An Efficient High Power Node Rejection Clustering Algorithm for WSN

S.Sivaranjani and M.Sudha

***Abstract*-- Power heterogeneousness is common in mobile unplanned networks (MANETs). With high-octane nodes, MANETs will improve network quantifiability, property, and broadcasting lustiness WSN will improve network quantifiability, property victimization high power nodes however, the output of power heterogeneous WSN is full of these nodes. to beat this downside, a loose-virtual-clustering-based (LVC) routing protocol for power heterogeneous (LRPH) WSNs is planned .The algorithmic rule aim at making Bi directional links by exploiting the benefits of high-octane nodes. so as to decrease the interference raised by high-octane nodes, routing algorithms ar developed to avoid packet forwarding via high-octane nodes. we have a tendency to demonstrate the system implementation and experimental results through simulations.**

***Index Terms*--Mobile ad hoc networks, LVC, LRPH, Routing**

I. INTRODUCTION

Mobile accidental network (MANET) may be a self-configuring, infrastructure less network of mobile devices connected by wireless and may amendment locations as shown in fig one.1. Nodes in painter will communicate with one another and may move anyplace while not restriction. Quality isn't restricted and characteristics of MANETs square measure simply deployable, so that they square measure very talked-about and appropriate for emergencies, natural disaster and military operations. Movable network consists of devices with completely different characteristics in terms of transmission power; means that it's a capability of lower power nodes to receive transmissions from higher power nodes however reverse isn't true. A cross layer framework offers an easy and effective approach for media access management and supports routing in power varied accidental networks. By this the outturn of the facility varied network is improved by twenty five more than ancient stratified approaches [1].

The benefits of high-energy nodes square measure the growth of network coverage and even have benefits in power and knowledge transmission rate. So, researchers have created efforts to look at these benefits, like backbone construction i.e., virtual backbone is built during a distributed and localized fashion whereas considering several incompatible objectives like quick convergence, and low computation price [2]. Topology management helps in preserving the energy by either reducing transmission power per node or conserving energy-efficient routes for the whole network [3]. But, the massive transmission varies of high power nodes results in large interference that reduces the abstraction utilization of network channel resources. Thanks to completely different transmission power, unidirectional links can occur in MANETs. Thence our aim is to interchange unidirectional links with duplex links. Several routing protocols in power varied MANETs square measure designed solely to seek out the unidirectional links and to avoid the transmissions supported these links while not creating use of the advantages of high-energy nodes. The routing performance of power heterogeneous MANETs ought to be improved by considering the benefits and neglecting the disadvantages of high- power nodes. Hence, during this paper we have a tendency to plan a loose- clustering-based (LVC) routing protocol for power varied MANETs, i.e., LRPH that achieves higher outturn. We have a tendency to build LVC to find unidirectional links by creating use of the advantages of high power nodes. Bunch may be a theme to boost the performance of the network.

So as to attain optimized bunch, a stratified cooperation theme is employed. The amount of stratified stages and also the connected cluster sizes that maximize the overall outturn is chosen. This theme is applied for random networks by developing bunch formula within which the whole network is split into quadrilateral clusters, every with equal range of nodes [7]. Within the existing bunch schemes, every node within the network plays a definite role as cluster head, member, or gateway. Thanks to cluster formation, a stratified routing is completed within which routes square measure recorded between clusters rather than between nodes. So, there's a rise in route period, therefore decreasing the quantity of routing management overhead [8].In our bunch theme, a loose coupling relationship is established between nodes as a result of the price of cluster construction and maintenance decreases. High-energy nodes square measure used for cluster formation however they're avoided for packet forwarding to scale back interference.

II. RELATED WORK

The sensing element nodes square measure “grouped" into “clusters" supported their relative geometer distances. Therefore the nodes that square measure spatially near one another square measure unbroken within the same cluster. The linear model we have a tendency to propose considers the impact of the closest neighbours on the present state price for every sensing element node and therefore permits inside cluster data exchange. We have a tendency to additionally propose non-parametric matrix stick breaking priors for the cluster specific model parameters and therefore think about the likelihood of knowledge exchange between the clusters within the network into account. Think about a sensing element network with K clusters and also the k-th cluster consists of nk sensors with a complete of n = KÍ k=1 nk sensors. Note that clusters square measure shaped by considering the geometer distance between the sensors, i.e. for a few mounted δ, all the sensors that square measure within the δ-neighborhood of every different square measure unbroken during a single cluster. Note that δ ought to be chosen specified the amount of clusters is neither too tiny nor large (typically but ten in our setting).

