Energy Efficient Routing by Reducing Iterative Broadcasting Mechanism in MANETs

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Abstract-*Mobile ad hoc network composes of independent devices communicating with each other directly without aid of any centralized administration.In general some nodes in network stop working because they run out of battery power, therefore it is much important to preserve the power. In MANETs the nodes are portable so routing and power managing has turn intoseriousissue. Nodes in MANETs have limited battery capacity . In this work, we recommend an energy-efficient routing protocol for MANETs to decrease energy depletionduring Route Discovery process. Previousmechanisms mainly engrossed on the shortest path schemes to reduce energy, which might end in network failure .This can lead to energy discrepancy and network life reduction. We propose an energy efficient routing protocol which increase network lifetime and consumes less power.*

Keywords: **MANET;Route Discovery ; Battery capacity; Energy Efficiency; Network Lifetime; Energy Consumption**

1. INTRODUCTION

Due to MANETsprospectiveuses in various circumstances such as a military battle field, disaster relief, , etc., Mobile Ad hoc networks [1, 2] have newlyarose as a primary research issue. MANETs consist of hosts that interconnect without a fixed structure. Communications takes place within the transmission range over a wireless channel, where each hostconnects with others in the neighborhood. Due to restricted infrastructure, dynamic connectivity and multi hop level relay based communication, achieving quality of service in an ad hoc network is a challenging subject.The lifespan of the network is a practical challengein MANETs as the battery level of the nodes are delimited to fixed level.Network is partitioned if the energy level of the battery is zero.Hence the energy preservationmethods are important to improvelifetimelifetimeof the battery. It is necessary that energy proficientrouting protocols should beused.Alltheconventional transmittingapproachesfails to look after thewanted proportionality between battery levels required and available and uses shortest path routing .If the paths are usedveryhigh in the network,the nodes in that particular path die because of their battery capacity. In this regard,power aware routing protocols have been designed whichselectstheroutes to reserve battery lifespan of the nodes.The power aware routing approachesselectpaths such a way that packetroutesthrough energy efficient path.Theidealproposal of energy efficiency under these circumstances is a vital requirement for MANET and focuses on the most cost-effective way to use battery power while guaranteeingappropriate operation of the network. The fundamentalmethod of route discovery and best path selection are taken from routing protocols such as DSR [2], TORA [3], and AODV [4].

2. RELATED WORKS

In shortest path routing the power depletion at each hop nodesis the issue that fascinatespresent research. In this respect, manypower aware routing elucidationsare projected. Projectedaninnovativemeanstominimize power usein Shu-Lin Wu et al[5] spite ofintensifying channel use. To measure the battery lifespan thisschemeconsiders the RTS/CTS packet transmissions.S.Singhet al [6] proposed the PAMAS protocol, whichtargets to avoid the depletion of the lifespan of battery of a node during idle time. This protocolused two distinctchannelsone is for information and and other is for signal. The indicator channel alerts the nodes to halt their RF devices during idle time.Further, Wan et al., [7] and Govardhan et al [17] suggested a least power usage routing which isdedicated to fixedMANETs.Ourplanned work concernedwith power-consciousmethod for MANET routing protocols.

Theodore S et al [10],proposed the power is directly proportional to d^{α} , here 'd' signifies the distance between two nodes and'$\propto$'valueisin the range of 2 to 4. SoMTPR route discovery process selectsmore nodes with lessdistances.Butthe start to end delay is more when compared to the power usage . In this, the chosenroutefrequentlyexperience the splintering due to nodes with no battery level.Li and Wan [9] described a protocol which constructs a topology of least power and developed an process to find a shortest path whose distance is within a constant factor of that path. Energy consumption is calculated in terms of the length of the path. This proposed algorithm used only local information

3. Energy Efficiet Routing by Reducing Iterative BroadcastingMechanism(EER-RBM)

In the projectedEER-RBMmethodology, each host in the network has a routing table which has the capacity of battery of its neighbor nodes, route request status duringRT discovery.At this point we suggest a newrestricteddissemination to decrease overhead of packet that picksbest paths with least distance and minimum energy. We consider a newmethod that confesses the hosts to exchange their existing battery level with their neighbor.

