International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017),e-ISSN:2455-2585
International Conference on
Recent Explorations in Science, Engineering And Technology (ICRESET'19)
Volume-5, Special Issue-March, 2019.

ENERGY PROFICIENT BASED ROUTING PROTOCOL ASSORTMENT IN AD HOC NETWORKS

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ABSTRACT: This manuscript presents an original document for multicast routing protocol for mobile ad hoc wireless networks. The protocol, termed ODMRP (On-Demand Multicast Routing Protocol), is a mesh-based, rather than a predictable tree based, Multicast scheme and uses a forwarding group concept (only a subset of nodes forwards the multicast packets via scoped flooding). It applies on-demand measures to dynamically build routes and maintain multicast group membership. ODMRP is well suited for ad hoc wireless networks with mobile hosts where bandwidth is partial, topology changes frequently, and power is controlled. We estimate ODMRP's scalability and performance via simulation.

Keywords: ODMRP, Topology, Network, Unicast, Multicast

1. INTRODUCTION

A Mobile ad hoc network (MANET) is a group of wireless nodes which dynamically organize themselves to form a network without the need for fixed infrastructure. For relaying the packets towards the destination, each node needs to execute routing functionality. As a result, the connection between any two nodes forms a multi-hop path supported by other nodes. However, for the network to operate, each node must be willing to promote packets on behalf of other nodes.

Multicasting is the transmission of datagram's to a group of hosts identified by a single destination address and hence is intended for group-oriented computing. Multicasting can efficiently support a variety of applications that are characterized by collaborative efforts and data transmission. Multicasting techniques can be considered as an efficient way to deliver packets from the source to any number of client nodes.

Multicast routing algorithms have become increasingly important in the field of wireless ad-hoc networks, because they enable the distribution of data to a potential large set of nodes. Nodes form a multicast delivery structure which in normal cases performs better than using multiple unicast routing paths. This is crucial in ad-hoc environments, where bandwidth and power resources are at a premium.

2. PROBLEM STATEMENT

Existing a power control loop, similar to those commonly found in cellular networks, for ad-hoc wireless networks. Mobile ad-hoc networking involves peer-to-peer communication in a network with a dynamically varying topology. Achieving energy efficient communication in such a network is more challenging than in cellular networks since there is no centralized arbiter such as a base station that can administer power management. We use an inclusive simulation infrastructure consisting of group mobility, group communication and environment blockage models. A major focus of research in ad-hoc wireless networking is to shrink energy consumption because the wireless devices are envisioned to have small batteries and be powerless of energy scavenging. We show that this power manage loop reduces energy consumption per transmitted byte by 10 - 20%. Furthermore, we show that it increases overall throughput by 15%.

3. PROPOSED WORK

In this paper present multicast traffic over the Internet is growing steadily with increasing number of demanding applications including Internet broadcasting, and data stream applications and web-content distributions. The proposed work in this paper presented a distributed optimal routing algorithm to sense of balance the load along multiple paths for multiple multicast sessions. In addition, we tackle the optimal multipath multicast routing problem in a more general framework than having multiple trees. We consider different network models with different functionalities. The proposed power alert multicast identifies the characteristics of the proposed routing algorithm. It evaluates its routine under various network conditions. In networks consisting of these nodes, where it is impossible to refill the nodes' power, techniques for energy-efficient routing as well as efficient data dissemination between nodes is crucial.

The optimal values recommend that the complexity of having smart routers that are able to promote packets onto each branch at a different rate offers only a marginal benefit in this scenario. However, it is hard to express any further conclusions as this result may depend on the specific topology and source-destination pair selections. Also, our algorithm does superior than tradition power algorithm as a consequence of the availability of multiple trees to distribute the traffic load. However, while under network topology model the algorithm is able to decrease the cost to a certain level, it cannot eliminate the packet losses and has a much higher overall cost compared to traditional ones. The reason behind this result is the need of multicast functionality. Since we cannot create multicast trees, the only resources due to multicasting occurs between the sources and overlay nodes.

3.1 MULTI PATH CREATION:

- In this module, creates the nodes (sensors) according to the network capacity. Here it will demonstrate in a draw panel. While the creation itself, all the nodes shows their associated calls and initially it will be zero.
- After the creation of the multi paths, connection between the nodes will establish. Connections are based on two conditions, by finding nearest neighbors and by connecting to the isolated paths.
- Each path should connect to the nodes made by the devices, according to the node capacity and power efficient. If network capacity is less, there will be failed paths. User can see the list of total nodes made.

