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Zone Based Multi-Path Disjoint Routing In Manet Using Zbmdr Protocol

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Abstract:-A MANET (Mobile Ad hoc Network) is an accumulation of wireless mobile nodes which are autonomous and can dynamically self-organize that creates aprovisional network topology. Numerouspossible applications of MANETs necessitate group communications among several nodes, which is supported by multicasting. In a dynamic environment, it is difficult to maintain group membership management, which is a challenging task to implement robust and scalable multicast routing. For that reason, a novel Zone Based Multipath Disjoint Routing (ZBMDR) is proposed. The proposed ZBMDR is disjoint at the zones which can establish multiple zone disjoint routes between the source and the destination network zones which help to develop the network lifetime and also to reduce the congestion and communication overhead. The proposed ZBMDR protocol is simulated using the NS-2 (NS-2.39) and the experimental results are presented.

Keywords:- *MANET, Multicast Routing, Zone Leader and ZBMDR.*

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I. Introduction

MANETs does not have any pre-existing communication infrastructure and it provides several network services for various mobile users. So, MANET has gained more popularity in the field of research and academic. Pervasive computing is supported by the mobile networking, which is the most important concept in communication. The nodes of MANETs are linked by wireless links which can move freely and randomly within the network and these nodes can also acts as a router at the time of packet transmission takes place. MANETs is entirely different from considering the wireless infrastructure networks and it has several types' traffic also. It provides several applications such as Military Battlefield, Commercial Sector services, Local Level applications, PAN (Personal Area Network), virtual classroom and emergency relief premises. [2,3]. In order to save the bandwidth and network resources, multicasting is used since it involves the delivery of a single message to multiple destinations simultaneously. Multicast routing is an effective method to actualize group communications. If the nodes of MANETs are highly dynamic, then the design of routing protocols becomes a challenging task than wired networks. Generally, the formal multicasting protocols do not have better scalability in the situation of overhead for link searching and management of group membership. Data exchangeand collaborative operations required multicasting, which is a fundamental service of networking that enables group communication and zone based system design in a spread environment. [5,6].

MANETs is described by dynamic topology, restricted data transfer capacity and wireless resources. The mobile nodes that involve the network function by making the utilization of restricted battery power. In the event that certain mobile nodes in a network are utilized extensively it exhausted their battery power and thus they are not accessible for future utilization. This decreases the lifetime of the mobile network. A single path routing protocols make use of the mobile nodes that contain the route between the source and the destination mobile nodes to exchange data packets and thus their battery power is immediately exhausted and this results in a reduced network lifetime. [1].

In addition to frequent topology changes in single path routing need frequent route discovery process that increases the overhead related to the protocol. Multipath routing protocols create various routes between the source and the destination mobile nodes. [7]. The multiple path foundation establishments between the source and the destination, enhance the lifetime of the ad Hoc network, guarantees load balancing, reduces network congestion. Additionally, if any one of the routes created between the source and the destination node is broken, the other accessible routes can be made utilizing of to transmit data packets. The proposed ZBMDR protocol creates multiple zone disjoint routes between the source and the destination network zones subsequently overcoming the disadvantages related to the single path routing protocols.

II. Related work

Zone Routing Protocol (ZRP) [8] is a type of hybrid ad Hoc routing protocol that restricts the proactive nature of the mobile nodes nearby neighborhood. It is made out of an IntrAzone Routing Protocol (IARP) [9], IntErzone Routing Protocol (IERP) [10] and Bordercast Resolution Protocol (BRP) [11].An IARP is any type of proactive routing protocol, like Optimized Link State Routing [12] protocol and Destination Sequenced Distance Vector (DSDV) [13] routing protocol where the proactive path updates are restricted to the neighborhood of the mobile nodes. The extent of the IARP is characterized by the radius of routing zone: the node distance between the hops that IARP path updates are hands-off. The IARP makes utilization of the Neighbor Discovery Protocol (NDP) to get data about each participating node's neighbors. The zone of rooting for each mobile node is characterized as the set of mobile nodes whose minimum hop distance is no greater than the radius of a zone.

Peripheral mobile nodes are the nodes whose distance are defined as the number of hops from the mobile node is precisely equivalent to the radius of that zone. Other nodes in the network zone whose distance from the mobile node is not exactly the zone radius are known as interior nodes. Each mobile node will transmit its nearby routing data in its routing zone. Mobile nodes keep up a routing table that comprises routes to all the mobile nodes in its neighborhood. A path inside a routing zone of a node can be figured out instantly as soon as possible in order to reduce delay. Any conventional proactive directing protocol can be adjusted to IARP. IERP is the worldwide component of reactive routing of ZRP.

