WMDPQ: A WORK OF FICTION MULTICAST DIRECTION FINDING PROTOCOL TO GET BETTER QUALITY IN SERVICE IN MANNET

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ABSTRACT

Sending multiple copies of packet to different nodes is called Multicasting. Wired and infrastructure –based wireless networks are supported by many multicast routing protocol. But applying this concept in Mobile Ad hoc wireless networks (MANNETs) is a big challenge. Problem in ad hoc networks are scarcity of bandwidth, short life time of the nodes due to power constraints and dynamic topology due to mobility of nodes. Multicasting gives wireless networks more efficient, reliable and secure communication than unicast routing. There exist a lot of multicast routing protocols, some works with wired network and some work with wireless, some protocol deal with both wired and wireless network. In this paper we will develop a protocol that is known as WMDPQ which will help the over come of issues of routing protocol like problem in ad Hoc network are the scarcity of band with sort life time of nodes due to power constraints and dynamic topology due to mobility of nodes . To pursuit for an existing multicast tree outside the zone, constrained directional forwarding is used which ensure a good reduction in overhead in comparison to network wide flooding for search method. The protocol employs local connectivity technique and protective route reconfiguration on the basis of the current status of the nodes are being proposed which reduces the overhead, power and bandwidth requirement and try to increase the reliability and performance.

Keyword:* *Multicasting, Mobile Ad-Hoc Network (MANNET) , Protocol, Wireless GPS, protective route reconfiguration, Shared tree. Routes, WMDPQ

I. INTRODUCTION

Mobile Ad hoc network (MANNET) is a collection of wireless mobile nodes that form a network dynamically without any support of central administration. It is also known as self –orgaized network as it does not depends upon any infrastructure. Each node act as a router .If the network topology is changed, then their routing tables will change automatically. The mobile nodes can directly communicate with each other. And some intermediate nodes are used to route the packets. The mobile ad-hoc networks are fully distributed and robust. Wireless application, where sharing of information is mandatory, like personal area networking ,Military environment and emergency operation require rapid deployable and quick adoptable routing protocol due to these reasons there are need for multicasting routing protocol.

II. MULTICASTING ROUTING

Multicasting is the transmission of data packets to multiple nodes which shares one common multicasting address. There may be more than one sender also may exist in a multicast group, so it is called as group oriented computing. In wired network some of the routing protocol are well established which can provide efficient multicast, but when it comes to MANNET, these protocol may fail due to some unique characteristics of MANNETS. When designing protocol for multicast in mobile ad-hoc network, we should consider some key issues. It includes constant update of delivery of path, dynamic group membership, and little state information. A good multicast routing protocol should possess the characteristics like Robustness ,Efficiency, control overhead ,Quality of service. Dependency on the unicast routing protocol, resource management, etc

III. MULTICAST ROUTING PROTOCOLS IN WIRELESS NETWORK

A Wireless network is asset of mobile nodes that are connected to each other called wireless links. The topology of the network changes randomly as the nodes move on. Due to dynamic change topology and lack of central source node to destination cannot be directly used in wireless network. As a result may routing protocols for ad-hoc networks are developed in the recent past. Since multicast routing is complex. There are many classification in multicast routing is continuously growing and not stable because of that a general overview about multicast routing protocol staed in this paper.

IV. CLASSIFICATION OF MULTICAST ROUTING PROTOCOL

4.1 Tree-Based Multicasting

A tree –based multicast routing protocol establishes and maintains a shared multicast routing tree to deliver data from a source to receivers of a multicast group. A well known example of tree based multicast routing protocols are the Multicast Ad hoc On demand Distance Vector routing protocol (MAODV)

Multicast Ad-hoc On –Demand Distance vector protocol (MAODV): Multicast Ad-hoc on Demand Distance Vector protocol is the extension to the Ad-hoc on Demand Distance vector protocol. It has the capability of unicasting and as well as broadcasting. It can route the information using multicast routing. When a nodes wishes to join a multicast group then it originates a route request (RREQ) message and also if the nodes has some data to send to group but it does not have route to that group then also it does the same thing. Only the members of the multicast group respond to join RREQ from a+ node which is not member of multicast group, then it rebroadcast the RREQ to its neighbors. But if the RREQ is not a join request any node of the multicast group may respond.

