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An Enhanced Zone Routing Protocol to evaluate performance over MANET

Diksha Jamwal[1], Kamal Kumar Sharma[2], Sharad Chauhan[3]

[1]Student, M.tech, ESSEAR, Ambala
[2]Professor, Dept. of CSE, E-Max group of Institutions, Ambala
[3]Assistant Professor, Dept. of CSE, E-Max group of Institutions, Ambala

Abstract: Adhoc network is the collection of mobile hosts which are continuously moving as they do not have the fixed infrastructure in which engagement of mobile host without an access point. In this paper, we present an algorithm for Adhoc network .The basic idea of this design or algorithm is to reduce the routing overhead between each mobile host and time taken by the sender to send the data packet will be less. Algorithm address some of the previous objections in the protocols, related to the poor efficiency, routing overhead, energy consumption and time taken is more.

Keywords: Wireless Network, Routing Protocol Technique, Adhoc, MANET

I. INTRODUCTION

A computer to computer network is known as Ad-hoc network. In an Adhoc network, computer and devices are connected directly to each other instead of a hub or router .It is a wireless network which do not have fixed infrastructure, it is temporary basis network used in order to serve a temporary communication in which functionality normally assigned to switches, access points. This is not fixed infrastructure because in this nodes continuously moves. So for mobile node which continuous move specific routing is provided i.e. specific routing algorithm is designed or developed to provide a good fit with the expected traffic. Ad-hoc network lacks infrastructure and topology of the network changes dynamically. In mobile adhoc network some protocols are very necessary in order to communicate or exchange packets between two hosts because host cannot exchange the packet directly. Adhoc network must deal with frequent changes in topology because nodes are continuously moving they are continuously changing their location, link status of regular basis. So Ad hoc routing protocols must minimize the time required to converge after these topology changes.

Mobile Ad-hoc networks are self-organizing and self-configuring multihop wireless networks, because the structure of the network changes continuously due to continuously changing or movement of nodes or hosts. Nodes in these networks utilize the same random access wireless channel, cooperating in an intimate manner to engaging themselves in multihop forwarding. The node in the network not only acts as hosts but also as routers that route data to other nodes in network. In mobile ad-hoc networks there is no infrastructure support as is the case with wireless networks, and since a destination node might be out of range of a source node transferring packets; so there is need of a routing procedure. This is always ready to find a path so as to forward the packets appropriately between the source and the destination.

Problems in routing with Mobile Ad hoc Networks

1. Asymmetric links: This is due to the continuously moving of nodes or hosts. Means infrastructure is not fixed. So due to this problem arises.

2. Routing Overhead: Stale routes are generated in the routing table due to which it leads to routing overhead because in Adhoc network nodes often change their location within network.

3. Dynamic topology: As the mobile mode continuously changes this means topology is not constant. In ad-hoc networks, routing tables must somehow reflect these changes in topology and routing algorithms have to be adapted.

A number of routing protocols have been suggested for ad-hoc networks [2]. These protocols can be classified into two main categories: proactive (table-driven) and reactive (source-initiated or demand-driven). Proactive routing protocols attempt to keep an up-to-date topological map of the entire network. With this map, the route is known and immediately available when a packet needs to be sent. The approach is similar to the one used in wired IP networks, for example in OSPF [3]. [1]

Proactive protocols are traditionally classified as either distance-vector or link-state protocols. The former are based on the distributed Bellman-Ford (DBP) algorithm, which is known for slow convergence because of the "counting-to-infinity" problem. To address the problem, the Destination-Sequenced Distance-Vector routing (DSDV) [4] protocol was proposed for ad-hoc networks. On the other hand, link-state protocols, as represented by OSPF [3], have become standard in wired IP networks. They converge more rapidly, but require significantly more control traffic. Since ad-hoc networks are bandwidth limited and their topology changes often, an

Optimized Link-State Protocol (OLSR) [5] has been proposed. While being suitable for small networks, some scalability problems can be seen on larger networks. The need to improve convergence and reduce traffic has led to algorithms that combine features of distance-vector prescribed, although the various and link-state schemes. Such a protocol is the wireless routing protocol (WRP) [6], which eliminates the counting-to-infinity problem and avoids temporary loop without increasing the amount of control traffic. In contrast to proactive routing, reactive routing does not attempt to continuously determine the network connectivity. Instead, a route determination procedure is invoked on demand when a packet needs to be forwarded. The technique relies on queries that are flooded throughout the network.