3.2 MULTI-PATH POWER EFFICIENT ROUTING:

A MANET may consist of nodes which are not able to be re-charged in an expected time period, energy conservation is crucial to maintaining the life-time of such a node. In networks consisting of these nodes, where it is impossible to refill the nodes' power, techniques for energy-efficient routing as well as efficient data dissemination between nodes is crucial. An energy-efficient mechanism for unipath routing in sensor networks called going to diffusion has been proposed. Directed diffusion is an on-demand routing approach. In directed diffusion, a (sensing) node which has data to send frequently broadcasts it. When nodes receive data, they send a support message to a pre-selected neighbor which indicates that it desires to receive more data from this selected neighbor.

As these reinforcement messages are propagated back to the source, an implicit data path is set up; each intermediate node sets up state that forwards similar data towards the previous hop.

3.3 RESULT ANALYSIS MULTI-PATH MULTICAST:

Experiments are conducted with the intra domain network topology. It is a close approximation to examine how our routing algorithm performs under these conditions since; recent findings suggest that many ISPs are in the process of increasing the node connectivity of their networks. The routing algorithm starts from the setting that all overlay rates other than the source nodes are set to model, the algorithm starts with basic unicast routing to reach each destination.

It starts with a single shortest path multicast tree rooted at each source node and gradually shifts traffic to alternative trees rooted at overlay nodes 40. Graph module is the important one to see the network ability and to know what the network condition is. Graph draws according to the average number of hops and number of completed paths. This also shows which nodes are at present in the sleep state.

4. ON DEMAND MULTICAST ROUTING PROTOCOL – OVERVIEW

In ODMRP, group membership and multicast routes are established and updated by the source *on demand*. Similar to on-demand unicast routing protocols, a demand phase and a reply phase comprise the protocol. While a multicast source has packets to send, it periodically broadcasts to the entire network a member advertising packet, called a JOIN REQUEST.

This periodic transmission refreshes the membership information and updates the route as follows. When a node receives a non-replica JOIN REQUEST, it stores the upstream node ID (i.e., backward learning) and rebroadcasts the packet. When the JOIN REQUEST packet reaches a multicast receiver, the receiver creates or updates the source access in its Member Table. While valid entries survive in the Member Table, JOIN TABLES are broadcasted occasionally to the neighbors. When a node receives a JOIN TABLE, it checks if the next node ID of one of the entries matches its own ID. If it does, the node realizes that it is on the path to the source and thus is part of the forwarding group. It then sets the FG Flag and broadcasts its own JOIN TABLE built upon coordinated entries. The JOIN TABLE is thus propagated by each forwarding group member until it reaches the multicast source via the shortest path. This process constructs (or updates) the routes from sources to receivers and builds a mesh of nodes, the *forwarding group*.

One of the basic internet tasks is routing between various nodes. It is nothing other than establishing a path between the source and the destination. However in large and complex networks routing is a difficult process because of the possible intermediate hosts it has to cross in reaching its final destination. In order to reduce the complexity, the network is considered as a collection of sub domains and each domain is considered as a separate entity. This helps routing easy. However basically there are three routing protocols in ad hoc networks namely proactive, reactive and hybrid routing protocols. Of these reactive routing protocols establish and maintain routes based on demand.

The reactive routing protocols (e.g. AODV) usually use distance-vector routing algorithms that keep only information about next hops to adjacent neighbors and costs for paths to all known destinations. The reactive routing protocols (e.g. AODV) usually use distance-vector routing algorithms that keep only information about next hops to adjacent neighbors and costs for paths to all known destinations.

The nodes then collectively ensured that all mobile nodes belonging to the multicast group get the message. If a node moves from one cell to another while a multicast is in progress, delivery of the message to the node was guaranteed.

Tree-based multicast routing provides fast and most efficient way of routing establishment for the communications of mobile nodes in MANET. The authors described a way to improve the throughput of the system and reduce the control overhead. When network load increased, MAODV ensures network performance and improves protocol robustness. Its PDR was found to be effective with reduced latency and network control overhead.

On Demand Multicast Routing Protocol is a multicast routing protocol (ODMRP) designed for ad hoc networks with mobile hosts. Multicast is nothing but communication between a single sender and multiple receivers on a network and it transmits a single message to a select group of recipients. Multicast is commonly used in streaming video, in which many megabytes of data are sent over the network. The major advantage of multicast is that it saves bandwidth and resources.

Moreover multicast data can still be delivered to the destination on alternative paths even when the route breaks. It is an extension to Internet architecture supporting multiple clients at network layers. The fundamental motivation behind IP multicasting is to save network and bandwidth resource via transmitting a single copy of data to reach multiple receivers. Single packets are copied by the network and sent to a specific subset of network addresses. These addresses point to the destination. Protocols allowing point to multipoint efficient distribution of packets are frequently used in access grid applications. It greatly reduces the transmission cost when sending the same packet to multiple destinations.