Protocol Independent Multicast Routing Protocol (PIM): PIM multicast routing protocol uses an existing unicast infrastructure. It is referred to as protocol independent because it uses routing information provided by other routing protocols such as the border Gateway protocol (BGP), Routing information protocol (RIP), Open shortest path first (OSPF) and Multicast Source Discovery protocol. This protocol consists of a group of multicast routing protocol each of these protocols is dedicated for a different environment. They include Sparse Mode (PIM-SIM), PIM Dense Mode (PIM-DM), PIM Source Specific Multicast (PIM-SSM) and Bidirections PIM. In this protocol the state information is updated at the routers by periodic control messages.

Multicast Open Shortest Path First Protocol (MOSPF): Multicast O[pen Shortest Path First protocol is the extension of OSPF (Open Shortest Path) protocol to provide efficient multicasting within a network. IGMP(Internet group management protocol) is used in this protocol to examine the membership reports. The group information is transmitted in the network by flooding of OSPF link State Advertisement(LSA). This information is used by the routers to build the shortest path is created for each source destination group pair. Compare to Dista NCE Vector Multicast Routing Protocol (DVM RP), faster network convergences is provided by MOSPF.

4.2 Mesh-Based Multicast Routing Protocols

esh based protocols provide multiple paths between sender and recivers On-Demand Multicast Routing Protocol (ODMRP): The On-Demand Routing Protocol (ODMRP) is an On-demand mesh based protocol where a mesh is formed by a group of nodes known as forwading nodes. These nodes forward the data packets between the Source and destination and keep a message ache which helps in the detection of duplicate data and control packets. To maintain multicast group numbers soft – state approach is used. This protocol is more attractive in mobile wireless networks due to reduction of channel/storage overhead and richer connectivity.

Priority Unavoidable Multiple Access Protocol(PUMA): It supports any of the sources to send multicast packets addressed to a given multicast group. The election alogorithm used here is similar to spanning tree algorithm. It implements the distributed algorithm to elect one of the recivers as a coordinators of the group.When the data packet reaches a mesh member it is flooded with in mesh and nodes maintain a packet ID cache to drop duplicate packets.

V. PROPOSED PROTOCOL WMDPQ

This section introduces a new multicast protocol, Effective Multicast Routing Protocol for MANET with Least Control Overhead, which follows a hybrid approach using the grid location service to gather the physical location of the nodes. Use of backup root node provides support in case of primary root node failure. The protocol reduces the total energy consumption as well as improves the performance than a conventional shared tree based protocol by reducing the overhead.

5.1 Zone Routing

A routing zone is defined for each node separately, and the zones of neighboring nodes overlap. A k-hop routing zone of node S can be defined as a connected topological subgraph, on which node S is aware of the route to any other node [13]. The nodes of a zone are divided into border nodes and interior nodes. Border nodes are nodes which are exactly k hops away from the node in question. The nodes which are less than k hops away are interior nodes. In fig. 2, the nodes G, D and M are border nodes and rest all are interior nodes and the node N, 4 hops away from S, is outside the routing zone. However node L is within the zone, since the shortest path up to L with length 3 is less than the maximum routing zone hops.

To manage the overhead, the proactive scope is reduced to a small zone around each node in the WMDPQ protocol. As the zone radius is significantly smaller than the network radius, the cost of learning the zones' topologies is a very small fraction of the cost required by a global proactive mechanism. Zone routing is also much cheaper (in terms of control traffic and congestion) and faster than a global reactive route discovery mechanism, as the number of nodes queried in the process is very small [4]. A bigger proactive zone can be selected for comparatively stable topology where the updates of topology are done on topology change only. In a limited zone, each node maintains a proactive unicast route to every other node. In the proposed protocol the routing is initially established with proactively prospected routes within the zone and then outside the zone, using diffused routing towards the tree members. Therefore, route requests can be more efficiently performed without exploiting the flooding in the network.