There are several reactive routing protocols such as the Ad Hoc on interest, directing convention (AODV) [14], Dynamic Source Routing (DSR) [15] can be utilized as the IERP protocol. At the point when a mobile node needs a path to a node that is not in its routing zone and the IERP will help to discover it. IERP starts a route discovery process and the IERP make utilization of the Bordercasting Routing Protocol (BRP) to path the external query to the peripheral mobile nodes. The conventional reactive routing protocols are adjusted to IERP routing protocol. The peripheral mobile nodes operate the bordercasting again in the event that they can't answer to the question. At last, the inquiry will be spread all through the network. On the off chance that the destination node is exhibited in the zone of a mobile node a route reply message is sent back to the source. The route to a destination mobile node comprises of a record of peripheral mobile nodes. A novel route discovery process is needed at whatever points a peripheral mobile nodechanges. This builds the overhead connected with the path routing protocol.

III. Existing protocol

Zone-Disjoint Multipath extension of Dynamic Source Routing (ZD-MPDSR) protocol [16] is proposed for the Omnidirectional network operation as follows: When a source node wants to make communication with a destination node, but it has no other transmission paths for packet transmission; the source node initiates the route discovery process by broadcasting Route-Request (RREQ) messages throughout the network. Number of Active Neighbors is present for each node that has received and forwarded the RREQ messages during t route discovery process. The RREQ message comprises an Active Neighbor Count Field which is updated by each and every intermediary node before transmitting the message in the neighborhood. When an intermediary mobile node receives a RREQ message, then it disseminates a 1-hop RREQ-query message to its neighbor nodes in order to determine the total number of neighbor nodes who have discovered the RREQ message. These neighbor nodes send number of RREQ query messages and its replies which are received by the mobile node. Depending on this, a measure of the Active Neighbor Count Field is updated in the RREQ message. The destination hub obtains a few RREQ messages and chooses the multiple node disjoint routes with lower Active Neighbor Count measures and the Route- Reply (RREP) messages are broadcasted to the source node along these routes. Despite the fact that the choice of the zone-disjoint routes with lower number of dynamic neighbors will promptdiminish met at end-to-end delay per packet, the route, obtaining stage will acquire a fundamentally more transmission delay as RREQ queries are sent at each and every hop and the intermediate mobile node need to hold up to obtain the RREQ-query replies from their neighbor nodes. This will altogether build the control overhead in the system. This will mainly increase the control overhead in the mobile network.

IV. Proposed Protocol

In this research, Zone Based Multipath Disjoint Routing (ZMBDR) protocol is proposed to increase the efficiency of the MANET. Here, network area is split into several zones to preserve the energy of each participating mobile node. Grouping mobile nodes into zones has been widely employed in the field of research in order to attain network scalability. The network nodes are split into several zones in which each zone has monitoring node. Inter zone routing and intra-zone routing is performed by the network. Each zone in the network has unique ID called zone ID which is used for intra-zone routing. The routing mechanism and multipath formation are explained in the following subsection.

4.1. Routing Mechanism

When a mobile node needs to send in sequence to the destination node it needs to recognize the current zone ID of the destination mobile node so as to successfully forward information to the destination node. As the mobile nodes are transferable they can't be associated with a fixed ID of the zone and consequently it is required for the source to start a location search mechanism to recognize the current zone ID of the destination mobile node. Whenever a source needs to send information to the destination mobile node, it checks its intra zone routing table to check whether the destination mobile node is exists in the table if so, it properly transmits the data packets to the destination mobile node through the route sustained in the intra-zone routing table. In the event that the source does not have a route to the destination mobile node in the intra-zone routing table it starts a location search mechanism to recognize the zone in which the destination mobile node is introduced in. Figure 1 represents the format of location request which is encrusted to all zones in the ad Hoc network. Whenever the gateway node of a zone receives a location request, then it checks its zone coordinates to check whether the destination node exists in its zone, assuming this is the case, Figure 2 represents the format of a location reply which is sent back to the source. Then the source node makes consumption of it's inter zone routing table to transmit the data packets to the destination mobile node. All the mobile nodes in the intermediate network zones send the information packets as per its inter-zone routing table. The destination zone mobile nodes make utilization of the intra zone routing table to send the data packets to the destination mobile node.

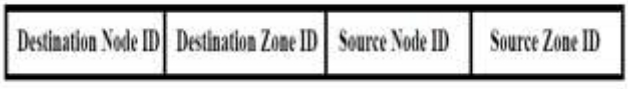

Fig. 1 Location Request Format

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Destination Node ID	Destination Zone ID	Source Node ID	Source Zone ID

Fig. 2 Location Reply Format

4.2. Multipath Formation

With a specific end goal to build multiple zones disjoint routes between the source zone and the destination zones when a destination mobile node delivers a route request it begins a Route Request (RREQ) accumulation timer. As long as the accumulation timer runs, the destination mobile node obtains and operates duplicate route requests starting from the same source. It receives and operates the route requests that are disjoint in the zone level, that is, the paths between the source node and the destination nodes possess no common network zones between one another. The only deviation is that the source zone and the destination zones could be the same. Whenever the accumulation timer runs out the message of route reply is sent back to the source through the different zone disjoint routes created between the source and the destination mobile nodes. The source obtains the request messages and stores them and transmits the information through the different zone disjoint routes which results in the formation of multiple zones disjoint routes between the source and the destination network zones.

