Contents

Abstract i

Acknowledgements ii

Contents iii

List of Figures v

List of Tables vi

Abbreviations vii

1 Introduction 1
- 1.1 Overview and Problem Statement 1
- 3
- 1.2 Motivation 4
- 1.3 Problem Definition 4
- 1.4 Contributions of this work 4
- 1.5 Organisation of the Thesis 5

2 Background and Related Work 6
- 2.1 Properties of MANET 6
- 2.2 Power Issues in MANET 7
- 2.3 Energy efficient routing in MANET 8
- 2.4 Existing Energy Efficient Protocols of MANET 9
  - 2.4.1 Transmission Power Control Approach 10
    - 2.4.1.1 FAR (flow Augmentation Routing) Protocol [8] 10
    - 2.4.1.2 OMM (Online Max Min Routing) Protocol [9] 11
    - 2.4.1.3 PLR (Power-aware Localized Routing) Protocol [10] . . . 11
    - 2.4.1.4 MER (Minimum Energy Routing) Protocol [11] 11
    - 2.4.1.5 Retransmission-Energy Aware Routing (RAR) [12] protocol 11
    - 2.4.1.6 Smallest Common Power (COMPOW) protocol [13] . . . 12
  - 2.4.2 Load Distribution Approach 12
    - 2.4.2.1 Localized Energy Aware Routing (LEAR) Protocol [14] . 12
    - 2.4.2.2 Conditional Max-Min Battery Capacity Routing (CMMBCR) Protocol [15] 13
  - 2.4.3 Sleep/Power Down Mode Approach 13

2.4.3.1 SPAN Protocol [16] 13
2.4.3.2 GAF (Geographic Adaptive Fidelity) Protocol [17] 13
2.4.3.3 PEN (Prototype Embedded Network) Protocol [18] . . . 14
2.5 Conclusion of the existing Energy Efficient Protocols of MANET 14

3 Proposed Energy Efficient Routing Protocol for MANET 15
3.1 AODV(Ad hoc On Demand distance Vector routing) Protocol [2] 15
3.1.1 Route Discovery 15
3.1.2 Route Maintenance 16
3.2 Objectives of the proposed protocol 16
3.3 Proposed Protocol 16
3.3.1 Route Request 17
3.3.2 Route Reply 18
3.3.3 Data transfer 21
3.3.4 Route maintenance 21
3.4 Graphical explanation 21
3.5 Simple hardware requirements 22

4 Performance Study 25
4.1 Simulation Environment 25
4.2 Simulation Scenario 25
4.3 Results and Analysis 26
4.3.1 Simulation Results of AODV and DSDV in terms of residual power of nodes 26
4.3.2 Simulation Results of AODV, DSR and DSDV in terms of residual power of network 27
. 27
4.3.3 Simulation Results of AODV, DSR and DSDV in terms of throughput 28
4.3.4 Analysis 28
4.4 Summary of performance study 29

5 Conclusion and Future works 30
5.1 Conclusion 30
5.2 Future work 30

List of Figures

1.1 Mobile Ad hoc Network 2
1.2 MANET Emergency scenario 2

3.1 RREQ Message Format 17
3.2 RREp Message Format 19
3.3 Route Discovery Flowchart 20
3.4 Proposed idea explanation 21
3.5 Cisco Aironet 350 23
3.6 Intel Proset 2200BG 23

4.1 Node Power states 26
4.2 Residual Power of Network 27
4.3 Throughput of Network 28

List of Tables

2.1 Energy Efficient Routing Protocol 10
2.2 8 options of MER protocol 12

3.1 COST Table 19
3.2 dbm to watt conversion table 24

4.1 Simulation Parameters and Comparison 26

Abbreviations

LAN	Local Area Network
MANET	Mobile Ad hoc Network
P2P	PeerTo Peer
AODV	Adhoc On Demand distance Vector routing
RREQ	Route REQuest
RREP	Route REPly
RERR	Route ERRor
MAC	Medium Access Control
DSDV	Destination Sequenced Distance Vector routing
FAR	Flow Augmentation Routing
OMM	Online Max Min routing
PLR	Power-aware Localized Routing
MER	Minimum Energy Routing
RAR	Retransmssion energy Aware Routing
COMPOW	SmallestCommon Power
DSR	Dynamic Source Routing
LEAR	Localized Energy Aware Routing
CMMBCR	Conditional Max Min Battery Capacity Routing
GAF	Geographic Adaptive Fidelity
PEN	Prototype Embedded Network
IP	Internet Protocol