 36
4.4 Summary of Performance Comparison: MPLS, InFaRR, and P4AFR 38

V CONCLUSION 39
5.1 Conclusions . . . 39
5.2 Future Works . . . 40

REFERENCES 41