Reactive route determination is used in the Temporally Ordered Routing Algorithm (TORA) [7], the Dynamic Source Routing (DSR) [8] and the Ad-hoc On-demand Distance Vector (AODV) protocols. In DSR and AODV, a reply is sent back to the query source along the reverse path that the query traveled. The main difference is that DSR performs source routing with the addresses obtained from the query packet, while AODV uses next- hop information stored in the nodes of the route. In contrast to these protocols, TORA creates directed acyclic graphs rooted at the destination by flooding the route replies in a controlled manner.

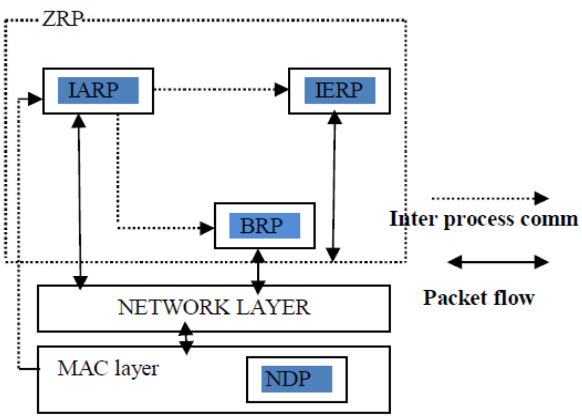
II. THE ZONE ROUTING PROTOCOL

In this section, ZRP combines two completely different routing methods into one protocol. Within the routing zone, the proactive component IARP maintains up-to-date routing tables. Routes outside the routing zone are discovered with the reactive component IERP using route requests and replies. ZRP can be regarded as a routing framework rather than as an independent protocol. ZRP reduces the traffic amount compared to pure proactive or reactive routing. Routes to nodes within the zone are immediately available. ZRP is able to identify multiple routes to a destination, which provides increased reliability and performance. It ensures that the routes are free from loops. It is a flat protocol, which reduces congestion and overhead usually related to hierarchical protocols. The zone routing protocol is targeted for large networks. It differs from cluster based routing protocols because the zones overlap. Because proactive updates are propagated only locally, the amount of control traffic does not depend on network size. The reactive routing is more efficient than flooding since local topology information can be used. Enlarging the zone size reduces the amount of reactive traffic. [10]

