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AN EFFICIENT GEOGRAPHIC MULTICAST PROTOCOL FOR SUPPORTING SCALABLE MULTICASTING OVER MANET

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Abstract- ***In mobile ad hoc networks, it is challenging to implement efficient and scalable multicast because of multicast packet forwarding and difficulty in group membership management. To overcome this problem we propose an efficient geographic multicast protocol (EGMP).To achieve this a network wide zone based bidirectional tree is constructed. Position is determined by which the tree structure and route searching reduces efficiently. To further improve the protocol efficiency a concept called zone depth is used. The EGMP evaluates the scalability and the efficiency through simulations and quantitative analysis. Its simulation results demonstrates high packet delivery ratio, low control over head and multicast group joining delay. Thus EGMP is more efficient compared to scalable position based multicast (SPBM).Even though EGMP is more efficient, when the destination node moves it leads to loss of data. In order to avoid this loss we are implementing a new concept known as Bloom Filtering. Finally in this paper we compare SPBM with EGMP and EGMP with DOM based bloom filtering.***

I. INTRODUCTION

Mobile AdHoc Networks (MANETs) are interesting increasingly. Example applications include the exchange of group messages among a group of soldiers in the battle field, teleconference etc. Multicast uses one to many or many to many transmission patterns.

Conventional MANET multicast protocols are of two types-trees based and mesh based. Using tree based protocol it is difficult to maintain the tree structure because of constant movement as well as frequent network joining and leaving from individual nodes. The mesh based protocols are used to enhance the robustness with the use of redundant paths between source and destination pairs. Over

dynamic MANET conventional multicast protocol do not have good scalability due to the over head incurred for route searching, group membership management, creation and maintenance of the tree/mesh structure.

For MANET to attain scalable and robust packet transmission unicast routing and geographic routing protocols have been designed .To reduce the topology maintenance over head and support more reliable multicasting, position in formation is used to guide multicast routing. But there are many challenges in implementing an efficient and scalable multicast scheme in MANET For example, in unicast geographic routing the destination address is carried out in packet header to guide the packet forwarding, while in multicast the destination is a group of members. In addition to efficient packet forwarding, a scalable multicast protocol also requires to efficiently manage the membership of possibly large group. But the existing small group based protocol solves only a part of these problems.

In this work, we propose an efficient geographic protocol, EGMP, which can scale to a large group size and network size. It is more simple and efficient for more reliable operation. It has a zone based scheme to for handling group membership management. The zone structure is formed virtually and the zone where a node is located can be calculated based on the position of the node and the reference orgin. By using local information, EGMP could quickly and efficiently build packet distribution paths.

II. RELATED WORKS

In this section we first summaries the basic procedures assumed in conventional protocols and then introduce a few geographic multicast protocols, and then introduce a few geographic multicast algorithms proposed.

Conventional topology based protocol has tree based protocols and mesh based protocols. Tree structure has a tree for more efficient forwarding of packets to all the group members. Mesh based protocol expand a multicast packet with additional paths to forward packets. Although efforts were made to develop scalable topology it is difficult to scale a large network size. This work attempts to improve the stateless multicast protocol which allows in better scalability to group size. In contrast, EGMP use s allocation aware method for more reliable membership management and packet transmission. As the focus of the paper is to improve the scalability of location based multicast, it does not compare with the topology based protocol.

III.PROTOCOL REVIEW

EGMP supports scalable and reliable membership management and multicast forwarding through a two-tier virtual-zone-based structure. At the lower layer, in reference to a predetermined virtual origin, the nodes in the network self-organize themselves into a set of zones and a leader is elected in a zone to manage the local group membership. At the upper layer, the leader serves as a representative for its zone to join or leave a multicast group as required. As a result, a network wide zone-based multicast tree is built. For efficient and reliable management and transmissions, location information will be integrated with the design and used to guide the zone construction, group membership management, multicast tree construction and maintenance, and packet forwarding. The zone-based tree is shared for all the multicast sources of a group. To further reduce the forwarding overhead and delay, EGMP supports bidirectional packet forwarding along the tree structure. That is, instead of sending the packets to the root of the tree first, a source forwards the multicast packets directly along the tree. At the upper layer, the multicast packets will flow along the multicast tree both upstream to the root zone and downstream to the leaf zones of the tree. At the lower layer, when an on-tree zone leader receives the packets, it will send them to the group members in its local zone.

IV. PERFORMANCE EVOLUTION

The EGMP protocol is implemented by using global mobile simulation and compares it with SPBM. A multicast source sends a Join-Query message to the entire network periodically. An intermediate node stores the source ID, the sequence number, and updates its routing table with the node ID from which the message was received for the reverse path back to the source. The neighbor node whose ID matches the next-hop node ID of the message realizes that it is on the path to the source and is part of the forwarding group. It then broadcasts its own Join Table built upon matched entries. This whole process constructs the mesh of nodes which forwarding group.