5.2 Shared Multicast Tree with Backup Root

In case of shared multicast tree the protocol dependency on a root node to maintain the group information burdens the root node. Due to this shared tree multicast is particularly not suitable from energy balancing point of view because the root of the tree takes on more responsibility for routing, consumes more battery energy, and stops working earlier than other nodes. This leads to reduced network lifetime [12] and the whole multicast tree is disconnected into a number of partitions which consumes a lot of wireless bandwidth for reconstructing the multicast tree from all these partitions. To alleviate this problem, WMDPQ creates the shared multicast tree with backup root node as an alternative to the primary root node. Creation of a backup root node enhances the performance of the multicast tree and also lessens the load on the primary root node. In case of primary root node failure the backup root node takes over, therefore, reduces the dependency on a single root node. This facilitates a great reduction in tree maintenance and tree re-construction overhead. Selection of backup root node is done from the neighbor nodes of the primary root node on the basis of stability, battery status and quality. A non-tree member node with slow movement and more power status is chosen to be the backup root node. If the root node does not found any neighbor node with the required criterion then the selection process is delayed by some random time and after that the backup root node search process starts again. The selection process may lead to slight delay but improves overall efficiency of the protocol by selecting a suitable node as backup node. Selecting a suitable node as backup root node not only serves the purpose of standby root node but also defer the early possibility of searching the backup root node again in case of power failure or movement of the existing backup root node.

5.3 Shared Tree Preventive Modification

The robustness of the multicast tree is adversely affected with the time if individual links are repaired only when broken. Over a period of time due to high mobility of the nodes the overall structure of the tree would be far from optimal, hence making the tree susceptible to even more link breakages. In WMDPQ, the tree is updated regularly and also the preventive maintenance is done which kept the tree robust.

5.3.1 Tree Modification

In order to maintain the tree structure even when nodes move, group members periodically send tree_update requests to the backup root node to lessen the load on the primary root node. The multicast tree can be updated using the path information included in the tree_update request messages. If any change is found in the path the back up root node sends an update message to the primary root node to notify about the change so that the changes in the topology also reflect in the tree structure. Tree_update need to be initiated by leaf nodes only as each uplink next hop puts its own uplink on the tree update message, therefore contains all uplinks as it travels towards backup root node. The period must be carefully chosen to balance the overhead associated with tree update and the delay caused by the tree not being timely updated when nodes move [6, 18, 20].

4.3.2 Preventive Maintenance - Preventive approach is being used for tree reconstruction prior to link breakages in case the tree member wants to leave the tree or its power resource is going to deplete.

A non-leaf node wishing to move out of the multicast tree, will broadcast an alarm message with TTL value 1 to its neighbors before sending the Leave message. It then compares the distance of nodes in its LT and passes all of its routing information to a nearest node which is not a tree member. New links are attached on the tree from the upstream node and downstream nodes of the leaving node to the newly found neighbor node. The downstream node sends tree_update to the backup root node. All the future transmissions follow the path with newly discovered link. In case of leaf node or a normal network node, the node simply sends the leave message to its one hop neighbor nodes. All the neighbor nodes receiving the alarm packet from any node also remove the related entry from their LT and also from request table, if the entry with IP of leaving node exists there. In case of primary root mobility, the primary root sends the alarm message to back up root notifying it to take the control of the tree and passes its all routing information to the back up root. Upon receiving the alarm message, the back up root updates its downstream next hops to the downstream next hops of the primary root node. It also selects a new back up root for its replacement after it resumes as primary root node.

IV. 5.PERFORMANCE COMPARISON

6.1 Simulation Testing

For the simulation of the protocol NS-2.26 simulator has been used. The nodes use the IEEE 802.11 radio and MAC model provided by the CMU extensions. The nodes are placed at uniformly random locations in a square universe. We generate 50 mobile hosts moving randomly within a flat square (1000m X 1000m) area. The model is configured with 100 pixels radio transmission power and 2 Mb/s basic data rate as a sample case. Two Ray Ground mobility model with node speed of 10m/s was used for the simulation. Each simulation was run for 900 simulated seconds. Data traffic was generated using constant bit rate (CBR) UDP traffic sources with 5, 10, 15, 20 and 25 mobile nodes acting as receivers in the multicast group. The node chooses a random destination and moves toward it with a constant speed chosen uniformly between zero and a maximum speed (10 m/s).

