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Opportunistic Data Forwarding In MANETS through Proactive Source Routing

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ABSTRACT: In multi hop wireless networking, Opportunistic data forwarding has drawn much attention, with most research conducted for stationary wireless networks. Opportunistic data forwarding has not been widely utilized in mobile ad hoc networks (MANETs),the reason behind this is the lack of an efficient lightweight proactive routing scheme with strong source routing capability. In this paper, proposed a lightweight proactive source routing (PSR) protocol. PSR can maintain more network topology information than other protocols like distance vector (DV) routing to facilitate source routing, although it has much smaller overhead than traditional DV-based protocols [e.g., destination-sequenced DV (DSDV)], link state (LS)-based routing [e.g., optimized link state routing (OLSR)], and reactive source routing [e.g., dynamic source routing (DSR)]. This paper concentrates on reducing the overhead at the base line protocols, then testing to the better data transportation. Network Simulator (NS-2) help in testing and implementing to this paper for effectively reduced to the overhead in the data transportation.

KEYWORDS: Multi hop networking, oppourtunistic data forwarding,proactive routing, source routing,overhead.

I.INTRODUCTION

Mobile ad-hoc network (MANET) is considered to be a self-configuring and self organized network of mobile devices. In a wireless communication network that contains the mobile devices, cameras, Laptop, desktop, pocket Device. Mobile ad hoc network (MANET) is a wireless communication network, where nodes that are not within the direct transmission range of each other require other nodes to forward data. It can operate without existing infrastructure and support mobile users, and it falls under the partitions and constrained resources.[1] MANETS does not require base stations.The most salient research challenges in this area include end-to-end data transfer, link access control, security, and providing support for real-time multimedia streaming [2].

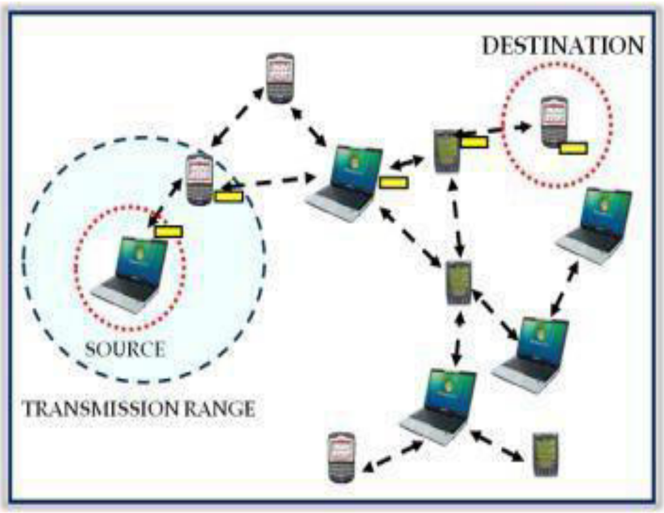

Fig 1.Mobile Ad hoc Network.

The network layer has received a great role in the research on MANETs. Practically, the two most important operations at the network layer are data forwarding and routing.These are the two distinct concepts. Data forwarding regulates

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how packets are taken from one link and put on another link.And the other function routing determines what path a data packet should follow from the source node to the destination. The basic idea of opportunistic routing is selecting forwarding nodes to forward data packets and coordination among these nodes to avoid duplicate transmissions. The opportunistic routing in MANET is used to fully utilize the broadcast nature of wireless medium and to improve transmission reliability of the network[3]. Opportunistic routing is used, where the network has the features like dynamic topology changes and intermittent network connectivity. Opportunistic data forwarding refers to a way in which data packets are handled in a multihop wireless network.[1]

III LITERATURE SURVEY

Zehua Wang and Cheng Li, discussed[1] about opportunistic data forwarding and Proactive or Table Driven Protocols. This type of routing protocols is very familiar in fixed wired networks. In this approach, each ad-hoc node consists of a topology table, which contains the up to date networks nodes interaction information. This table is updated all the time and it gives the proactive protocols another name of table-driven. One or more routing tables are maintained at each node and are exchanged periodically to share the topology information with the neighbouring nodes in order to maintain a consistent network view.

M. Al-Rabayah and R. Malaney [2] proposed A new scalable hybrid routing protocol for VANETs. Hybrid protocols inherit the advantage of high-speed routing form proactive and less overhead control messages from reactive protocols. The characteristics of proactive and reactive routing protocols can be integrated to achieve hybrid routing technique.

Topology control and routing in ad hoc networks is presented by R. Rajaraman [3] discussed Ad-hoc network based on proactive protocols, power and bandwidth in this type of consumption increased due to topology table exchange among nodes after each changing in nodes location. This takes place even if the network is in stand-by mode.