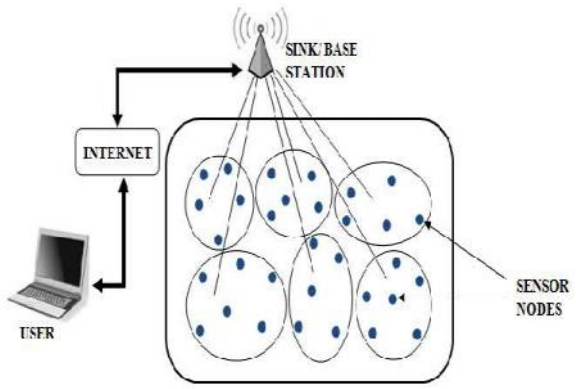

Fig. 1: Cluster based data collection in WSN

However, in reality, the number of clusters (and hence the value of δ) depends on the coverage area and the nature of the experiment. We consider a discrete-time state estimation procedure in this article. For making an energy efficient protocol, we assume that all the sensors within a cluster are not necessarily measured exactly at the same time points. Some sensors might be kept in the sleep mode for some time and since in the sleep mode the sensors consume very little battery power, the network becomes energy efficient. We assume that the *i*th sensor belonging to the *k*-th cluster (k = 1, 2, . . . , K) is measured at *T*ki different time points and *X*ik (*t*ij) denotes its state value at time *t*i j (*j* = 1, 2, . . . ,*T*ki). However, we also assume that at each time point at least one (if not all) sensor from each cluster is measured to keep the cluster active. Our linear Markov model for estimating the state value of the *i*th sensor at time *t*i j based on the observed measurements till time *t*i(j−1) can be expressed as the following:

$$X_{ik}(t_{ij}) = f_k(t_{ij}) + \theta_{k1} X_{ik}(t_{i(j-1)}) I(|t_{ij} - t_{i(j-1)}| < p) + \theta_{k2} Z_{ik}(t_{i(j-1)}) + e_{ijk},$$

Where *f*k is the cluster specific general effect of time which we model using Penalized splines. The effect of time on the state values is possibly different for different clusters and hence we include the subscript *k* in the function *f* (.). Here the indicator function *I*(|*t*i j − *t*i(j−1) | < *p*) takes value 1, if |*t*i j − *t*i(j−1) | < *p* and 0, otherwise. Note that θk1 is the cluster specific effect of the previous available measurement on the current state value and will be estimated based on the available data. The previous available measurement will influence the current state value only when the time difference is below a fixed (known) threshold *p* (typically *p*=3). This is based on the assumption that measurements corresponding to the closer time points are more related than those for the further time points.

A network with several clusters where the clusters do share the model parameters. Our WSN consists of three clusters (*k*=1,2,3) with 40, 45 and 50 sensors respectively. For simplicity, we assume that each sensor is measured exactly at 10 different time points (i.e. consider a case of regular longitudinal measurement).

II. PROPOSED ALGORITHM

We consider two types of nodes in the networks: B-nodes with high power nodes and a large transmission range. Gnodes- low power with small transmission range. The number of B-nodes (Backbone nodes) and G-nodes(General nodes) are denoted as *NB* and *NG*, respectively and there transmission ranges as *RB*and *RG*, respectively. The state of G-nodes in the network is defined as *G*isolated - G-node that is not covered by any B-node. *G*member - G-node Whose bidirectional neighbours (BNs) are covered by its cluster head. *G*gateway - G-node who’s BNs are not covered By its cluster head.

Abbreviation:

- LVC: Loose Virtual Clustering
- LRPH: Loose-virtual-clustering-based Routing protocol for Power Heterogeneous
- BND: Bidirectional Neighbor Discovery
- AN: Aware Neighbor
- LAT: Local Aware Topology

- GLI: G-node LVC Initialization

BLI: B-node LVC Initialization

- TTL: Time to Live
- CMR: Cluster Member Register
- CHD: Cluster Head Declare
- LR and GR: Local Routing and Global Routing
- RREQ: Route Request
- RREP: Route Request Replay
- RERR: Route Error
- DSR: Dynamic Source Routing
- MC: Multiclass

A. *LVC Algorithm*

1) *BND:* Unidirectional links are eliminated by discovering bidirectional links as shown in fig 3.a.1. BND packet consists of its own information ex: ID, type, state and the information on its discovered neighbors.

