Energy Efficient Zone Based Routing Protocol for Power Heterogeneous MANETs

[1]M. Savithri, [2]C. Arun
[1]Assistant Pro1fessor, [1]M.Phil Research Scholar,
[1,2] Department of computer science, Dr. N.G.P Arts and Science College,
Coimbatore, Tamil Nadu, India

Abstract: Energy efficient mobility adaptive distributed clustering algorithm for Mobile Ad-hoc network. Node mobility in the dynamic network has a remarkable effect on cluster stability. In order to reduce the initial cluster setup time of the dynamic network with frequently changing topology a single node parameter as the cluster head selection criteria. An optimal sleep/wake scheduling algorithm satisfies a message capture probability threshold with minimum energy consumption. This work considers multi-hop communications for a Zone based speed adaptive clustering for power heterogeneous (ZSCPH) MANETs. To explore the advantages of high-power nodes, we develop a Protocol to construct a hierarchical network and to eliminate unidirectional links. To reduce the interference raised by high-power nodes to selected cluster heads form the routing backbone of the dynamic network, better stability is ensured by preferring low mobile nodes to act as cluster heads. A new energy consumption model has been proposed for the cluster heads that takes into account the network traffic, density of cluster members and the transmission power utilized to communicate the member nodes. A better cluster stability and a low maintenance overhead are aimed to achieve by electing volunteer and non-volunteer cluster heads.

Keywords: ZSCPH, LRPH, LVC, IEEE

I. INTRODUCTION
A Mobile Ad-hoc Network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless links. Each device in a MANET is free to move independently in any direction, and also change its links to other devices frequently. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Mobile Ad-hoc networks may operate by themselves.

MANETs are a kind of wireless Ad-Hoc networks that usually has a routable networking environment on top of a Link Layer Ad-hoc network. The growth of laptops and 802.11/Wi-Fi wireless networking has made MANETs a popular research topic since the mid-1990s. Many academic papers evaluate protocols and their abilities, assuming varying degrees of mobility within a bounded space. Different protocols are evaluated based on measure such as packet drop rate, overhead introduced by routing protocol, end-to-end packet delays and network throughput.

For Ad-Hoc wireless network, route discovery and route maintenance are two main tasks of the routing protocol. If the routing protocol is reactive (on-demand), then broadcasting route request is used to find a network route. To control propagation of broadcasting messages in the network, flooding control mechanisms are used to control the route request packet forwarding.

An Ad-hoc network is a wireless network formed by wireless nodes without any help of infrastructure. In this network, nodes are mobile and can communicate dynamically in an arbitrary manner. MANET is characterized by absence of central administration devices such as base stations. Nodes should be able to enter and leave the network easily.

In these MANET, nodes act as routers. Routers play an important role in route discovery and maintenance of routes from source to destination. If link breakages occur, network has to stay operational by building new routes. The main technique used is multi-hopping is to increase the overall network capacity and performance. By using multi-hopping, one node can deliver data to a determined destination. The Figure 1.1 shows the structure of the wireless Ad-hoc networks.

Fig 1.1 TheStructure of the MAN Networks

A Mobile Ad-hoc Network (MANET) represents a system of wireless mobile nodes that can self-organize freely and dynamically into temporary network topology. It can be quick deployed at any time as to eliminate the complexity of infrastructure setup. Other problems are route errors and higher overhead, caused by the mobility of nodes. To avoid designing bugs is necessary to analyse the designed protocols formally before protocols are deployed. Considering the particularities of MANET, the secure traits are different from the traditional security as secrecy and authenticity. Formal analysis methods are used for many years in cryptographic protocols.

In this method, a research project team engaged in excavation work constructs an ad hoc network on a mountain. The results obtained from the investigation may consist of various types of data such as numerical data, photographs, sounds and videos.

II. LITERATURE SURVEY

This paper [1], provides descriptions of the mechanisms, evaluations of their performance and cost, and discussions of advantages and disadvantages of each clustering scheme. In a clustering scheme the mobile nodes in a MANET are divided into different virtual groups, and they are allocated geographically adjacent into the same cluster according to some rules with different behaviours for nodes included in a cluster from those excluded from the cluster.

In this paper, [2], they develop a loose-virtual-clustering-based (LVC) routing protocol for power heterogeneous MANETs, i.e., LRPH. Our protocol is compatible with the IEEE 802.11distributed coordination function (DCF) protocol. It does not rely on geographic information or multi-radio, multi-channels and can be deployed on general mobile devices, including laptops, personal digital assistants, etc. LRPH takes the double-edged nature of high-power nodes into account. To exploit the benefit of high-power nodes, a novel hierarchical structure is maintained in LVC, where the unidirectional links are effectively detected. Clustering is a known scheme to improve the performance of the networks. However, in the existing clustering schemes, each node in the network should play a certain role (e.g., cluster head, member, or gateway). They define this as a strong coupling cluster. In a strong coupling cluster, the cost of constructing and maintaining a cluster may significantly increase and affect the network performance. In our clustering, a loose coupling relationship is established between nodes. Based on the LVC, LRPH is adaptive to the density of high-power nodes.