3.1. RT DiscoveryPhase

A node selectsthe neighbourtobroadcasta RT by taking into account the ratio between life of battery required and life of battery available at hop level neighbor nodes.

3.2. RTRequest(RReq)

The source host 's'routes the messageby measuring the battery level 'bc'which is calculated as the average energy indulgence per bit of data that transfersto its hop level nodes. Along with the RTrequest(RReq)the source node transmits that 'bc'. When each node that getsa RT request in a dissemination way itvalidates the status of the RT request. If that RT request is received previously then it rejects otherwise it verifies, whetherthat node itself is destination node, else it begins conditional broadcasting of that RTrequest to its hop level nodes.

The route request RReq structure is as follows:

$$\boldsymbol{RReq} =< \boldsymbol{id}(\boldsymbol{s}), \boldsymbol{id}(\boldsymbol{d}), \boldsymbol{bc}, \{\boldsymbol{h_1}, \boldsymbol{h_2}, \ldots . \boldsymbol{h_i}\} >$$

3.3. RT Reply(RRep)

Upon getting the RT requestRReq, the destination host 'd'verifies RReq status. If it is replicate of the earlier received RReq it discardsotherwise , the destination host'd' sends the RRep. The RRepthat is initiated,uses the same path that is used by RReq but in the reverse direction. Each hop level node hi updates the RRep with the distance d(hi→hi+1) upon receiving the RRep.Thisprocess is repeated until RRepis received by the source node 's'.

The RRep configuration of a hop level node $h_i$is as follows:

$$\boldsymbol{RRep} =< \boldsymbol{id}(\boldsymbol{s}), \boldsymbol{id}(\boldsymbol{d}), \boldsymbol{hl}, \boldsymbol{dl} >$$

In the above structure, hl is the hop list and dl is the distance record which consists of distances between two neighbour nodes.

Once RRepis received by the source node 's', the RRep is registered into the best paths list by the source node.

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3.4. Route Selection

Let's assume we have route discovery path through EER-RBM and discovered three major routes and the shortest route to get to the destination, as shown in Figure 1. However, there is no assurance that the shortest path obtained will be power-efficient path. A pre-determined energy strategy is to quickly disclose an energy-efficient routenear to the mainly energy-efficient route and then route it to a preservation plan to increase energy efficiency.

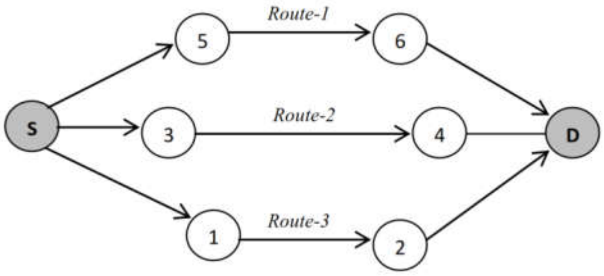

Fig.1 : Route Discovered from S to D by means of EER-RBM

In Fig.1, shows the intermediate hostss between S and D as {1, 2, 3, 4, 5, 6}, and there are 3 shortest routes possible between S and D as, {(S→1→2→D), (S→3→4→D), (S→5→6→D)}.

The d/E is "distance/primary hop energy" defines the optimality condition needed to cover the distance at different power level.

Table- I : Link Cost Table

Next Hop	Distance(d)	Primary Hop Energy(E)	Optimality Criteria(d/E)
S→1	1	9	0.11
S→3	2	9	0.22
S→5	2	9	0.22
1→2	1	5	0.2
3→4	3	7	0.42
5→6	2	6	0.33
2→D	1	8	0.12
4→D	3	9	0.33
6→D	1	6	0.16

Based on the Table we can calculate the possible predetermine energy for each route by adding up all the values obtained in optimality condition from S to D.

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Table-II : Predetermine Energy Table

Path	Probable Predetermine Energy Req. (P_E)
S→1→2→D	P(0.11+0.2+0.12) = 0.43
S→3→4→D	P(0.22+0.42+0.33) = 0.97
S→5→6→D	P(0.22+0.33+0.16) = 0.71

Based on the pre-determined energy values in the Table-II, we choose a path which is having minimum value.

