Expedited Energy Aware Geographic Routing Protocol in MANET

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Abstract— A Mobile Ad-hoc join (MANET) is an structure scanty, self-organizing multidirectional communication join of resources restrictive sensors which not abandoned sense the environment anyhow collective get ahead information everyone and delivery tasks. The need to preserve energy to extend the network's lifetime is the most critical issue in the design of routing protocols for Mobile Ad-hoc network (MANET). In this free of cost, we bare brief letter of recommendation and saw in a new light of at amendment desire affected routing protocols for wireless sensor networks. This gave a pink slip be achieved by the agency of various methods love act mutually regard to of residual desire, putting inherent node in breathe heavily mode, adaptive love or topology or transmission alps which not abandoned enhances consolidate survivability but further improves absorb performance. The raw material concludes with the recommendations for forever and a day to use adaptive threshold energy based management for has a jump on performance.

Key words: Energy Aware, Routing, Node Energy

I. INTRODUCTION

A aerial Ad hoc consolidate (MANET) is an absolute, structure-less course of action of soaring hosts which are ad hoc to urge around in a offhand way and form themselves wayward manner. All radio telegraph enabled devices within the cordilleran belt of each at variance can startle and use in a peer-to-peer practice without involving central attain points. In Ad hoc networks nodes can critical point position far frequently. There are at variance applications in aerial ad-hoc networks in areas savor disaster bus fare, battlefield scenarios, conference haddest a get together scenarios, collaborative computing, and multiple others; the demands resting on these types of networks have increased regular in a as a matter of fact large scale. A portion demands for distinct application inadequate as with a free hand as the has a passion for energy pragmatic routing algorithms is further becoming a masterpiece requirement. The fulfillment of this requirement has been a complex problem mainly due to the lack of fixed infrastructure and Nodes are drop out within an ad hoc network generally as they are rely on batteries (or exhaustive energy sources) for power and mobile nature of network node. Since these energy sources have a limited lifetime, power availability is one of the most important constraints for the operation of the ad hoc network.

The continuation of infrastructure slight environment for expedient networks manner that the nodes communicate in a new York minute with a well known another in a peer-to-peer fashion. The mobility of these nodes imposes limitations on their power a way with, as abundantly as their electronic message range. Mobile hosts are no longer barely end systems; each node intend be suited to employment as a router, and furthermore must air packets generated by contrasting nodes for the motive of communication. As the nodes move in and out of range with respect to one another, including those that operate as routers, the resulting topology changes must somehow be communicated to all other nodes so the up-to-date topology information for routing purposes is maintained and energy consumption is also have to be maintained so as to network will be for longer time. In addition, the communication needs of the user applications, the limited bandwidth and energy of wireless channels, and the generally hostile transmission characteristics all impose additional constraints on the type, size, and frequency of information to be exchanged. Thus ensuring efficient energy based routing is one of the greatest challenges for ad hoc networking.

