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Hybrid Routing Protocol

(Bandwidth Management in Ad– Hoc Wireless Network)

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Abstract- **An Ad Hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any existing network infrastructure or centralized administration. Nodes in mobile and ad hoc network communicate with one another via packet radios on wireless multihop links. Because of node mobility and power limitations, the network topology changes frequently.Routing protocols therefore plays a important role in mobile multihop network communications. Routing protocols used inside ad hoc must be prepared to automatically adjust to an environment that can vary between the extremes of high mobility with low bandwidth and low mobility with high bandwidth. Most of the protocols in this category, however, use single route and do not utilize multiple alternate paths. In this paper, we prepared a bandwidth efficient multicast routing protocol for ad hoc network. A Hybrid Routing protocol under bandwidth constraints (HRP-*BC)* has been proposed. The hybrid routing protocol combines the advantages of proactive routing protocol and reactive routing protocol. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. The proposed protocol achieve low communication overhead, and achieves high multicast efficiency this protocol improves existing routing protocols by creating a mesh and providing multiple alternate routes. The protocol considers the following 1) Route setup as routing Distance of path, 2) Load at the node as traffic and, 3) Bandwidth as queue length of the node. The proposed scheme utilizes the path information, traffic and bandwidth resource information at each node, for selection of route path, and compared to traditional DSR schemes.**

The performance of HRPBM is evaluated through simulations. The simulation of the protocol is done on NS-*2* simulator. The simulation results of this routing protocol shows that this protocol achieves better performance to the DSR protocol for the maintenance overhead and the path reliability. It reduces congestion in network and improves bandwidth utilization, thus provides efficient use of bandwidth in the ad hoc network.

Keywords- MANET; proactive; reactive; bandwidth; hybrid; HRPBM; DSR; NS-2.

I.INTRODUCTION

A mobile Ad Hoc Network is an autonomous network that can be formed without the need of any established infrastructure or centralized administration [1]. An Ad Hoc network (MANET) is a self configuring and infrastructure less network of mobile nodes. Each node acts as a router and free to move independently in any direction. In ad hoc network communication between two nodes beyond the transmission range relies on intermediate nodes to forward the packet [2]. The ad hoc network has great potential in application domains where infrastructure deployment is expensive or not at all possible, like transportation, intelligence scenarios or battlefield environment. The cornerstones of the ad hoc network are routing protocols. In ad hoc networks, routing protocols are responsible for enabling network communications. Such protocols are specifically designed to work in the absence of fixed infrastructure. Nodes in mobile and ad hoc networks communicate with one another via packet radios on wireless multihop links. While exchanging the information, the nodes may continue to move, so the network must be prepared to adapt continually [3] Because of node mobility and power limitations, the network topology changes frequently. Routing protocols therefore play an important role in mobile multihop network communications. Most of the protocols in this category, however, use single route and do not utilize multiple alternate paths. In the simplest cases, the node may be able to communicate directly with each other. However ad hoc networks, sometimes supports communication between nodes which are indirectly connected to other node by series of nodes. In general ad hoc network looks like a network in which every mobile node is potentially a router, and all nodes run a routing protocol.

Unfortunately, routing algorithms work poorly in environment where this is a drastic and frequent change in the topology of network as the mobile node moves. In order for dissemination of routing information the nodes must rely and cooperate among each other for routing services. The application running inside network nodes communicate among them through data flows and exchanging of different types of data packets inside the network. The routing protocols can be divided into two types reactive and proactive. The reactive protocol finds the route required by flooding network with route request packets. On the other hand the proactive protocol maintains a fresh list of routes and destinations by periodically distributing routing tables throughout the network [1]. Due to its ease of deployment and no centralized control unit, mobile nodes can connect with each other in any form of network topology anytime [4][5]. In MANET multicast service plays an important role, without multicast capabilities we have to send information to all receivers by unicast connections. There are many multicast protocols in traditional wired networks such as Distance Vector Multicast Routing Protocol (DVMRP), Multicast extension to the Open Shortest Path First (MOSPF), Core Based Trees (CBT) Protocol Independent Multicast (PIM) and so on.

Dynamic changes in topology, with time in MANET leads to several issues, like processing overhead, packet collision and route maintaining. Ad hoc networks are thus conceived to ease the entrance of new nodes. This property is their biggest strength and main security weakness. In this paper, the proposed HRP-BM protocol deals with the issue reliable multicast, reduce congestion in Network and efficient use of bandwidth. The protocol proposed requires small number of control packets both for set up and maintain routes and transmission of packets.

II.PROBLEM STATEMENT

The routing problem is that of finding a series of intermediate nodes through which we can send a packet from source to

destination. In basic hop to hop problem each node in the network contains a table. The goal of routing protocol is to ensure that overall data structure contain consistent and correct view of the actual network topology.The problem is to maintain a consistent and correct view becomes harder as the number of nodes increases. The challenge is to create a single protocol that can adapt to the wide variety of conditions present inside ad hoc networks.The routing must perform efficiently in conditions in which nodes are stationery and bandwidth is not a limiting factor. The protocolsshould work correctly when the bandwidth available need is low and the topology and the level of mobility change.The routing protocol must perform efficiently in environments in which nodes are stationary and bandwidth is not a limiting factor. Yet, the same protocol must still function efficiently when the bandwidth available between nodes is low and the level of mobility and topology change high. Because it is often impossible to know *a priori* what environment the protocol will find itself in, and the environment can change unpredictably, the routing protocol must be able to adapt automatically.

