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MOBILE AD HOC NETWORKS PROVIDING EFFICIENT MULTICASTING TECHNIQUES

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ABSTRACT

Multicasting is the transmission of packets to a group of zero or more hosts identified by a single destination address Multicasting is intended for group oriented computing. Typically the members of a host group are dynamic that is hosts may join and leave groups at any time T. In Mobile Ad hoc Networks communication among the groups is more important. To implement group communication we use efficient Multicast method. The implementation using efficient and scalable multicast in MANET is very difficult in group membership management and multicast packet forwarding over a dynamic topology.

Several strategies have been proposed to further improve the efficiency of the protocol, for example, introducing the concept of zone depth for building an optimal tree structure and integrating the location search of group members with the hierarchical group membership management. A scheme is designed to handle empty zone problem faced by most routing protocols using a zone structure. The scalability and the efficiency of EGMP are evaluated through simulations and quantitative analysis. The simulation results demonstrate that EGMP has high packet delivery ratio, low control overhead and multicast group joining delay under all test scenarios, and is scalable for both group size and network size. Compared to Scalable Position-Based Multicast (SPBM), EGMP has significantly lower control overhead, data transmission overhead, and multicast group joining delay.

INTRODUCTION

An Ad hoc Network consists of a set of autonomous mobile nodes that communicate via multi-hop wireless communication in an infrastructureless environment. It is an autonomous system in which mobile nodes connected by wireless links are free to move randomly and often act as routers at the same time. Ad hoc networks have become increasingly relevant in recent years due to their potential applications in military battlefield, emergency disaster relief, vehicular communications etc. [10].

Conventional MANET multicast protocols can be described into two main categories, tree-based and mesh based. However, due to the constant movement as well as frequent network joining and leaving from individual nodes, it is very difficult to maintain the tree structure using these conventional tree-based protocols (e.g., MAODV, AMRIS, MZRP, and MZR). The mesh-based protocols (e.g., FGMP, Core-

Assisted Mesh protocol, ODMR) are proposed to enhance the robustness with the use of redundant paths between the source and the destination pairs [9].

Conventional multicast protocols generally do not have good scalability due to the overhead incurred for route searching, group membership management, and creation and maintenance of the tree/mesh structure over the dynamic MANET. For MANET uni-cast[4] routing, geographic routing protocols have been proposed in recent years for more scalable and robust packet transmissions. The existing geographic routing protocols generally assume mobile nodes are aware of their own positions through certain positioning system, and a source can obtain the destination position through some type[6] of location service an intermediate node makes its forwarding decisions based[9]. on the destination position inserted in the packet header by the source and the positions of its one-hop neighbors learned from the periodic beaconing of the neighbors. By default, the packets are greedily forwarded to the neighbor that allows for the greatest geographic progress to the destination. When no such a neighbor exists, perimeter forwarding is used to recover from the local void, where a packet traverses the face of the planarized local topology sub-graph by applying the right-hand rule until the greedy forwarding can be resumed. Similarly[4], 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. However, there are many challenges in implementing an efficient and scalable geographic multicast scheme in MANET[6].

For example, in uni-cast geographic routing, the destination position is carried in the packet header to guide the packet forwarding, while in multicast routing, the destination is a group of members. A straight-forward way to extend the geography-based transmission from uni-cast to multicast is to put the addresses and positions of all the members into the packet header, however, the header overhead will increase significantly as the group size increases, which constrains the application of geographic multicasting only to a small group. Besides requiring efficient packet forwarding[4], a scalable geographic multicast protocol also needs to efficiently manage the membership of a possibly large group, obtain the positions of the members and build routing paths to reach the members distributed in a possibly large network terrain. The existing small-group-based geographic multicast protocols normally address only part of these problems.

ODMRP (On Demand Multicast Routing Protocol) [6] is proposed to enhance the robustness with the use of redundant paths between the source and the destination pair's scalability due to the overhead incurred for route searching, group membership management, and creation and maintenance of the tree/mesh structure over the dynamic MANET.

We introduce zone-supported geographic forwarding to reduce the routing failure, and provide mechanism to handle zone partitioning. In addition, we introduce a path optimization process to handle multiple paths, and provide a detailed cost analysis to demonstrate the scalability of the proposed routing scheme [4].

Techniques used for providing efficient and scalable multicast:

1. Efficient Geographic Multicast Protocol

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 pre-determined virtual origin, the nodes in the network self-organize themselves into a set of zones as shown in