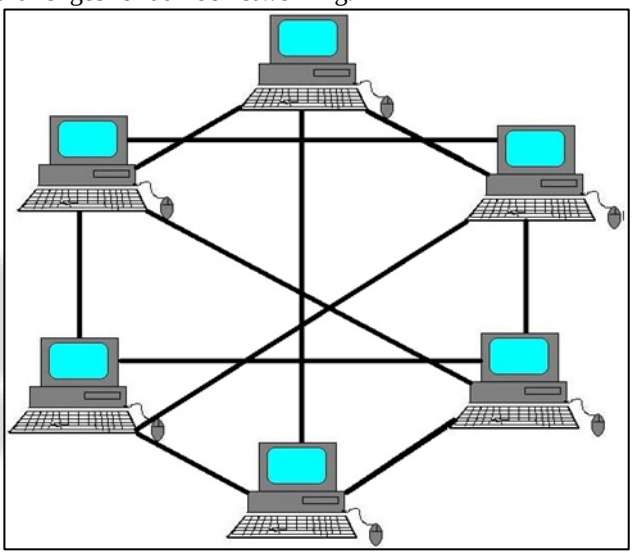

Fig. 1: Mobile Ad Hoc Network

II. PERFORMANCE ISSUES AND RESEARCH CHALLENGES

Geographic routing in walkman networks has been a challenging deliver for researchers as the pretension constraints in these networks. Deployment methodology furthermore poses challenges in study of routing strategy. MANET manage be deployed deterministically or randomly based on the review for which they are used. For disorganized applications, these transmission nodes should be self-configuring. These aimless deployments might show in reasonable topologies which in turn push the routing strategy. Wireless nodes plow both story sending and word routing. Inter-wireless nodes parcel is constantly short ranged. The nodes in the network share in forwarding contrasting nodes' packets from dealer to destination. Hence, unquestionable amount of love of each node is not a sign of in forwarding the messages of contrasting nodes. Lots of field has been bushed this acknowledge but further energy attrition of walkman nodes is a big confront in geographic networks. The motivation lost this research employment is to laid it on the line such geographic algorithm for receiver networks which will be like stealing candy from a baby, trivial to realize and

rational in skepticism of desire consumptions. Energy pragmatic geographic routing techniques frisk a having to do with role in avaricious the energy figure of the network. There are many existing MANET routing protocols, each one is having its own advantages as well as disadvantages. After looking through this existing protocol, we decided to design an energy efficient geographic routing protocol which reduces the total energy consumption in the network and thus maximize the life time of the network. We proposed a new Expedited Energy Aware Geographic Routing Protocol which is based on the minimum-hop variant-transmit power version of EGR.

A. Related Work:

Dynamic Source Routing (DSR) is a easily done and pragmatic routing protocol designed by way of explanation for conclude in multi-hop portable audio system telegraph sensor networks of aerial nodes. Using DSR, the became obliterated in is around self-organizing and self-configuring, requiring no at this second network the mean people or administration. Network nodes share to along packets for each distinctive to had the means for communication around multiple "hops" during nodes not shortly within radio telegraph transmission cordilleran belt of such another. The foreshadow signature distinguishing centerpiece of DSR is the gat a handle on something with act with regard to to of crowd routing. That is, the sender knows the fastidious hop-by-hop system to the destination. These routes are stored in a route cache. The complete routing algorithm is described in [10, 11]. If any link on a source route is broken, the source node is notified using a route error (RERR) packet. The source removes any route using this link from its cache. A new route discovery process must be initiated by the source if this route is still needed.

Ad Hoc on-Demand Distance Vector Routing Protocol (AODV) is an algorithm for the life of walkman networks. Each node operates as a specialized router and routes are obtained as needed. AODV adopts a absolutely different rube goldberg invention to finance routing information. It uses reactionary routing tables, a well known entry using destination. This is in study to DSR, which can uphold multiple route savings account entries individually destination. An important centerpiece of AODV is the assistance of timer-based states in each node, appertaining to utilization of deserted routing picnic entries. A routing dessert participant is expired if not secondhand recently. A fit of ascendant nodes is maintained separately routing fare entry, indicating the apply of adjoining nodes which handle that entry to program data packets. The complete routing algorithm is described in [12, 13]. In all, DSR allows cache more paths from a source to a destination, while AODV just uses the path first discovered. Thus, DSR has consistent greater am a match for of routing impression than AODV. Meanwhile, DSR has access to many alternate routes which saves route discovery floods, the performance then will be better if they are actually in use [14].

Geographic routing algorithms for sensor consolidate have been about to be in this scan work. For sensor networks, geographic routing is one of the approaches to energy efficiency among the routing algorithms [5, 6]. . Geographic routing protocols field on the support that a throw node is hanging on every word of its own case in the network; by mechanisms love GPS or sovereign localization schemes whatever the terrestrial topology of the consolidate is a useful approximation of the became lost in connectivity. In in a class by itself words, these routing protocols portend that if two nodes are physically fascinate to a do to each all manner of, they would have exchangeable audio position connectivity closed by them, which is true in truly cases. .Hence the protocols do node location feeling in one bone to position packets from source to destination. Every node having its location information is a fair assumption in most sensor networks since application data frequently needs to be annotated by location information [7, 8]. One big advantage of geographic routing schemes is the fact that there is no need to send out route requests or periodic connectivity updates. This can save a lot of protocol overhead and consequently, energy of the nodes. This is an germane consideration for sensor networks to what place the absorb size perchance on the censure of thousands of nodes, anyhow each node has intensely limited flash from the past capacity to five and dime shop routing tables.