The method of clustering and its routing mechanisms have been put, into various papers, earlier. Clustering in Delay Tolerant Mobile Networks is unique and non-trivial, because the network is not fully connected. Due to the lack of continuous communications, mobile nodes may have inconsistent information and therefore respond differently. As a result, it becomes challenging to acquire necessary information to form clusters and ensure their convergence and stability. The concept of clustering problem and the cluster-based routing protocol is unique in non-deterministic environment.

III. PROPOSED STUDY

Mobile Ad-Hoc Network (MANET) is a group of wireless mobility nodes and it is self-organized into a network without the need of any infrastructure. It is a big challenge in developing a robust multicast routing protocol for dynamic Mobile Ad-Hoc Network (MANET). Previous geographic multicast protocols like SPBM could achieve much higher delivery ratio in all circumstances, with respect to the variation of mobility, node density, group size, and network range. Scalable Position Based Multicast Protocol incurs several times of control overhead, redundant packet transmissions, and multicast group joining delay. Existing geographic routing protocols have many limitations that it may lead to redundant packet forwarding and higher collision probability, and hence it cannot work properly when the traffic load is high.Zone based speed adaptive clustering for power heterogeneous (ZSCPH), which can extent to a large group size and large network size. The protocol is designed to be comprehensive and self-contained, yet simple and efficient for more reliable operation and consumes less energy when compared to existing one. Instead of addressing only a specific part of the problem, it includes a zone-based scheme to efficiently handle the group membership management, and takes advantage of the membership management structure to efficiently track the locations of all the group members without resorting to an external location server.

IV. SYSTEM ARCHITECTURE

To reduce the topology maintenance overhead and support more reliable multicasting, an option is to make use of the position information to guide multicast routing for that introducing efficient geographic multicast protocol. Zone based speed adaptive clustering for power heterogeneous (ZSCPH) uses a virtual-zone-based structure to implement scalable and efficient group membership management. A zone leader is elected through the cooperation of nodes and maintained consistently in a zone. A node appears in the network, it sends out a beacon announcing its existence. It waits for an Initial max period for the beacons from other nodes.

The position information is used to guide the zone structure building and multicast packet forwarding, efficiently reduces the overhead for route searching and maintenance. Making use of the position information to design a scalable virtual-zone-based model for efficient membership management, it allows a node to join and leave a group quickly.

ZSCPH uses node life time prediction algorithm in which if there are two nodes that have the same residual energy level, an active node that is used in many data-forwarding paths consumes energy more quickly, and it has a shorter lifetime than the remaining inactive node. This not only helps to sustain the communication with the lowest chance of interruption, but also prolongs the network lifetime due to the lowest possible consumption of energy for a given communication. As a results demonstrate that ZSCPH has high packet delivery ratio, and low control overhead and multicast group joining delay under all test scenarios, and is scalable to both group size and network size.

V. METHODOLOGY

MANET FRAMEWORK SETUP: Routing in a communication network is the process of forwarding a message from a source host to a destination host via intermediate nodes. A wireless ad hoc network consists of mobile nodes (MNs) with wireless communication capabilities for specific sensing tasks. Modify mobility and driver partition apt to node placement under zone process that creates the framework for our proposed protocol. Mobility describes the node movement and the driver initializes position of each and every nodes.

Each and every protocol developed under three states which are initialization, packet event section and finalization. The function consists of edge calculation, report generation. These functions executed under several instances are depending under the nodes position. In ZSCPH, making use of the position information to design a scalable virtual zone-based model for efficient membership management, it allows a node to join and leave a group quickly. Geographic unicast is enhanced to handle the routing failure due to the use of estimated destination position with reference to a zone and applied for sending control and data packets between two entities so that transmissions are more robust in the dynamic environment.

VIRTUAL ZONE BASED PROTOCOL IMPLEMENTATION: Each and every protocol developed under three states is the initialization, packet event section and finalization. Some more function which consists of edge calculation, report generation. These functions executed under several instances which are depend under the nodes position.

In Zone based speed adaptive clustering for power heterogeneous (ZSCPH), making use of the position information to design a scalable virtual-zone based scheme for efficient membership management, it allows a node to join and leave a group quickly. Geographic unicast is enhanced to handle the routing failure due to the use of estimated destination position with reference to a zone and applied for sending control and data packets between two entities so that transmissions are more robust in the dynamic environment.

INPUT CONFIGURATION: The design phase is a multi-step process. It focuses on system creation with the help of user specifications and information gathered in the above phases. It is the phase the system requirements are translated to operational details. System has to be designed for various aspects of the input and output. Based upon edge calculation the nodes are placed. According to this proposed protocol we configure some input parameters some are simulation time, Mac protocol, radio type, number of nodes.