V. Experimental Results

Our proposed protocol is simulated in the Network Simulator Environment of version 2.39 (NS- 2.39). The mobile network is split into a number of non overlapping disjoint mobile zones, each of size 350 meter x350 meter Total number of nodes used for simulation are 150 nodesthroughout the network over the number of disjoint zones. The network nodes are mobile and have random movement within a zone orit has communication from one zone to another zone. Since the proposed protocol establishes multiple routes between the source node and the destination mobile nodes. The packet loss ratio of existing and proposed protocols is given in figure 2.

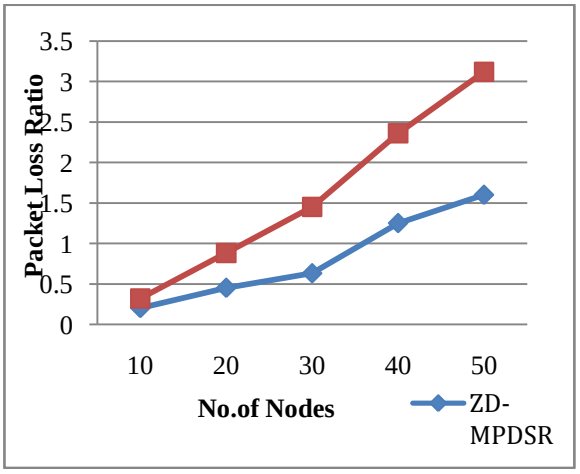

Figure 2: Number of Nodes Vs Packet Loss Ratio

The packet delivery ratio of proposed and existing protocols is compared in figure 3 which increases for the proposed protocol since multiple routes are established which can be employed to route data packets to the destination mobile node simultaneously.

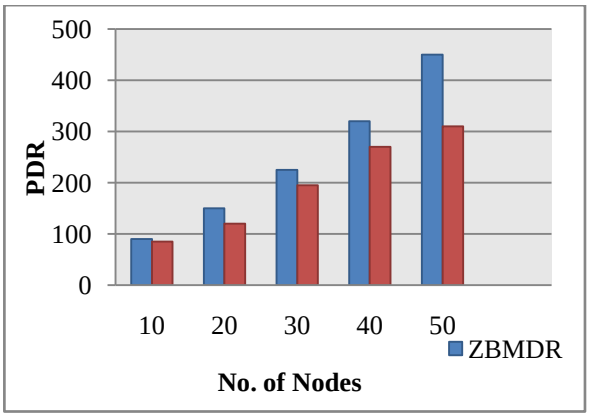

Figure 3: Number of Nodes Vs PDR

Throughput and Scalability of proposed and existing protocols are compared in figure 4.

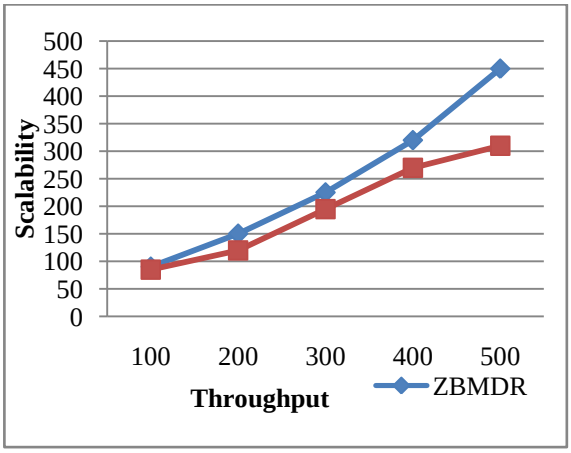

Figure 4: PDR Vs Throughput

VI. Conclusion

Thus, we proposed Zone Based Multipath Disjoint Routing (ZBMDR) protocol that establishes multiple zone disjoint routes between the source and the destination mobile nodes. Our proposed protocol helps in increasing packet delivery ratio, load balancing and reducing packet loss; thus, network lifetime is increased. The experimental results, check our cases and demonstrate that the proposed ZBMDR protocol reduces the data packet loss and increases the packet delivery ratio when compared to the conventional ZD-MPDSR protocol. As a region of interest in the future, a novel security protocol with dedicated security mechanisms applies to our proposed work in order to enhance the security of our proposed protocol.

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