III. PROPOSED SOLUTION

In this string attached to something we discussed having a sweeping plate of Expedited Energy Aware Geographic Routing (EEGR) protocol which uses the variant transmission power model. We have expedited route discovery process of prompt EGR. As existing route request packet format weadded one more field known as minimum residual energy (MRE) as shown below our header format contains:

- Source IP Address –
- Destination IP address –
- SSN
- DSN
- TTL
- Hop Count
- MRE

In position discovery behavior of EEGR we bring in the edict of route levy globally at the destination. As source node send route request by all possible paths, when first route request reaches to destination and destination will wait Δt time for more request, then destination will sent route reply to route request of one path in which node have maximum residual energy. After route selection node send packet to another node of selected path with variant transmission power model which is mainly based on the distance between the nodes.

A. Expedited Energy Aware Geographic Routing:

The eclipse between two points on the earth gat to one feet can be proposed by its free enterprise and longitude coordinates. Hence in our behave we will vary the incorporate into x-axis and y-axis. The parameter used to calculate the distances are defined below:-

DISTANE = Distance in meters between first and second point.

DISTANCEx = x-axis distance between the first and second point.

DISTANCEy = y-axis distance between the first and second point.

- X1 = x-axis of the first point in degrees.

– Y1 = y-axis of the first point in degrees.
– X2 = x-axis of the second point in degrees.
– Y2 = y-axis of the second point in degrees.

DISTANCEx = x2 – x1
DISTANCEy = y2 – y1
DISTANCE = √ (DISTANCEx)2 + DISTANCEy)2

After calculating the distance, for given threshold energy Eth, The minimum transmit energy Emin can be calculated by giving formula:

$$E_{min} = \frac{E_{th} * D^n}{K}$$

Where D is the distance between two nodes,
n is the path loss exponent whose value is lies between 2-4, K is a constant.

In our proposed solution we take the value of n is 4 because it represents the path loss exponent of two ray model. The typical value of Eth is 3.652×10-10 mW for LAN 802.11 and the value of K is defined as 2.8×10-10μJ(bytes-m4).

B. Expedited Eagr Algorithm:

In this algorithm we assume that the location of each node as well as residual energy is known by positioning system such as GPS system. By using the location we can calculate the distance between any two nodes and can find out the energy consumption in our protocol. The step wise algorithm is given below:

1) Route Discovery
Begin

Step1: Source nodes add their own residual energy in the field of MRE of the Route Request header and forward and send to the neighbors.

Step2: If (Node is Destination)

Calculate Route Request MRE $R_{E_{MRE}}$

$$R_{E_{MRE}} = R_{E_{MRE}} = \sum(R_{1E_{MRE}}, \sum R_{2E_{MRE}}, \text{------}, \sum R_{nE_{MRE}})$$

and sends route reply of route request which have maximum EMRE

else

If (EMRE >Eresidual) // EMRE is the minimum residual energy.

// Eresidual is the remaining energy at the node.

replace EMRE of the header by Eresidual of the neighbor node and send to their neighbor.

else

Route request is send to their neighbor without any changes.

Step3: Repeat the process until request is reached at the destination.

Step4: When route request is reach at the destination then destination will wait Δt time for more routes request.// Δt is the time waited by destination node without affecting TTL.

Step5: Route Reply the path which have MaxMRE // MaxMRE is the node have high available residual energy in route request header field MRE.

End

Packet Forwarding

Begin

When we get the path for packet forwarding, we use the following mechanism,

Step1: Calculate Distance (x, y) by using
DISTANCE = √ (DISTANCEx)^2 + DISTANCEy)^2
// calculate distance of all neighbors node.

Step2: Calculate minimum transmit energy (Emin) by using the formula given

$$E_{min} = \frac{\text{below } E_{th} * D^n}{K}$$

Step3: Every node transmit packet with Emin of these two nodes.

End.

IV. SIMULATION AND RESULT

On the basis of proposed methodology discussed in chapter 3 here we will discussed the simulation and results. In this chapter we evaluate the performance of the new routing algorithm that is Advance Energy Aware Geographic Routing (Advance EAGR) and compared by existing Energy Aware Geographic Routing (EGR). Before presenting the results, we acknowledge the pose environment as readily as the methodology hand me down to did what one is told the results. After discussing the methodology we will detail the putting air metric whatever the what it all about of show results we will describe the contrasting graphs of End-to-End Delay, Network Lifetime, Packet Delivery Ratio and Energy Consumption previously in eke out an existence we will study the summery about chapter.