5. PERFORMANCE EVALUATION

The simulator is implemented surrounded by the Global Mobile Simulation (GloMoSim) library. The GloMoSim library is a scalable simulation location for wireless network systems using the parallel discrete-event simulation capability provided by PARSEC.

Our simulation models a network of 50 mobile hosts placed randomly within a 1000 area. Radio propagation range for each node is 250 meters an_ d channel capacity is 2 Mbits/sec. Each simulation executes for 300 seconds of simulation point. Multiple runs with different seed numbers are conducted for each situation and collected data is averaged over those runs.

A free space propagation model with a threshold cutoff is used in our experiments. In the radio model, we assume the ability of a radio to lock on to a sufficiently strong signal in the presence of interfering signals, i.e., radio capture. If the capture ratio (the minimum ratio of an arriving packet's signal strength relative to those of other colliding packets) is greater than the predefined threshold value, the arriving packet is acknowledged while other intrusive packets are dropped. The IEEE 802.11 Distributed Coordination Function (DCF) is second-hand as the medium access control protocol. The method used is Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) with acknowledgments.

The metrics used in ODMRP evaluation are:

- **Packet Delivery Ratio**: The number of data packet delivered to multicast receivers over the number of data packets supposed to be delivered to multicast receivers.
- **Number of Control Bytes Transmitted per Data Byte Delivered**: Instead of using a pure control overhead, we choose to use a ratio of control bytes transmitted to data byte delivered to investigate how efficiently control packets are utilized in delivering data. In addition to bytes of control packets (e.g., JOIN REQUESTS, JOIN TABLES), bytes of data packet headers are included in calculating control bytes transmitted. Accordingly, only bytes of the data payload contribute to the data bytes delivered.
- **Number of Data and Control Packets Transmitted per Data Packet Delivered**: This measure shows the efficiency in terms of channel access and is very important in ad hoc networks since link layer protocols are typically contention-based.

6. SIMULATION RESULTS

The size of multicast group is different to examine the scalability of the protocol. Having only two multicast members corresponds to a unicast position. The outcome indicates that ODMRP delivers high portion of data packets in most of our scenarios. In highly mobile situations, the presentation is the least effective in the two members' case.

When ODMRP functions as a unicast protocol, a mesh is not created and there is no idleness in packet forwarding. Since there are no numerous routes, the probability of packet drop increases with mobility speed. This performance degradation with speed increase also occurs in other unicast routing algorithms. As the number of members increases, the forwarding group mesh creates better-off connectivity among members. The mesh makes the protocol scalable and vigorous to speed. In a tree configuration, a link break prevents packets from being delivered until the tree is reconfigured.

But in the mesh, the data can still reach receivers via other unnecessary routes formed by the forwarding group nodes. We can see from the result that ODMRP delivers greater than 95% of multicast packets even in the appearance of high mobility.

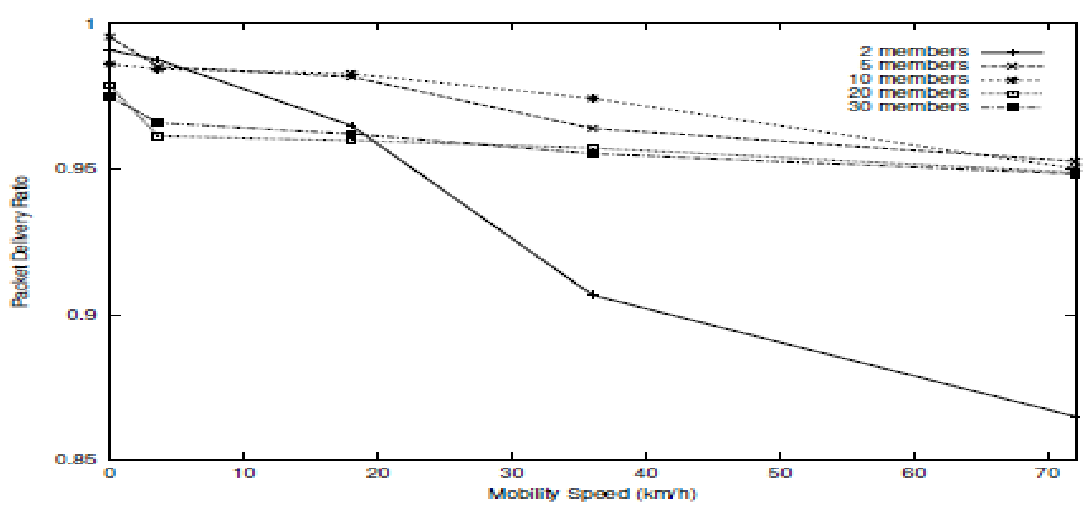

Fig. 1: Mobility Level

The average number of control bytes transmit per data byte delivered is shown in Fig. 1. We can see that ODMRP professionally utilizes control packets in delivering data. JOIN REQUESTS are transmitted by the source only when it has data to launch. JOIN TABLES are sent by receivers when suitable sources exist in their Member Table.

