



**Bahria University**  
Discovering Knowledge

**FINAL YEAR PROJECT REPORT**

**IMPLEMENTATION OF MULTIPATH  
ROUTING IN AD HOC NETWORK FOR  
DISASTER RECOVERY**

**In fulfillment of the requirement  
For degree of  
BS (COMPUTER SCIENCES)**

**By**

**ZEESHAN KHAN**

**32818 BSCS**

**MUHAMMAD RAFAY KHAN**

**32869 BSCS**

**SUPERVISED BY**

**SYED MUHAMMAD ASIM ALI RIZVI**

**BAHRIA UNIVERSITY (KARACHI CAMPUS)**

**SPRING, 2017**

## ACKNOWLEDGEMENTS

We would like to thank everyone who had contributed to the successful completion of this project. We would like to express gratitude to our project supervisor, Mr Syed Muhammad Asim Ali Rizvi for his invaluable advice, guidance and his enormous patience throughout the development of the research.

In addition, we would also like to express thanks to our loving parent and friends who had helped & financed us.

# IMPLEMENTATION OF MULTIPATH ROUTING IN AD HOC NETWORK FOR DISASTER RECOVERY

## ABSTRACT

*"A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Ad hoc is Latin and means for this purpose".*

Multipath routing is one of the most versatile technique in routing among a mobile network. It is believed that VANET abbreviated Vehicular Ad Hoc Networks is most promising emerging edge technology of this era. After 2001, this technology immensely expands the way of communication systems by integrating ad hoc network to achieve intelligent inter-vehicle communications. Thus this improves road traffic safety and transportation system either a short route under metropolitan or on highways. VANETs are notable from rest of other kinds of Ad Hoc networks only by their hybrid nature, distributed architecture, mobility characteristics while handling all new types of application scenarios under different conditions. Therefore, this new entity may pose many unique challenges for researchers and the engineers to design an efficient protocol for routing in VANETs.

In Ad Hoc networks, it is observed fiddly that there may be no restriction on node to move this they are free to move independently in any direction which result their change in communication links to other devices so frequently. If a message needs to be sent to a farthest node, only hopping will be the right solution. Multipath routing in Ad Hoc network gives an added advantage in specifically disaster conditions. Project helps the social masses to adopt multipath routing in Ad Hoc network. This project comprise with analysing the need of multipath routing in Ad Hoc network and considerably under specific circumstances, its implementation of robotic cars for firefighting efforts.



## TABLE OF CONTENTS

<b>DECLARATION</b>	<b>iii</b>
<b>APPROVAL FOR SUBMISSION</b>	<b>iv</b>
<b>ACKNOWLEDGEMENTS</b>	<b>vii</b>
<b>PLAGIARISM CERTIFICATE</b>	<b>vii</b>
<b>ABSTRACT</b>	<b>ixi</b>
<b>TABLE OF CONTENTS</b>	<b>ix</b>
<b>LIST OF TABLES</b>	<b>xiv</b>
<b>LIST OF FIGURES</b>	<b>xv</b>

### CHAPTER

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
	1.1 Background	1
	1.2 Problem Statement	3
	1.3 Aims and Objectives	4
	1.4 Scope of Project	4
	<b>LITERATURE REVIEW</b>	<b>6</b>
	2.1 Introduction	6
	2.2 Need of Mobile Ad Hoc Network	6
	2.3 Characteristics of MANET	7
	2.3.1 Dynamic Network Topology	7
	2.3.2 Power Constraint	7
	2.3.3 Bandwidth Constraints	7
	2.3.4 Security	7
	2.3.5 High Mobility	7

2.3.6	End to End Communication	7
2.4	Applications of MANET	8
2.5	Comparison of Military Vs Commercial MANET	8
2.5.1	Military battlefield	8
2.5.2	Commercial sector	9
2.6	Mechanisms for Developing MANET	9
2.7	Architecture	10
2.8	Ad Hoc Network Components	10
2.8.1	Hardware	10
2.8.2	Software	11
2.8.3	Way Path / Locality	11
2.9	Ad Hoc Network Operating Principle	13
2.10	Challenges in Ad Hoc Mobile Networks	13
<b>3</b>	<b>DESIGN AND METHODOLOGY</b>	<b>14</b>
3.1	Conception & Analysis Phase	14
3.2	Communication Issues	14
3.3	Routing Issues	14
3.3.1	Problems with pro-active routing protocols	15
3.3.2	Advantages of Re-Active Routing Protocols	15
3.4	Designing & Developmental Phase	15
3.5	Assembling Phase	16
3.6	Hardware Requirement	17
3.6.1	Arduino Board with ATMEGA	17
3.6.2	Robotic Cars Chassis	19
3.6.3	Bluetooth HC-05	19
3.6.4	XBEE	21
3.6.5	Fire Detection Sensor	22
3.6.6	Fire Extinguisher unit	23
3.6.7	Alarm Buzzer	24
	24	
3.6.8	GMS Module for Arduino	25
3.7	Routing Algorithm	27

3.7.1	Cluster based Routing	27
3.8	Algorithm Assuming	28
3.9	Algorithm Description	28
3.10	Algorithm at Node to Process Packet	29
3.11	Routing Protocol	29
3.12	Reactive Protocol	29
3.13	Route discovery	30
3.14	Route Maintenance	31
3.15	FLOWCHART	33
<b>4</b>	<b>IMPLEMENTATION &amp; TESTING</b>	<b>34</b>
4.1	Implementation	34
4.2	Network Interconnection Diagram	35
4.2.1	CASE I:	35
4.2.2	CASE II	35
4.2.3	CASE III	35
4.3	Route Request Diagram	36
4.4	Testing	37
<b>5</b>	<b>RESULTS &amp; CONCLUSION</b>	<b>38</b>
5.1	Key Findings	38
5.2	Outcomes	39
5.3	Conclusion	39
	<b>REFERENCES</b>	<b>40</b>
	<b>APPENDIX-I</b>	<b>41</b>
	<b>APPENDIX-II</b>	<b>45</b>
	<b>APPENDIX-III</b>	<b>50</b>