LVC:

To derive benefits of B-node, LVC algorithm is designed. B-node is chosen as a cluster head to establish a loose coupling relationship with G-nodes. G-nodes (*G*member or *G*gateway) which are covered by B-nodes will LVC has two features:

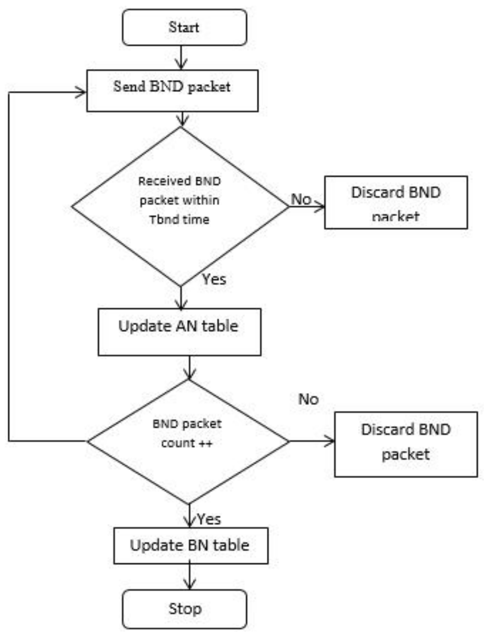

Fig. 2: Flowchart for Bidirectional participate in cluster formation

.i) avoidance of overhead which is caused by reconstruction and maintenance of the cluster when the B-node count is small. ii) Even though all G-nodes are in the *G* isolated state, LRPH protocol is adaptive to the high number of B-nodes. By exchanging control packets, all nodes build a local aware topology (LAT) table which stores local topology information based on discovered bidirectional links. Construction of Received CMR packets and CHD packets are used to build LAT by all B-node, and all G-nodes resply.

3) *LVC Maintenance:*

It is activated when the links between nodes fail, particularly when node ni detects any of the following conditions based on the periodical BND packets.

- If node ni does not receive the BND packet from node nj in the AN table within a specified time, *nj* should be out of its coverage range.
- If node *ni* receives the BND packet from node *nj* and node *nj* is not in the AN table, a new link between *ni* and
  nj should be added.

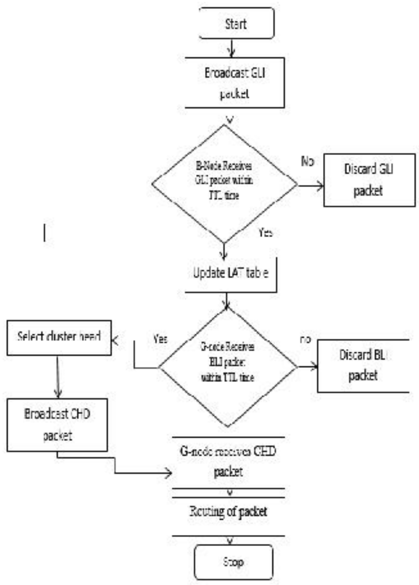

Fig. 3: Flowchart for building up of LVC

LVC maintain by G-nodes:

Step1: G-node *ni* updates its node state, AN and BN tables.

Step 2: If *nj* is the cluster head of *ni*, a new cluster head is acquired. Initially, *n i*calculates the path to the old cluster head conforming with LAT and then updates the topology information related to *nj* in LAT. Then, new cluster head is selected by *ni*. At last, *ni* multicasts CMR packets to both the new and old cluster heads *nj*. Now node *ni* registers to the new cluster head and notifies the old cluster that *ni* is out of the transmission range of *nj* .

• If *nj* is a B-node but not the cluster head of *ni*, *ni* leaves the coverage range of B-node *nj* , and *ni* updates the topology information on *nj* in LAT.

• If *nj* is G-node and in the BN table, the bidirectional link fails. *G*member or *G*gateway nodes send the BN update (BNU) packet to the cluster head for updating the BNs.

Step 3: After recieving CMR packets, B-node broadcast CHD packets. If the cluster head receives BNU packets, it broadcasts BNU packets again in one hop. The G-node updates the cluster and LAT information in conformance with received packets.

LVC maintain by B-nodes:

Step 1: B-node *ni* updates LAT, AN and BN tables.

Step 2: If *nj* is in the BN table of *ni*, *ni* broadcasts BNU packets in one hop to update the LAT tables of all nodes within its coverage range.

4) Cluster Head Selection:

The number of B-nodes in the AN table maintained at any G-node *gi* is denoted by N. The cluster head of *gi* is found as shown in fig3.a.4

1) *Route Discovery Procedure:* If a source node S needs to send a data packet to destination node D,*S* first searches the path to *D* in its route memory, if so *S* directly sends the data packet else it activates the route discovery procedure to discover a route to *D*as shown in fig 3.b.1. This procedure consists of the local routing (LR) and global routing (GR) components.