V. PARAMETERS AND METRICS

We focus on the studies of the scalability and efficiency of the protocol under the dynamic environment and the following metrics were used for the multicast performance evaluation:

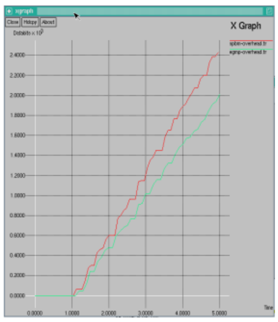
1. *Packet Delivery Ratio:* The ratio of the number of packets received and the number of packets expected to receive.
2. *Normalized Control Overhead:* The total number of control message transmissions divided by the total number of received data packets.
3. *Normalized Data Packet Transmission Overhead:* The ratio of the total number of data packet transmissions and the number of received data packets.
4. *Joining Delay:* The average time interval between a member joining a group and its first receiving of the data packet from that group.

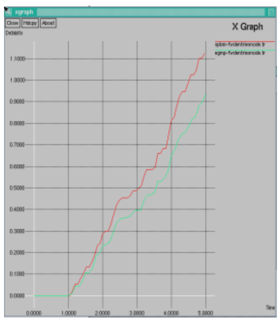
VI. SIMULATION RESULTS

EGMP Vs SPBM

Overhead **Multicast Hops**

Group Joining Delay **Packet Delivery Ratio**





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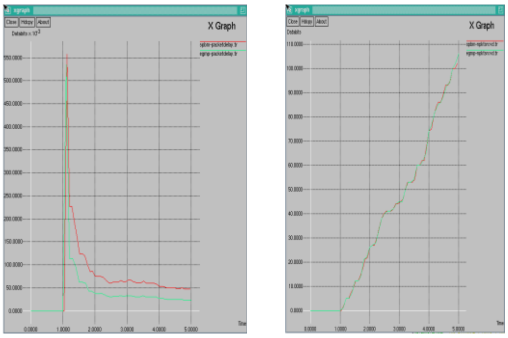
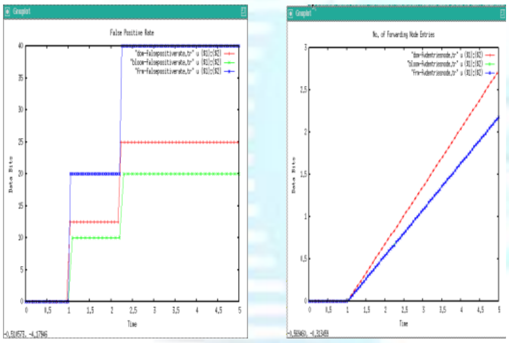


Fig 1. EGMP Vs SPBM

EGMP Vs DOM

False Positive Rate **Node Joining**



Delay **Packet Delivery Ratio**

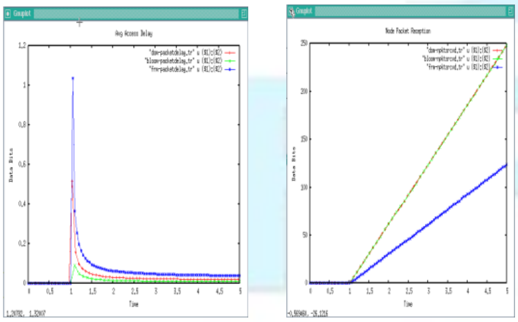


Fig 2. EGMP Vs DOM

VI. CONCLUSION

In this paper we propose an efficient and scalable geographic multicast protocol for MANET. The scalability of EGMP is achieved through a two-tier virtual zone based structure, which takes advantages of the geometric information to greatly simplify the zone management and packet forwarding.

At the upper tier a zone based bi-directional multicast tree is built for more efficient multicast membership management. At the lower tier intra zone management is performed to realize the local membership management. Compared to conventional topology based multicast protocols, EGMP significantly reduces the tree construction and maintenance overhead and enables quicker tree structure adaptation to the network topology change also to handle the empty zone problem, it uses geographic forwarding for reliable packet transmission and tracks the positions of multicast group members.

Our simulation results demonstrate that EGMP has high packet delivery ratio, and low control overhead and multicast group joining delay under all cases studied, and is scalable to both the group size and the network size. Compared to the geographic multicast protocol SPBM, it has significantly lower control overhead, data transmission overhead, and multicast group joining delay.

Finally we have simulated our experiment by comparing EGMP with DOM based bloom filtering. In the Bloom filter based multicast protocol; it is assumed that any node can be a source or a receiver of multicast data in the network. The protocol demands slightly higher computational and memory resources on the node which is sending data to the multicast group. Moreover, it is assumed that IP based packet routing is available during the process of joining and leaving the multicast group. However, when data is sent by the source of multicast data, IP routing is not used. Instead, Bloom filter based forwarding is used. In addition to previous assumption, it is also assumed that the packets always follow the shortest path between the nodes when unicast through IP based routing system.

Compared to the geographic multicast protocol EGMP, it has significantly lower control overhead, data transmission overhead, and multicast group joining delay.

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