Rashmi Dewangan, Prof. Somesh Kumar Dewangan[4] proposed a theory in the paper ," An Enhanced Light-weight Proactive Source Routing Protocol using BFS and DFS for MANET", In this paper, MANET is a self organized and self configurable network without existing infrastructure. It consists of several mobile wireless nodes. A routing protocol provides an efficient route between mobile nodes within the network. The discovery and maintenance of route should consume minimum overhead and bandwidth. In this paper, a novel Proactive Source Routing protocol that has a very small communication overhead. The proposed work is an efficient and improved light-weight proactive source routing protocol for MANETs that utilizes two common searching algorithms, called breadth first search (BFS) and depth first search (DFS) to discover the route. MANET continuously maintains the information required to properly route the traffic.

S. Biswas and R. Morris studies the concept of ExOR: Opportunistic multi-hop routing for wireless networks, "In this Ex OR [5], an integrated routing and MAC technique that realizes some of the gains of cooperative diversity on standard radio hardware such as 802.11.ExOR broadcasts each packet, selecting the best forwarder to forward only after learning the set of nodes which actually received the packet. In the co operative diversity schemes, delaying forwarding decisions until or after the reception allows Ex OR to try multiple long but radio lossy links concurrently, leads to high expected progress per transmission. But, unlike cooperative methods, Ex OR uses only a single node to forward each packet, so that ExOR works with existing radios. The main problem in realizing Ex OR is ensuring that only the "best" receiver of each packet forwards it, in order to avoid duplication.

T. Clausen and P. Jacquet in , "Optimized Link State Routing Protocol (OLSR),"[6] described the Optimized Link State Routing (OLSR)protocol for mobile ad hoc networks. The protocol is an optimization of the classical link state algorithm tailored to the requirements of a mobile wireless LAN. The key concept used in the protocol is that of multipoint relays (MPRs).

C. E. Perkins and E. M. Royer describes in their paper, "Ad hoc On-Demand Distance Vector (AODV) routing,"[7] that Reactive routing techniques, also called on-demand routing, take different approach for routing than proactive protocols. Routes to the destination are discovered only when actually needed. When source node needs to send packet to some destination, it checks it routing table to determine whether it has a route. If no route exists, source node performs route discovery procedure to find a path to the destination. Reactive routing protocols can dramatically reduce routing overhead because they do not need to search for and maintain the routes on which there is no data traffic. Such property is so much important in the resource-limited environment. The most accepted reactive protocols are DSR and AODV. They do not initiate route discovery by themselves, until they are requested, when a source node request to find a route. These protocols setup routes when demanded. When a node wants to communicate with another node in the network, and the source node does not have a route to the node it wants to communicate with, reactive routing protocols will establish a route for the source to destination node.

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IV.SYSTEM MODEL AND ASSUMPTIONS

Design Of Proactive Source Routing-

PSR provides every node with a breadth-first spanning tree (BFST) of the entire network rooted at itself. To do that, nodes periodically broadcast the tree structure to their best knowledge in each iteration.