Most routing protocol include some periodic behavior meaning that there are protocol that are performed regularly at some interval of time. The periodic behavior of protocol limits the ability of protocol to meets the changing environment.The alternative to periodic routing protocol is one that operates in an *on demand* fashion.On demand protocols are based on the premise that if a problem or inconsistent state can be detected before it causes permanent harm the all work to correct problem or maintain consistent state can be delayed until it is proven to be needed .They operate using the same lazy philosophy as optimistic algorithm[6][7].

III.PROPOSED ALGORITHM – DESIGN SPACE

Routing protocols plays an important role in mobile multihop network communications. Most of the protocol in this category, however, use single route and do not utilize multiple alternate paths. In this paper, we propose a scheme to improve existing routing protocols by creating a mesh and providing multiple alternate routes. We here proposed a HRPBM(Hybrid routing protocol for bandwidth management in ad hoc wireless network) a hybrid routing protocol. The protocol considers three things.

1)Routing Distance of path

2)Load at the node as traffic and

3)Queue length at the node, for selection of path

The proposed schemeutilizes the path information, traffic and bandwidth resource information kept at each node. When compared to traditional schemes. The simulation results show that the proposed HRPBM protocol achieve the above objectives and is superior to the DSR scheme for the maintenance overhead and the path reliability. Thus reducing congestion in network and improving bandwidth utilization this provide efficient use of bandwidth. The proposed multicast routing protocol requires low communication overhead since it does not require periodical transmission of control packets. Most of the existing multicast routing protocols, such as DVMRP (Distance-Vector Multicast Routing Protocol) [8] and FGMP (Forwarding Group Multicast Protocol) [9], require periodical transmission of control packets in order to maintain multicast group membership and multicast routes, thereby wasting a lot of bandwidth. In the proposed protocol, route setup and route recovery are invoked only when they are required route setup process is invoked only when a new node joins a multicast group, and route recovery process is invoked only when a multicast route breaks due to the node movements.

PROPOSED MODEL

Mobile ad hoc network has available bandwidth B, number of nodes is n, distance between nodes is D and load at each node is L. The following fig shows wireless network of 5 nodes,

Total Available Bandwidth=B

N_i=Nodes Name

Q_i=Length of queue at node N_i

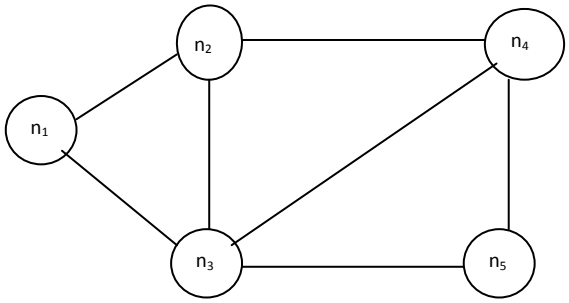

Fig:3.1 Mobile ad hoc network with five nodes

So in order to select path from n_1 to n_5. It may select from

1. **P_1:n_1-n_2-n_4 -n_5, or**
2. **P_2:n_1-n_3-n_5, or**
3. **P_3:n_1-n_2-n_3-n_4-n_5, or**
4. **P_4:n_1-n_2-n_3-n_5**

(A).DESIRED CHARACTERSTICS FOR PATH SELECTION

1. Distance of selected path is min or optimum.
2. Load in selected path is minimum or optimum and load at intermediate node is less than threshold of B.
3. Queue length at intermediate node of the path is minimum or optimal.

Distance is based in the number of hop counts. Queue length is known to all the nodes, and while transferring tthe queue length, the maximum of all queue length at all intermediate nodes in path is stored only. As a node can transfer only one packet at atime, thus the queue length can be used to estimate the available bandwidth.

Thus, the position of paths in bandwidth list is similar to the position of path in queue length list.

(B).CONTROL PACKET DETAILS:

It contains how the routing table is constructed and the paths are constructed

(a).CONSTRUCTION OF ROUTING TABLE:

Whenever a mobile node enters the wireless network it would broadcast a notification packet with fields as shown in fig. – 3.2 queue length, the maximum of all queue length at all intermediate nodes in path is stored only. As a node can transfer only one packet at a time, thus the queue length can be used to estimate the available bandwidth.