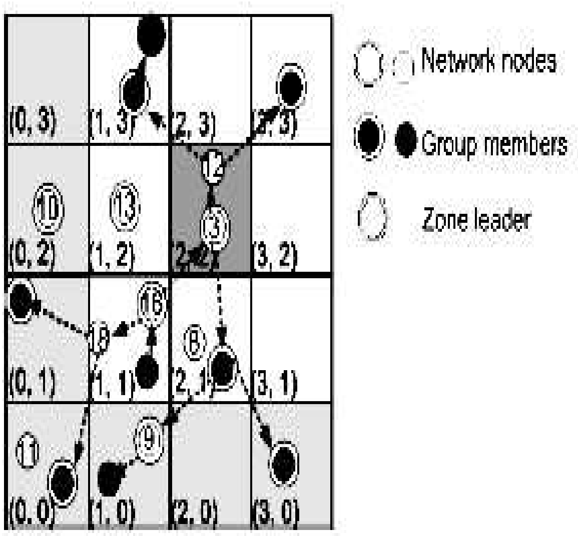


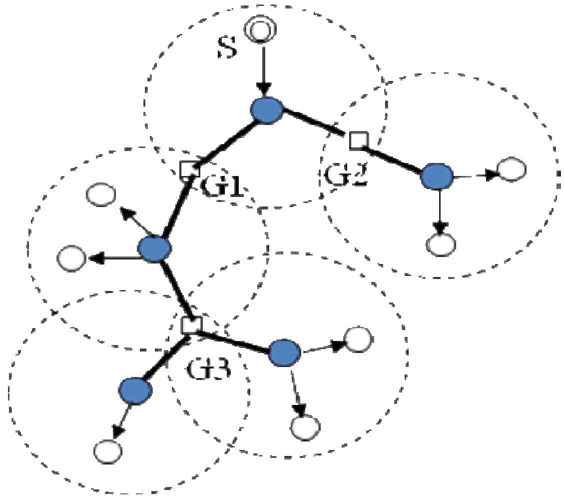
Fig. 1 and a leader is elected in a zone to manage the local group membership. At the upper layer, the leader serves as a representative for its zone to join or leave a multicast group as required.

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.

2. Multicast Tree Construction

The multicast tree creation and maintenance schemes are provided. In EGMP, instead of connecting each group member directly to the tree, the tree is formed in the granularity of zone with the guidance of location information, which significantly reduces the tree management overhead. With a destination location, a control message can be transmitted immediately without incurring a high overhead and delay to find the path first, which enables quick group joining and leaving.

3. Multicast group join

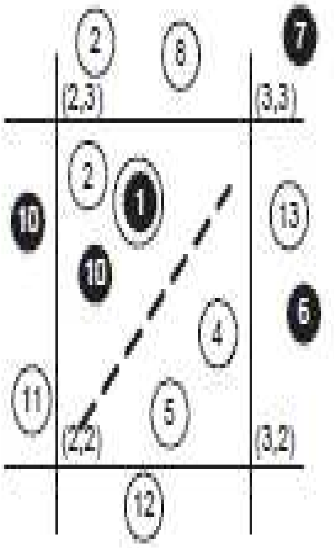


When a node M wants to join the multicast group G, if it is not a leader node, it sends a JOIN REQ(M; PosM; G; fMoldg) message to its zLdr, carrying its address, position, and group to join. The address of the old group leader Mold is an option used when there is a leader handoff and a new leader sends an updated JOIN REQ message to its upstream zone. If M did not receive the NEW SESSION message or it just joined the network.

4. Packet sending from the source

After the multicast tree is constructed, all the sources of the group could send packets to the tree and the packets will be forwarded along the tree. In most tree-based multicast protocols, a data source needs to send the packets initially to the root of the tree. If this scheme is used and node 5 in Fig. 1 is a source, node 5 needs to uni-cast the packets initially to root zone (2, 2). The sending of packets to the root would introduce extra delay especially when a source is far away from the root. Instead, EGMP assumes a bi-directional tree- based forwarding strategy, with which the multicast packets can flow not only from an upstream node/zone down to its downstream nodes/zones, but also from a downstream node/zone up to its upstream node/zone.

5. Multicast data forwarding



Maintain the multicast table, and the member zones normally cannot be reached within one hop from the source. When a node N has a multicast Packet to forward to a list of destinations (D1; D2; D3; :), it decides the next hop node towards each destination (for a zone, its center is used) using the geographic forwarding strategy. After deciding the next hop nodes, N inserts the list of next hop nodes and the destinations associated with each next hop node in the packet [6] header. An example list is (N1: D1; D3; N2: D2; :), where N1 is the next hop node for the destinations D1 and D3, and N2 is the next hop node for D2. Then N broadcasts the packet promiscuously (for reliability and efficiency). Upon receiving the packet, a neighbor node will keep the packet if it is one of the next hop nodes or destinations, and drop the packet otherwise. When the node is associated with some downstream destinations, it will continue forwarding packets similarly as done by node N[9]..

6. Multicast Route Maintenance and Optimization

In the zone structure, due to the movement of nodes between different zones, some zones may become empty. It is critical to handle the empty zone problem in a zone-based protocol. Compared to managing the connections of individual nodes, however, there is a much lower rate of zone membership change and hence a much lower overhead in maintaining the zone-based tree[6].

When a member node moves to a new zone, it must rejoin the multicast tree through the new leader. When a leader is moving away from its current zone, it must handover its multicast table to the new leader in the zone, so that all the downstream zones and nodes will remain connected to the multicast tree.

INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system[6]. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

OBJECTIVES

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities [9].

3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow.

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the
- Future.
- Signal important events, opportunities, problems, or warnings.
- Trigger an action.
- Confirm an action.

CONCLUSION

In this paper, we proposed an efficient and scalable geographic multicast protocol, EGMP, for MANET. The scalability of EGMP 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. The position information is used in the protocol to guide the zone structure building, multicast tree construction, maintenance, and multicast packet forwarding [6]. Compared to conventional topology based multicast protocols; the use of location information in EGMP significantly reduces the tree construction and maintenance overhead, and enables quicker tree structure adaptation to the network topology change. We also develop a scheme to handle the empty zone problem, which is challenging for the zone-based protocols. Additionally, EGMP makes use of geographic forwarding for reliable packet transmissions, and efficiently tracks the positions of multicast group members without resorting to an external location server [9].

Our results indicate that geometric information can be used to more efficiently construct and maintain multicast structure, and to achieve more scalable and reliable multicast transmissions in the presence of constant topology change of MANET [9].

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