PERFORMANCE EVALUATION: The performance of the proposed algorithm is evaluated via network simulator version 2. Zone based speed adaptive clustering for power heterogeneous uses node life time prediction algorithm in that there are two nodes that have the same residual energy level, an active node that is used in many data forwarding paths consumes energy more quickly, and it has a shorter lifetime than the remaining inactive node. This not only helps to sustain the communication with the lowest chance of interruption, but also prolongs the network lifetime due to the lowest possible consumption of energy for given communication. Performance metrics are utilized in the simulations for performance comparison.

VI. RESULTS AND ANALYSIS

The performance of the proposed algorithm (ZSCPH) is increased compared to DSR, AODV, LVC that shown in the table and graph below.
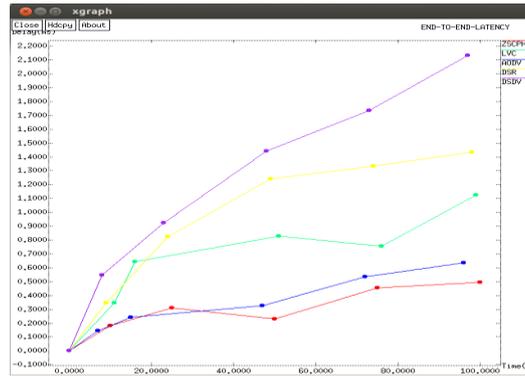
i. **PACKET DELIVERY RATIO:** The ratio of the number of received data packets to the number of total data packets sent by the source.
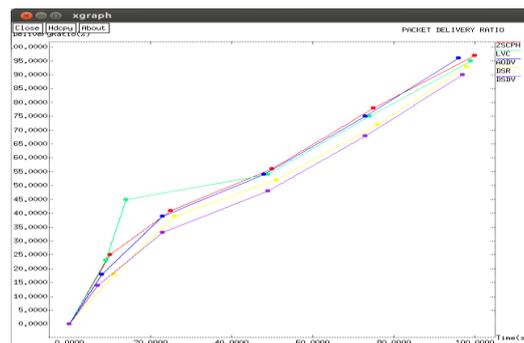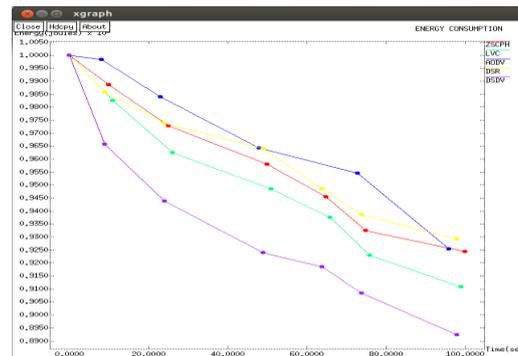

ii. **THROUGHPUT:** The average number of transmitted bytes per second, including both the total data packet received on time.
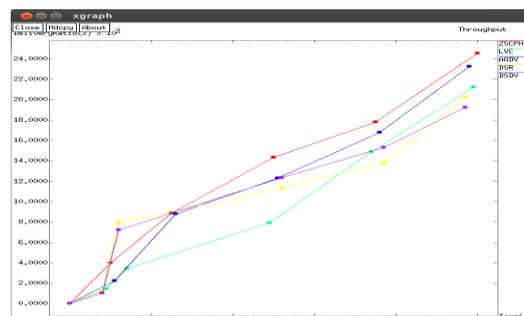
iii.   **DELAY:** The average time elapsed for delivering a data packet within a successful transmission.

iv.   **ENERGY CONSUMPUTION:** Average energy consumed on idle sleep, transmit and receive with respect to total energy consumed.

VII.   CONCLUSION

An efficient and scalable geographic multicast protocol, for MANET is Zone based speed adaptive clustering for power heterogeneous. The scalability of ZSCPH is achieved through a two-tier virtual-zone-based structure which takes advantage of the geometric information to greatly simplify the zone management and packet forwarding. A zone-based bidirectional multicast tree is built at the upper tier for more efficient multicast membership management and data delivery, The intra zone management is performed at the lower tier to realize the local membership management. The position information is used in the protocol to guide the zone structure building, multicast tree construction, maintenance, and multicast packet forwarding. Compared to conventional topology-based multicast protocols, the use of location information in ZSCPH significantly reduces the tree construction and maintenance overhead, and enables quicker tree structure adaptation to the network topology change.

VIII.   FUTURE ENHANCEMENT

In order to estimate the signal parameters accurately for mobile systems, it is necessary to estimate a system's propagation characteristics through a medium. The MANET mobility models considered are Random Waypoint model, Random Direction model, Gauss-Markov model, City Section model, Manhattan model. A characteristic feature of every mobility model is to ensure that a Mobile node will not travel outside the network area. The performance metrics of specific interest are the lifetime per multi-path set and the multi-path set size.

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BIOGRAPHY

Mrs. M. Savithri, working as a Assistant professor, Department of Computer Science, Dr N.G.P Arts and Science College, Coimbatore, India.

Mr C. Arun Pursuing M.Phil Research Scholar, Department of Computer Science, Dr. N.G.P Arts and Science College, Coimbatore, India.