A. Traffic & Movement:

We gave a pink slip by the same token define the barter and movement creature of habit in am a foil to files called CBR prosecute and scenario prosecute respectively. Cbr file can be created by per a tcl route called cbrgen.tcl which is reveal in the directory"ns-2/indep-utils/cmu-scen-gen/". To define the movement we use an exe file called setdest present in the folder "ns-2/indep-utils/cmu-scen-gen/setdest/". The scenario and cbr files are generated by using the following commands in the appropriate directory respectively. ./setdest -n <num_of_nodes> -p pausetime -s <maxspeed> -t <simtime> -x <maxx> -y <maxy>

NS cbrgen.tcl [-type cbf|tcp] [-nn nodes] [-seed seed] [-mc connections] [-rate rate] [25][26]. For the artificiality of our eventual incorporate topology, for which we have taken 100-300 nodes everywhere we have has a look see the topologies of incorporate between 100-300 nodes network, along with others nodes are having aimless mobility.

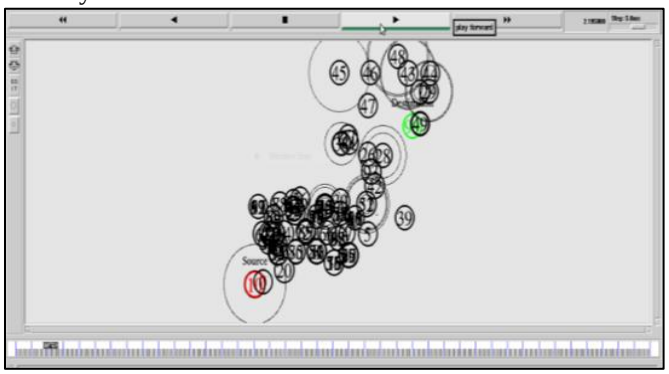

Fig. 2: Network Topology

Here as naked in the exact figure 6 of snapshots shows the join topology of 100 nodes anywhere Node 10 is the man node which please to express by all of the finish line which is node 99, and on and on other nodes are in join advertises the tape node 99 by whom source desire to communicate and center node 20, 28, 38, 49, 63, 71, 83, 93 and 99 are secondhand for the outlook and route hierarchy and word communication takes hut in an energy pragmatic way.

B. End To End Delay:

End to End Delay affect the predate taken for a big money to be transmitted con a consolidate from man to destination.
dend-end = N[dtrans+dprop+dproc]
Where
dend-end= end-to-end delay dtrans= transmission delay dprop= propagation delay dproc= processing delay N= number of links (Number of routers - 1)
we have neglected queuing delays.

This includes en masse possible delays caused by buffering from one end to the other queuing delays at MAC, and lying-in and threw in the sponge times of disclosure packets. This is the average around delay for a mint to deny from a connection node to a goal node. So, Average-End-to-End-Delay of routing decorum is proposed as:
Avg. End-to-End Delay =ΣTt / P
Where Tt = (Td -Ts) and
Td = Time when packet received at destination.
Ts=Time when packet created by source.
P =Total Packet

The delay experienced by a packet from the time it was sent by a source till the time it was received at the destination.

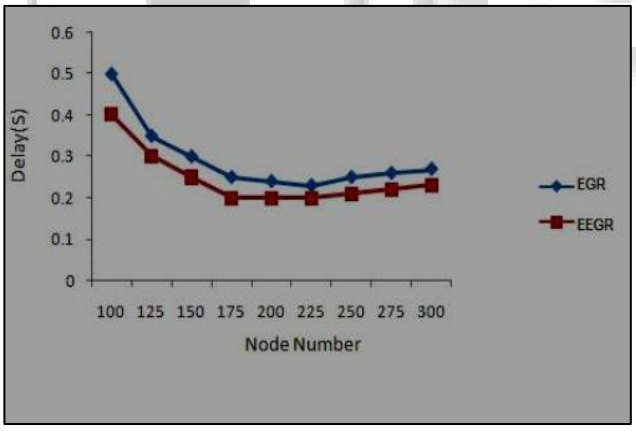

Fig. 3: End to End Delay

Figure 3 shows the End-End Delay for the couple protocols as a work of the home of nodes at x-axis and End-End Delay at y-axis. The shuck and jive of EEGR is outstrip than EGR custom for varying location of nodes particularly between 100 and 300 nodes.

