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Dynamic & Self-Organizing of Ad-Hoc Network that enables Information Transfer

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ABSTRACT: Wireless Communication, Remote correspondence empowers data exchange among a system of separated, and regularly versatile, clients. Well known remote systems, for example, cell phone systems and remote LAN's are customarily foundation based, i.e. base stations, get to focuses and servers are sent before the system can be utilized. Interestingly, impromptu systems are progressively shaped among a gathering of remote clients and require no current framework or pre-setup.

KEYWORDS: Mobile Ad-hoc Network, Scalable Position Based Multicast Routing Protocol.

I. INTRODUCTION

The dynamic and self-organizing nature of ad hoc networks makes them particular useful in situations where rapid network deployments are required or it is prohibitively costly to deploy and manage network infrastructure. Some example applications include:

- Attendees in a conference room sharing documents and other information via their laptops and handheld computer;
- Armed forces creating a tactical network in unfamiliar territory for communications and distribution of situational awareness information;
- Small sensor devices located in animals and other strategic locations that collectively, monitor habitats and environmental conditions;
- Emergency services communicating in a disaster area and sharing video updates of specific locations among workers in the field, and back to headquarters.

Unfortunately, the ad hoc nature that makes these networks attractive also introduces many complex communication problems. Although some of the first ad hoc networks were deployed in the early 1970's, significant research problems remain unanswered [2].

A mobile ad-hoc network (MANET) is a self-configuring network of mobile routers (and associated hosts) connected by wireless links the union of which form an arbitrary topology. The routers are free to move randomly and organise themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger Internet. Minimal configuration and quick deployment make ad hoc networks suitable for emergency situations like natural or human-induced disasters, military conflicts, emergency medical situations etc. [1].

The earliest MANETs were called packet radio networks, and were sponsored by DARPA in the early 1970s. BBN Technologies and SRI International designed, built, and experimented with these earliest systems. Experimenters included Jerry Burchfiel, Robert Kahn, and Ray Tomlinson of later TENEX, Internet and email fame. It is interesting to note that these early packet radio systems predated the Internet, and indeed were part of the motivation of the original Internet Protocol suite. Later DARPA experiments included the Survivable Radio Network (SURAN) project, which took place in the 1980s. Another third wave of academic activity started in the mid 1990s with the advent of

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inexpensive 802.11 radio cards for personal computers. Current MANETs are designed primarily for military utility; examples include JTRS and NTDR.

The popular IEEE 802.11 ("Wi-Fi") wireless protocol incorporates an ad-hoc networking system when no wireless access points are present, although it would be considered a very low-grade ad-hoc protocol by specialists in the field. The IEEE 802.11 system only handles traffic within a local cloud of wireless devices. Each node transmits and receives data, but does not route anything between the network's systems. However, higher-level protocols can be used to aggregate various IEEE 802.11 ad-hoc networks into MANETs. A list of some ad-hoc network protocols can be found in the Ad hoc routing protocol list [3].

II. LITERATURE SURVEY

In a MANET, wireless devices could self-configure and form network with an arbitrary topology. The network’s topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger Internet. Mobile ad hoc networks became a popular subject for research in recent years, and various studies have been made to increase the performance of ad hoc networks and support more advanced mobile computing and applications. Many efforts have been made to develop multicast protocols for MANETs. These include conventional tree based protocols and mesh-based protocols [5].

A. SCALABLE POSITION BASED MULTICAST ROUTING PROTOCOL

SPBM is a tree based protocol which uses the geographic position of nodes to provide a highly scalable group membership scheme and to forward data packets with a very low overhead. This protocol divides the network in to a quad-tree. Geographic regions are build which can be used to aggregate multicast traffic to group members located geographically close to each other. The group management scheme is responsible for the dissemination of membership information for multicast groups, so that forwarding nodes know in which direction receivers are located [12]. The multicast forwarding algorithm is executed by a forwarding node to determine the neighbors that should receive a copy of a given multicast packet. This decision is based on the information provided by the group management scheme. Thus the tree-based protocols construct a tree structure for more efficient multicast packet delivery and the tree structure are known for its efficiency in utilizing network resources. However, it is very difficult to maintain the tree structure in mobile ad hoc networks, and the tree connection is easy to break and the transmission is not reliable [7].