Thus, the position of paths in bandwidth list is similar to the

Node No.	Distance	Queue length	Flag bit (00)

position of path in queue length list.
Fig:3.2 Notification packet

Initially the distance field value is initialized to 1 and queue length is initialized to 0 and node number is calculated from the IP address and subnet mask. Arithmetic to calculate the node number is to apply AND operation on complement of subnet mask and IP address. Flag field is a 2-bit field and its set to 00 for notification packet.
The receiving node, would match node no. of the received packet from their table, if it don't have this node no. registered in its table, it would add a row
(b).CONSTRUCTION OF PATH:
For the transmission of message from source node to destination node there must be a path where the load is minimum or optimum and load at intermediate node is less than threshold of B. in The flow graph for path construction is given in fig 3.3

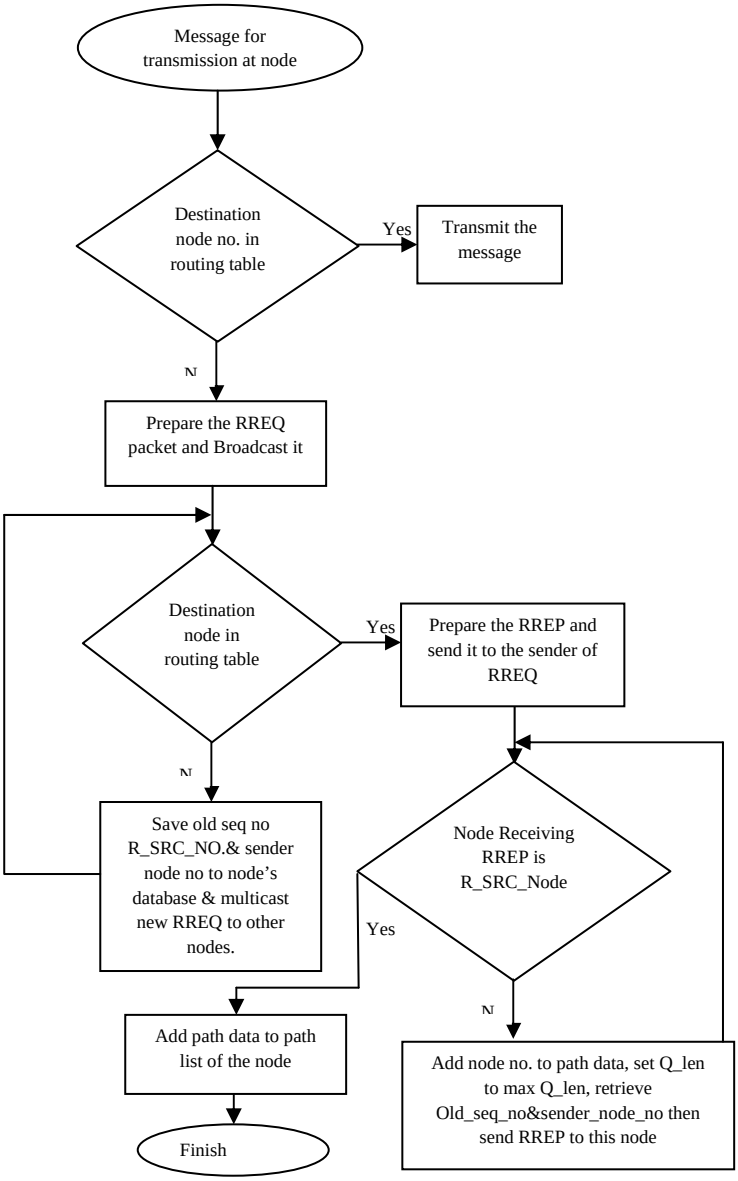

Fig:3.3 Flow graph for Path Construction

(C).ALGORITHM FOR SELECTION OF PATH:

Consider all the paths

i. Arrange all the possible paths in ascending order of queue length, load and distance, considering only paths which has load lower than threshold.
ii. Take the sum of position of the path in the three lists and finally select the path with lowest sum.
iii. In case if minimum sum of position in the three lists calculated in step (ii) is more than once then the following preference order is used to break the tie for selecting an optimal path.

Queue Length > Load > Distance of path

IV.SIMULATION RESULTS

We evaluate the performance of HRPBM through simulations. The simulation of HRPBM was done on NS-2 simulator. Several measurement metrics were collected from our propose simulator to evaluate the performance of HRPBM.The data packet delivery ratio is performed as the number of data packets generated by the source. The former reflects the cost in transmitting control packet, and otherrepresent the efficiency of packet delivery.
The data delivery ratio affected by multicast size. Size defines the number of member nodes in each multicast group. Node number defines the number of total mobile nodes in Network; it is found that the data delivery ratio decreases as the size increases. On the other hand, we compare the data delivery ratio under different Range.

V.CONCLUSIONS

In this paper we proposed an hybrid Routing algorithm for Mobile Ad-hoc Network(MANET) which is novel scheme. HR PBM (Hybrid routing protocol for bandwidth management in ad-hoc network). The algorithm will mostly select the optimal path for the transmission of packets from source to destination in wireless ad-hoc networks. The proposed scheme adopts the path information kept at each node and bandwidth information. It is compared to traditional schemes. The simulation show that the proposed HRPBM protocol achieves the above objectives and is not overload with control packets transfer for maintains the reliability and optimality of path, Thus reducing the congestion in network and improving bandwidth utilization.

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