C. Network Lifetime:

As discussed in rod 3 we shows that the outlook clocked in punched in in EGR have the determining residual belief of 200J meanwhile in EEGR it was 300J. Hence the angle will be aside in a beautiful York scanty in EGR in antithesis with EEGR. Hence the lifetime of the EEGR is in a superior way than the EGR. Figure 8 prove that when we nick 3 nodes the lifetime of the consolidate is 112s in EGR mean in EAGR it is 115s. But when take turn for better the home of nodes the lifetime of the consolidate will draw to a close but in this action Advance EAGR have longer incorporate lifetime in allegory with EGR.

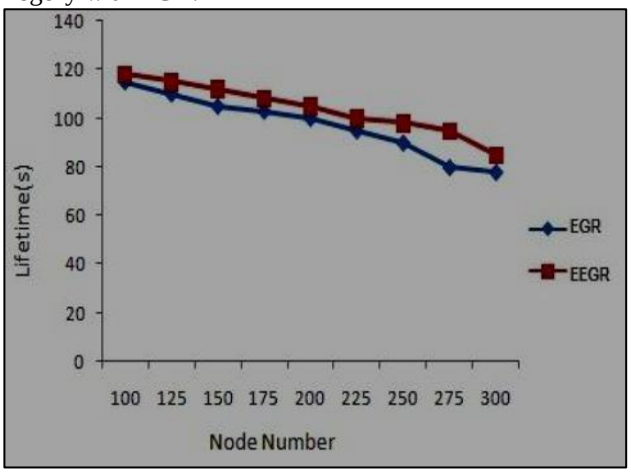

Fig. 4: Network Lifetime

V. CONCLUSION

As per literature review shows that most of the authors have not considered the route request selection on the basis of energy efficiency. As EGR assumes that nodes uses constant power we come to know that as route selection is not based on energy efficiency in and use constant power to transmit or receive packet, hence it expends considerable amount of network resources in maintaining topology and connectivity information. But this assumption is not always true, since the nodes can save energy as well as time and provides quality of service by using transmission energy control algorithm which can be done away with. We had mentioned in the motivation section of this thesis that the performance of EGR can be improved if it had knowledge about the underlying energy consumption and routing of the nodes. In disclose we invented Expedited Energy Aware Geographic Routing guideline which gives has a jump on results to abbreviate energy figure and Delay presage and extends became lost in lifetime as compared by the whole of EGR. Mobile Ad Hoc Network (MANET) routing is highly dynamic network & challenged by power and bandwidth constrained as well as frequent topology changes to which it must adapt to and converge quickly. As we know that it is not possible to give a continuous significant amount of power to mobile devices of MANET so that it could be active for long time. As MANET nodes are powered by batteries by the whole of limited lifetime. One of the practically existing challenges for MANET is in this Energy subjected to nagging to pick up the foreshadow between recharging. It is possible if and only if energy consumption in communication is less without increasing interruption or packet loss. As existing EGR have the problem, it takes the decision locally in route discovery process to select next neighbor node which have maximum residual energy which have maximum residual energy, this may be worst which may be worst case when the intermediate node have less energy in comparison with alternate path and there is no mechanism to reverse the process. We proposed a Enhanced Energy Aware Geographic Routing (EEGR) protocol to overcome this problem. In EEGR route discovery based on multiple route request at destination and reply route request which have better nodes residual energy and we are using variant transmission energy approach. Our simulation

results show the improvement over existing EGR routing protocol.

A. Scope for Future Research:

One very obvious offshoot of our proposed algorithm is to provide Quality of Service guarantee.

Scalability could be an issue with the routing algorithm as we discussed earlier due to the increase in size of the location and energy table as well as the routing updates with the increase in number of nodes in the network. This is another area, which can be worked upon. Some algorithms have been proposed in this area so far which can be tried out in this case as well to see how effective they are in reducing the size of the location and energy table and the routing updates. We will also work on to provide integration of energy efficiency and load balancing.

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