6.2 Performance Metrics

The metrics used for performance evaluation were: **(i)Consumption of power** of the nodes in thenetwork.

(ii) Average end-to-end delay of data packets - this includes all possible delays caused by buffering during route discovery, queuing delay at the interface, retransmission delays at the MAC, propagation and transfer times.

(iii) Packet delivery ratio — the ratio obtained by dividing the Number of data packets correctly received by the destination by the number of data packets originated by the source.

PDR= Packets Received / Packets Sent

(iv) Overhead – this includes control overhead required for tree re-construction, maintenance and route search process.

Figures compare the performance of WMDPQ with that of MAODV as a function of no. of receivers. Comparison of energy consumption is shown in fig. 9, end-to-end delay in fig. 10,delivery ratio in fig. 11 and overhead generated of NMPIQ and MAODV protocols is shown in fig. 12.

In all respects the WMDPQ outperforms MAODV due to the constrained directional forwarding in the direction of the target only instead of exploiting the broadcast in the whole network. Location information obtained through grid location service is very useful in this regard.

VII. CONCLUSION

The Effective Multicast Routing Protocol for MANET with Least Control Overhead is compared with other shared tree multicast protocol i.e. MAODV. Comparison was made on various parameters like Energy Consumption, Packet Delivery Ratio, Delay, and Throughput

WMDPQ eliminates the drawbacks even of the shared tree protocols. It reduces the delay problem due to directional diffused forwarding routing and also the network partition problem when a link error occurs due to the failure of primary root. Due to the physical location of the nodes obtained through GLS the route finding process becomes faster, therefore the packets are delivered on a fast pace.

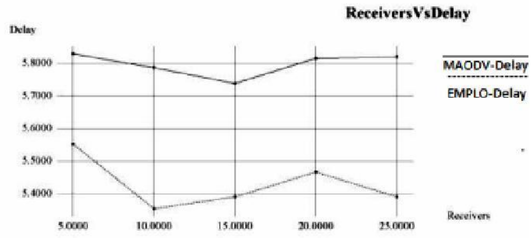

Fig. 10. End-to-End Delay as a Function of Receivers

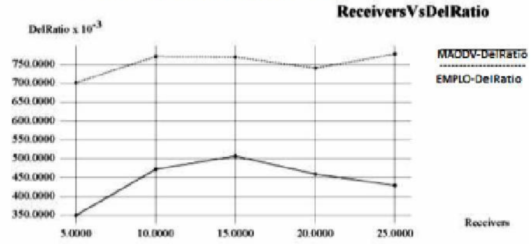

Fig. 11. Delivery Ratio as a Function of Receivers

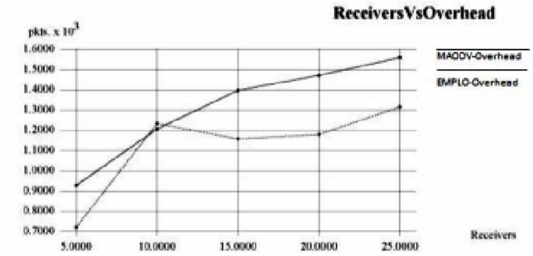

Fig. 12. Overhead as a Function of Receivers

Backup root also facilitates reduction in overhead in case of WMDPQ otherwise required for tree reconstruction and tree maintenance. This result in improved packet delivery ratio and energy balance compared to the conventional shared tree multicast (STM) due to preventive maintenance and also because of support from the backup root in case of primary root failure.

Scalability is achieved due to the shared tree multicast routing protocol as single tree maintenance for all group members is easier than the maintenance of number of trees in case of source based multicast routing protocol.

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