4. RESULT EVALUATION

4.1. Experimental Setup

To calculate the enactment we formed a EER-RBM protocol, and using the Table-III simulation parameter over GloMoSim Simulator calculated packet Delivery Ratio and energy efficiency for finishing the broadcasting execution. We also compare the EER-RBM with an existing PEER [16] and DSR to measure Packet Delivery Ratio and Energy Efficiency.

TABLE- III: SIMULATION PARAMETERS

Configuration	Parameter Values
Simulation Area	1000m X 1000m
Packet Size	512 bytes
CBR Rates	4 pkts/sec
Mobility	RWP
Pause time(sec)	60
No.of Nodes	20,40,60,80,100
No.of (S-D) pairs	5,10,20,30,40
Mobility(m/s)	10

4.2. Result Evaluation

With respect to scenario-1, the respective outcomes observed support on the number of node variation are shown in fig.2 between DSR, PEER[16], and EER-RBM.

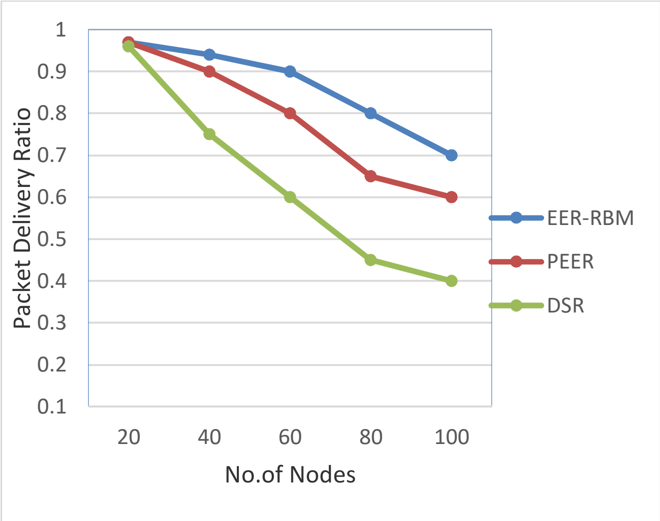

Fig.2. Throughput Comparison

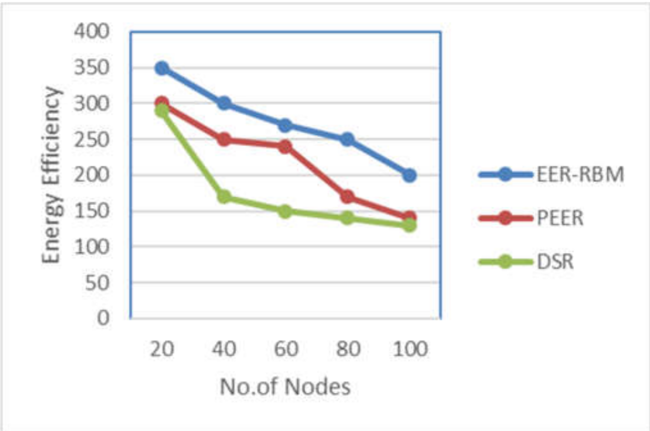

Fig.3. Energy Efficiency Comparison

The comparison results show an inventiveness over traditional DSR and PEER protocol in both the scenarios. In the case of Packet Delivery Ratio all three have to maintain constant fall rate but EER-RBM shows a 25 - 30% better PDR in compare as shown in Fig.2. Fig 3, shows the evaluation similarity of energy utilization efficiency. A high-quality difference in energy efficiency is observed.

5. CONCLUSION

This paper proposes new energy efficient routing model EER-RBM whichuses conditional broadcasting and chooses the best path from the paths selected during route discovery phase. The path identified in a predetermined energy efficiency process can be energy efficient enough for efficient data delivery. Experimental results show that energy efficiency is better and has improved throughput.In future, this protocol can further be modified and apply to scalable environment

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