The protocol performance can be optimized by adjusting a single parameter, the zone radius. The parameter controls the tradeoff between the cost of the proactive and reactive components, which both are convex functions of the zone radius. The optimal zone radius depends on a number of factors, including node velocity, node density and network span. Since these parameters changes, also the zone radius must be adjusted for optimal performance. Two methods for dynamically adjusting the zone radius have been examined in [10]. The “min searching” scheme keeps the traffic within 7% of the minimum traffic. The “traffic adaptive” scheme performs even better with traffic less than 1-2% than the optimal. The ZRP is defined in three separate Internet drafts: IARP in [11], IERP in [12] and BRP in [13]. ZRP is one of the protocols that are currently under evaluation and standardization by the IETF MANET working group. Since ZRP is more like a routing framework, it does not directly compete with other routing protocols. Most evaluations and comparisons of protocols for ad-hoc networks skip ZRP. The reason is usually that ZRP is aimed for larger networks than the test comprises, or that ZRP is not an independent protocol but rather a routing framework. Further, any evaluation of the ZRP version with support for unidirectional links could not be found. Tests made in [10] verify that ZRP with proper configuration of radius performs more efficiently than traditional routing protocols without need for centralized control. It is especially well adapted to large networks and diverse mobility patterns. We will discuss the routing types. Proactive routing uses excess bandwidth to maintain routing information, while reactive routing involves long route request delays. Reactive routing also inefficiently floods the entire network for route determination. The Zone Routing Protocol (ZRP) [11] [13] aims to address the problems by combining the best properties of both approaches. ZRP can be classed as a hybrid reactive/proactive routing protocol. In an ad-hoc network, it can be assumed that the largest part of the traffic is directed to nearby nodes. Still, nodes farther away can be reached with reactive routing. Since all nodes proactively store local routing information, route requests can be more efficiently performed without querying all the network nodes. Despite the use of zones, ZRP has a flat view over the network. In this way, the organizational overhead related to hierarchical protocols can be avoided. Hierarchical routing protocols depend on the strategic assignment of gateways or landmarks, so that every node can access all levels, especially the top level. Nodes belonging to different subnets must send their communication to a subnet that is common to both nodes. This may congest parts of the network. ZRP can be categorized as a flat protocol because the zones overlap. Hence, optimal routes can be detected and network congestion can be reduced. Further, the behavior of ZRP is adaptive. The behavior depends on the current configuration of the network and the behavior of the users.

Architecture

The Zone Routing Protocol is based on the concept of zones. A routing zone is defined for each node separately, and the zones of neighboring nodes overlap. The routing zone has a radius expressed in hops. The zone thus includes the nodes, whose distance from the node in question is at most hops.



III. PROPOSED ZRP

The design of our algorithm makes the principle that in our design we define the zones, zone head and border nodes. Network is deployed by the nodes and then zones are formed by using the nearest neighbor algorithm and formation of zone head in the zone is formed. Zone head is formed by using the election algorithm and then border node is formed. All the nodes share their resources to each other. The node with best battery life and good processing speed will be elected as a zone head. Battery life of border node is more than aggregation node but less than zone heads. Border node is responsible for packet forwarding. Zone heads send the packet to border node which use the multicast technique and forward the packet to the destination. The main objectives of the research are:

- To reduce the routing overhead.
- To increase the throughput.
- Energy consumed by each node must be less.
- Time to route the packet is less.

IV. SIMULATION

In simulation we are using network simulator program (NS2). In this we have found the performance results of throughput, time delay and energy consumption ratio. As the previous work on routing packets using the technique of broadcasting as in case of LAR protocol as it was only based on flooding of packets all over the network zones. But in this efficient method to carry out routing we have chosen technique multicasting in ZRP. It will focus on factors like routing overhead, energy consumption, enhanced throughput and reduction in time delay. As we are using advanced technique of multicasting so it will give good coverage on reducing all the flaws faced in other protocols of MANETs. Hence it will give more efficient performance in terms of throughput, time delay, consumption of energy etc.

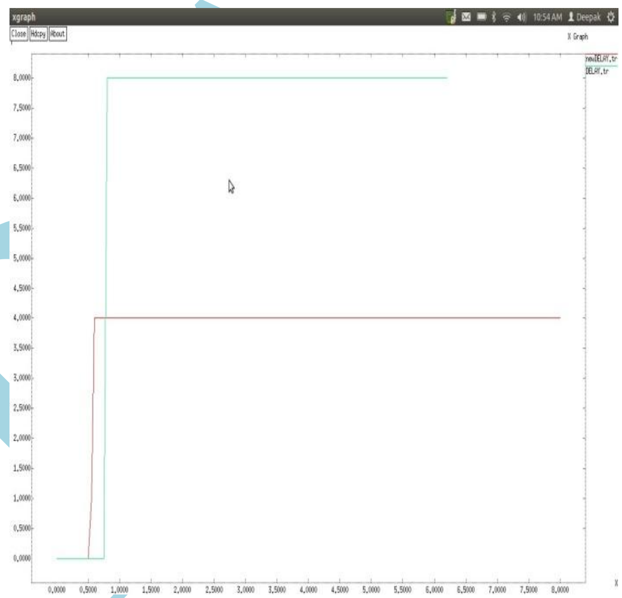


Fig.1: Delay between the previous protocol that use broadcasting and new ZRP which use multicasting