B. ON-DEMAND MULTICAST ROUTING PROTOCOL

ODMRP is a mesh based, multicast scheme and it uses a forwarding group concept. A set of nodes responsible for forwarding multicast data on shortest paths between any member pairs to build a forwarding mesh for each multicast group [15]. It applies on-demand procedures to dynamically build routes and maintain multicast group membership. Thus the mesh-based protocols, Core-Assisted Mesh protocol are proposed to enhance the robustness with the use of redundant paths between the source and the set of multicast group members, which incurs a higher forwarding overhead. There is a big challenge to support reliable and scalable multicast in a MANET with these topology-based schemes, as it is difficult to manage group membership, find and maintain multicast paths with constant network topology changes. Here we propose a Robust and Scalable Geographic Multicast protocol (RSGM), which can scale to a large group size and network size and provide robust multicast packet transmissions in a dynamic mobile ad hoc network environment.

The protocol is designed to be simple. Thus, it can operate more efficiently and reliably. We introduce several virtual architectures for more robust and scalable membership management and packet forwarding in the presence of high network dynamics due to unstable wireless channels and frequent node movements. Both the data packets and control messages will be transmitted along efficient tree-like paths; However, different from other tree based protocols, there is no need to explicitly create and maintain a tree structure [19].

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III. ROBUST AND SCALABLE GEOGRAPHIC MULTICAST PACKET DELIVERY

RSGM protocol has two tiers namely lower tier and upper tier. At the lower tier a zone structure is built based on the position information and a leader is elected on demand when a zone has group members. The upper tier consists of source and source home. The leaders of the member zone report the zone membership to the sources directly along a virtual reverse-tree based structure or through the source home [28].

A. ZONE CONSTRUCTION AND MAINTENANCE

Virtual zones are used as references for the nodes to find their zone positions in the network domain. The zone is set relative to a virtual origin located at(x_0, y_0) which is set at the network initialization stage as one of the network parameters. The length of a side of the zone square is defined as zone size. Each zone is identified by a zone ID (zID). A zone ID will help locate a zone, and a packet destined to a zone will be forwarded toward its center [30].

B. ON-DEMAND LEADER ELECTION

A zone has group members in it and a single node is elected as leader among them. The node with larger ID will be elected as zone leader. A leader floods a LEADER message in its zone to announce its leadership until the zone no longer has any members [32].

C. GROUP MEMBERSHIP MANAGEMENT

Every zone contains a no. of nodes and the group leader is elected among them. All the nodes in the zone send the REFRESH request message to the zone leader at the particular interval of time. Similarly, the zone leader sends the REPORT request message to the source at the particular interval of time. Even the node moves from one place to another place due to mobility, the zone leader knows the position of the node. Because every node sends the refresh request to zone leader at a particular interval of time [41]. If the node moves out of the zone, the group leader is waiting for the refresh request for a particular interval of time. If the time exceeds the node will be discarded from the group or zone .If the node enters into another zone, the node gives the request to all the nodes. The group leader sends the response to the requested node to join in its zone. Now the requested node will be a member of another zone [45].

D. MESSAGE AGGREGATION

As compared to local messages, the control messages sent at network tier would generally traverse through a longer path [42]. We use a reverse-tree-based aggregation scheme with which all the control messages sent towards the same destination will be aggregated to further reduce control overhead. Different from other tree based multicast protocols, no explicit tree-structure needs to be maintained, which avoids the overhead and improves the robustness. Specifically, the periodic Report messages sent to the source can be aggregated [49].

E. EMPTY-ZONE HANDLING

In the group management system, empty zone problem is handled. If all the nodes in the zone moved outside, the empty zone problem will occur. At that time data or packet loss will occur. When the zone is becoming empty, the moving out zone leader will notify source to stop sending packets to the empty zone [50].

F. MULTICAST PACKET DELIVERY

Multicasting is the process of sending data to many clients. When the client wants data, the source establishes the graphical virtual path to the destination. After that, source node sends the data to the group leader. The group leader sends the data to the particular node. If the any packet loss occurs, the lost packet will be sent by the source using unicast. Unicasting is the process of sending the packet to the only one destination at the time [54].

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IV. CONCLUSION

A Robust and Scalable Geographic Multicast protocol (RSGM) is designed for MANET. In RSGM, stateless virtual transmission structures are used for simple management and robust forwarding. Both data packets and control messages are transmitted along efficient tree-like paths without the need of explicitly creating and maintaining a tree structure. Scalable membership management is achieved through a virtual-zone-based two-tier infrastructure. A Source Home is defined to track the locations and addresses of the multicast sources to avoid the periodic network-wide flooding of source information, and the location service for group members is combined with the membership management to avoid the use of an outside location server. The position information is used in RSGM to guide the zone structure building, membership management, and packet forwarding, which reduces the maintenance overhead and leads to more robust multicast forwarding when the topology changes. The empty-zone problem also handled which is challenging for the zone-based protocols.

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