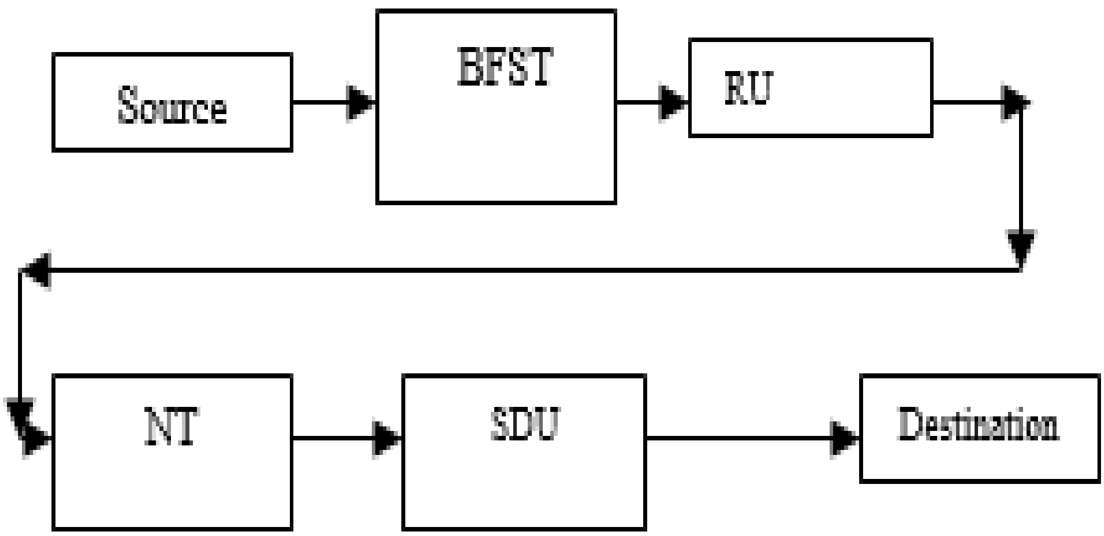

Fig 2:Block Diagram of The System

Based on the information collected from neighbours during the most recent iteration, a node can expand and refresh its knowledge about the network topology by constructing the more recent BFST. On the other hand, when a neighbour is deemed lost, a procedure is triggered to remove its relevant information from the topology maintained by the detecting node. Each and every node broadcast the packet in the form of tree structure. The relevant information is collected from all the neighbouring nodes. Based on this information collected from the neighbours, a node can expand and refresh its knowledge about the network topology. When a neighbouring node is lost, a procedure is triggered to remove its relevant information from the topology.PSR provides every node with a breadth-first spanning tree (BFST)[4] of the entire network rooted at itself. In this, nodes periodically broadcast the tree structure to their best knowledge in each iteration. Based on the information collected from neighbours during the most recent iteration, a node can expand and refresh its knowledge about the network topology by constructing a deeper and more recent BFST. This knowledge will be distributed to its neighbours in the next round of operation. On the other hand, when a neighbour is deemed lost, a procedure is triggered to remove its relevant information from the topology repository maintained by the detecting node. Before describing the details of PSR, we will first review some graph-theoretic terms used here. Let us model the network as undirected graph $G = (V, E)$, where V is the set of nodes (or vertices) in the network, and E is the set of wireless links (or edges). Two nodes u and v are connected by edge $e = (u, v) \in E$ if they are close to each other and can directly communicate with given reliability. Given node v, we use $N(v)$ to denote its open neighborhood, i.e., $\{u \in V \mid (u, v) \in E\}$. Similarly, we use $N[v]$ to denote its closed neighborhood, i.e., $N(v) \cup \{v\}$.

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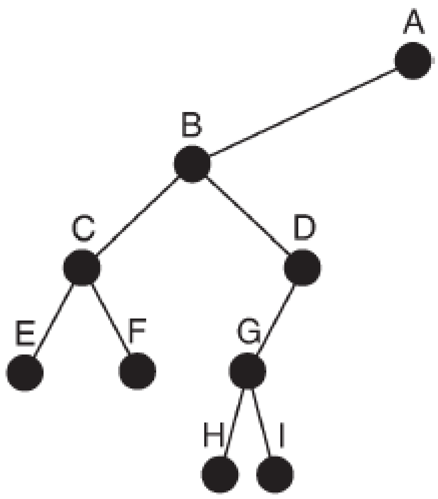

Fig 3:BFS Tree

Node v responds by:
1) first, updating $N(v)$ with $N(v) - \{u\}$;
2) then, constructing the union graph with the information of u removed, i.e.,

$$Gv = Sv \cup (Tw - v)$$

3) finally, computing BFST Tv.
Notice that Tv, which is thus calculated, is not broadcast immediately to avoid excessive messaging. With this updated BFST at v, it is able to avoid sending data packets via lost neighbours. Thus, multiple neighbour trimming procedures may be triggered within one period.

The functions of PSR are:
• Route Update
• Neighbourhood Trimming
• Streamlined Differential Update

Route Update
Due to the proactive nature of PSR, The update operation of PSR is iterative and distributed among all nodes in the network. Each node updates its own BFST based on the recent information received from its neighbours. Communication overhead is not increased as one routing message is sent per update interval.

Neighbourhood Trimming
When a neighbour is lost, its contribution to the network connectivity should be removed. Neighbourhood trimming takes place under the following conditions:
1) No routing update or data packet has been received from the lost neighbour for a given period of time.
2) A data transmission to the lost node have failed, as reported by the link layer.

Streamlined Differential Update
Full dump messages are interleaved using differential updates. The idea is to send the full update messages less frequently than shorter messages containing the difference between the current and previous knowledge of a node's routing module. First, we use a compact tree representation in full-dump and differential update messages to halve the size of these messages. Second, every node attempts to maintain an updated BFST as the network changes so that the differential update messages are even shorter.

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They attempt to maintain consistent and updated routing information for every pair of network nodes by propagating, proactively, route updates at fixed time intervals. As the routing information is usually maintained in tables, these protocols are sometimes referred to as Table-Driven protocols.