LR: The route to *D* will be directly obtained; if *D* is in the LAT table.

GR: If *D* is not in the LAT table, *S* broadcasts a route request (RREQ) packet to discover the source route to *D*, after receiving the complete route to *D*, it replies with a route reply (RREP) packet to *S*. When *S* receives the RREP packet, it inserts the new route into its route cache and sends data packets.

Now a node obtains a complete source route to *D*, it replies with a RREP packet to *S* directly. Because the RREP packet is delivered using unicast, the bidirectional links will be used. If packets are forwarded through B-nodes, throughput of a network will be decreased, so we exclude B-nodes in the path by replacing B-nodes with multihop G nodes.

But this scheme increases route hops and finally network throughput can be improved. A timer is set and if expires, drop the packet. If the route discovery fails for many times, data transmission will be cancelled.

2)*Route Maintenance Procedure:* Whenever a link failure occurs and is detected by middle node through the BN table, the route maintenance is activated. A route error (RERR) packet is created and sent to the source node along the reverse route. When any middle node (including the source node) along the route receives the RERR packet, the route with the broken link will be removed from the routing memory.

III. SIMULATION RESULTS AND DISSCUSSIONS

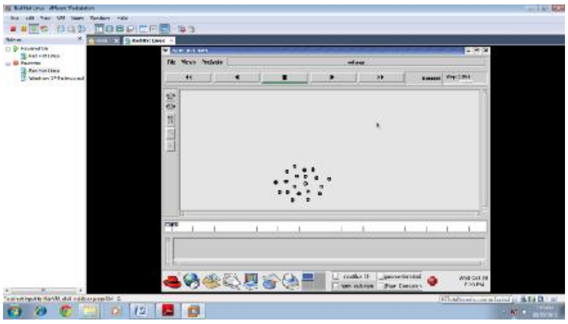

Fig. 4: Node creation

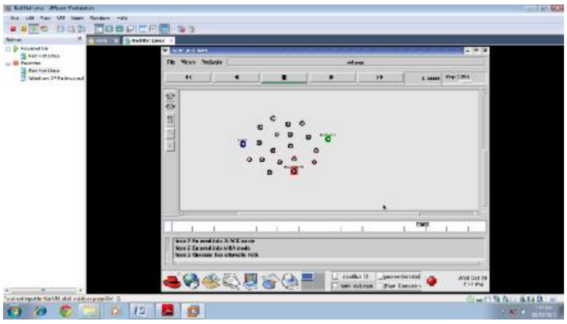

Fig. 5: Identifying Malicious node

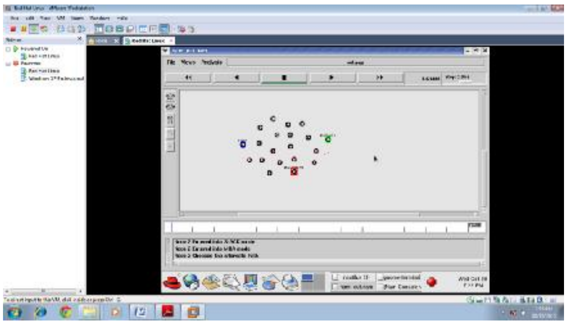

Fig. 6: Changing the node to transfer data using LVC

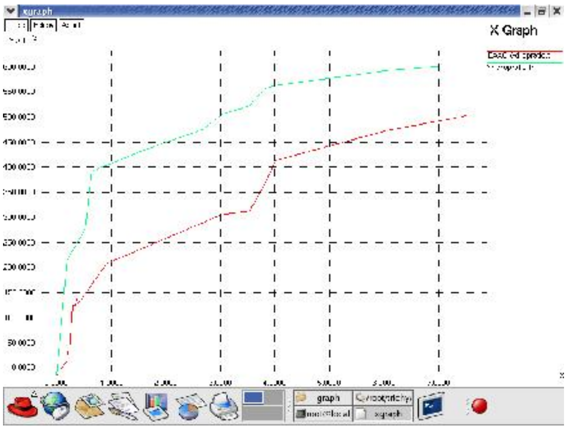

Fig. 7: Throughput ratio (Existing vs Proposed)

IV. CONCLUSION

Development of LVC-based routing protocol named LRPH for power heterogeneous MANETs, improves the network throughput largely. We designed an LVC algorithm to eliminate unidirectional links and to benefit from highpower nodes in transmission range and reliability. We developed routing schemes to optimize packet forwarding by avoiding data packet forwarding through high-power nodes.

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