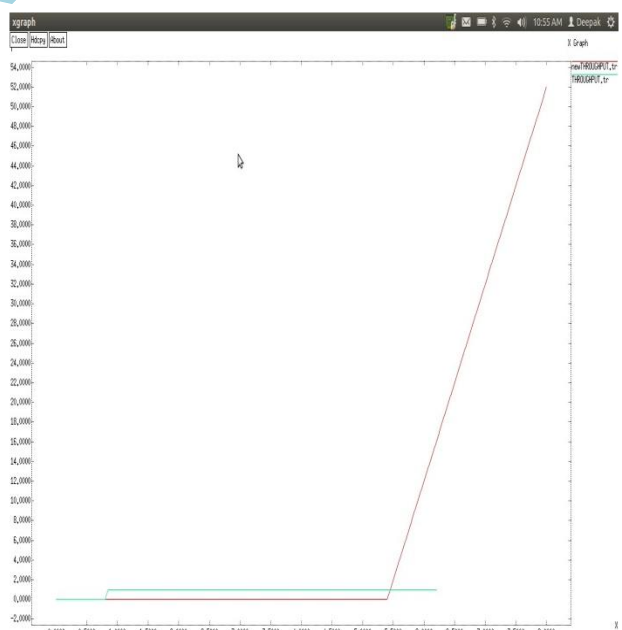


Fig.2: Throughput of new ZRP

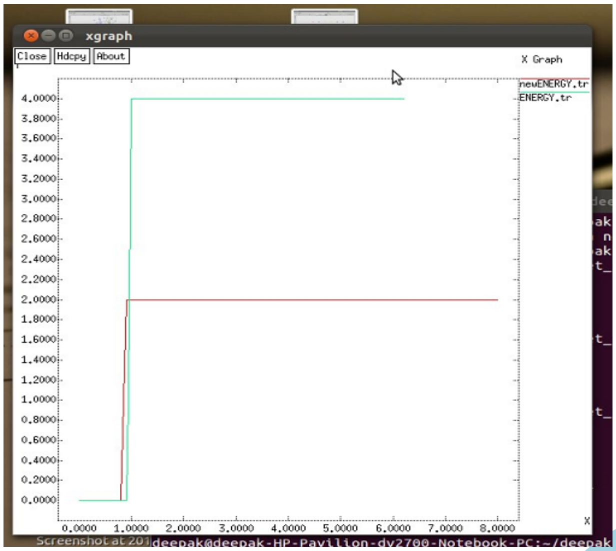


Fig.3: Energy consumed by new ZRP

Simulation will give the more efficient results using multicasting technique which proved to be efficient method of routing. This method will enhance the performance over MANETs. There will be great increase in throughput and decrease in time delay, energy consumption and routing overhead. This scheme gives more efficient results as compared to the previous results.

V. CONCLUSIONS

Based on the evaluations studied in this paper, we can conclude that ZRP performs better than any single proactive or reactive protocol. This is especially true if we take into account that almost any pure proactive and reactive protocol can be adapted as an IARP or IERP component of ZRP. However ZRP use the multicasting approach in which firstly all border nodes share their coordinates and location to their respective zone heads. After that coordinates are shared among all the zone heads by synchronization and then with the help of border nodes the route packet will be forwarded and path is selected. ZRP select the border node which is closest to the border node of zone of destination node so it send the packet to that particular border node and after that the border node sends the packet to destination node. Therefore, ZRP reduces the proactive scope to a zone centered on each node. In a limited zone, the maintenance of routing information is easier. Further, the amount of routing information that is never used is minimized. This reduce routing overhead,time delay and consumes less energy to forward the packet as compared with the LAR protocol. On the other hand it maximizes the throughput rate by proving the better performance among the others in the race.

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