Thus, control packets are generated only if needed and all the control messages are utilized in establishing or refreshing routes and group membership. Furthermore, the transmission of control packets is periodic and the pure control overhead remains relatively constant regardless of mobility speed.

As expected, the efficiency improves as the number of multicast members grows better. Although more JOIN TABLES are propagated when more nodes participate in a multicast group, the number of data delivered increases since more members receive the data.

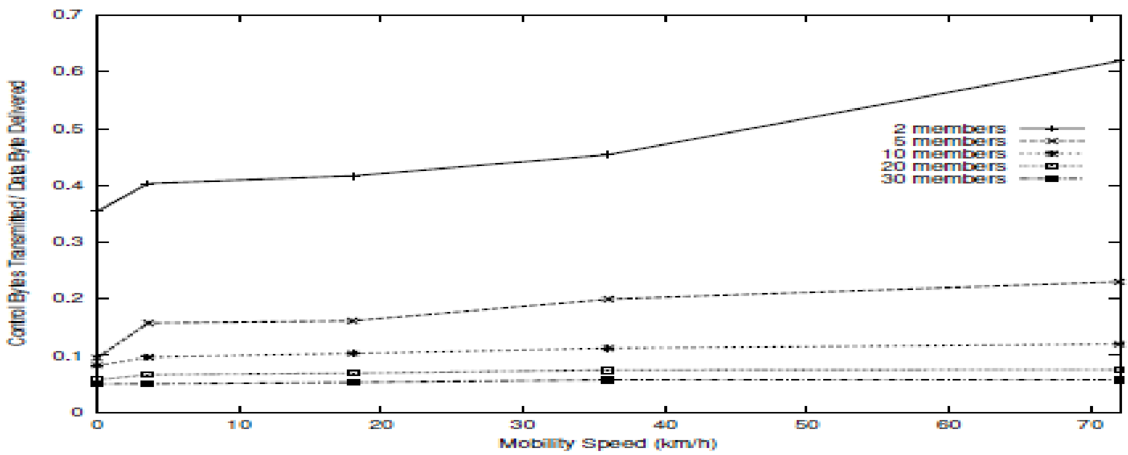

Fig. 2: Mobility Level at different stages

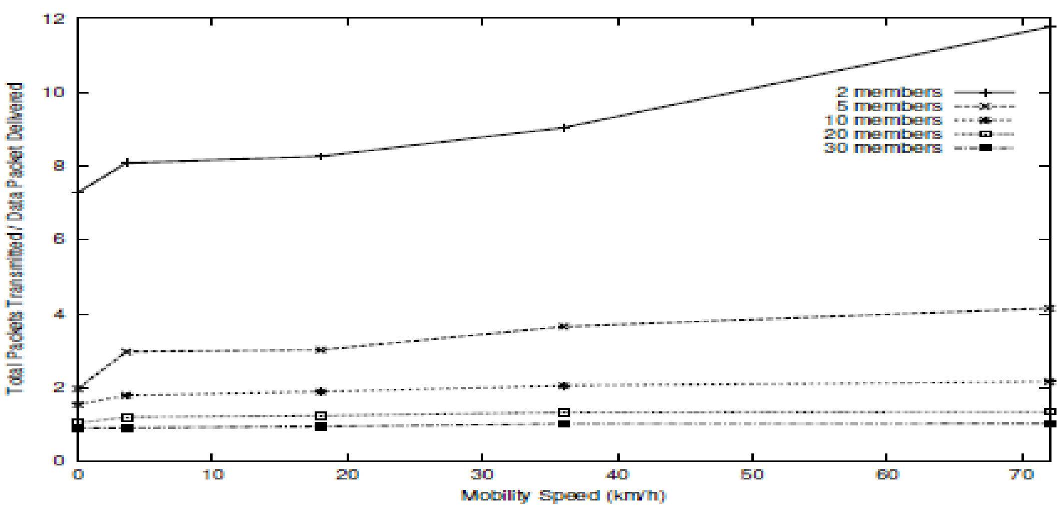

Fig. 3: ODMRP Mobility Level

7. CONCLUSIONS

We have projected ODMRP (On-Demand Multicast Routing Protocol) for a mobile ad hoc wireless network. ODMRP is based on mesh (instead of tree) forwarding. It applies on demand (as opposed to periodic) multicast route structure and membership maintenance. Simulation results show that ODMRP is effective and efficient in dynamic environments and scales well to a large number of multicast members.

The advantages of ODMRP are:

- Low channel and storage overhead
- Usage of up-to-date and shortest Routes.
- Robustness to host mobility.
- Maintenance and exploitation of multiple redundant paths.

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