Architecture of the Proactive Communication-

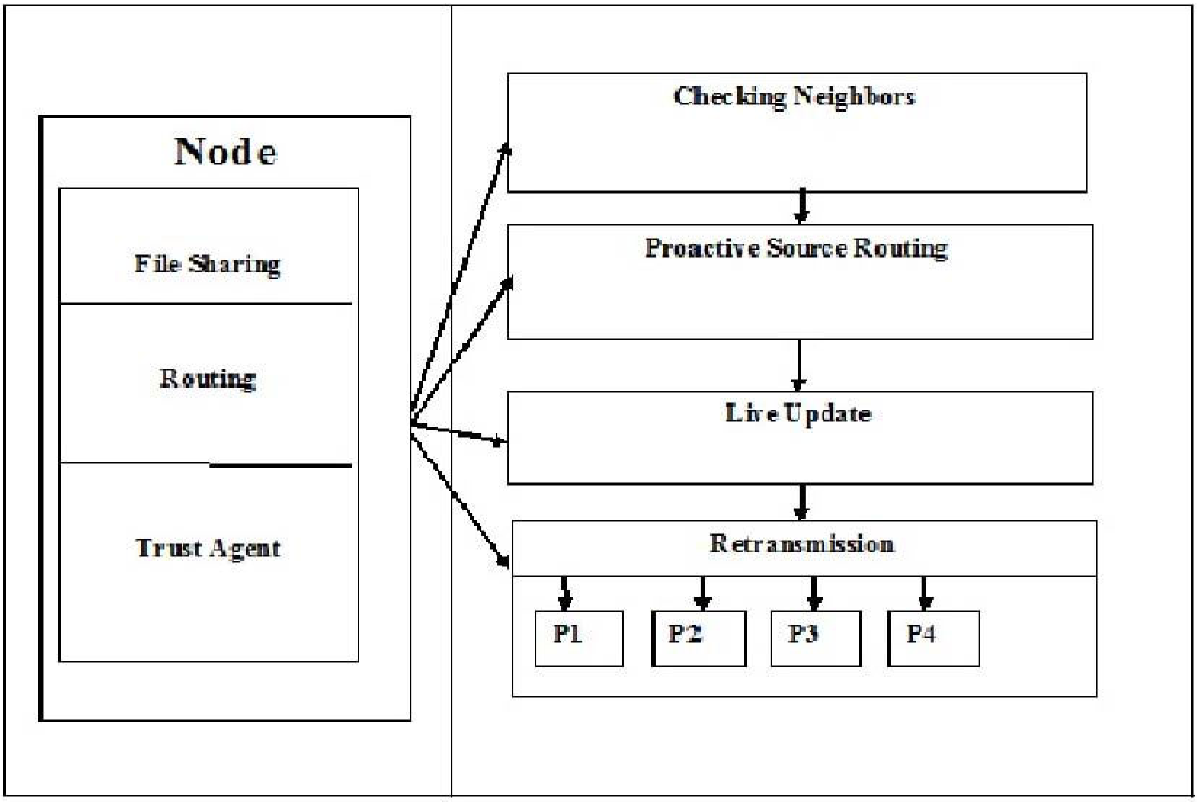

Fig4:Architecture Diagram For Proactive communication.

1) Table Update: Due to its proactive nature, the update operation of our work is iterative and distributed among all nodes in the network. At the beginning, node is only aware of the existence of itself. By exchanging the table information with the neighbours, it is able to maintain the network topology. In each subsequent iteration, nodes exchange their table data with their neighbours. From the perspective of source node, toward the end of each operation interval, it has received a set of routing messages from its neighbours. Note that, in fact, more nodes may be situated within the transmission range of source node, but their periodic updates were not received by it due to, for example, bad channel conditions. After all, the definition of a neighbour in MANETs is a fickle one. (We have more details on how we handle lost neighbours subsequently.) [4]Source Node incorporates the most recent information from each neighbour to update its own table. It then broadcasts this information to its neighbours at the end of the period. In fact, in our implementation, the given update of the table happens multiple times within a single update interval so that a node can incorporate new route information to its knowledge base more quickly. This does not increase the communication overhead at all because one routing message is always sent per update interval.

2) Lost Neighbour Information Removal If a neighbour is disconnected from the network then each node removes all the data about the lost node. Such process is triggered by the following cases: No routing update or data packet has been received from this neighbour for a given time. A data transmission to such node has failed.This process can be initiated more number of times.

3) Differential Update Mechanism[4] In addition to dubbing route updates as hello messages in this mechanism, we interleave the full dump routing messages, with differential updates. The basic idea is to send the full update messages less frequently than shorter messages containing the difference between the current and previous knowledge of a node's routing module. Our goal is to broadcast the information stored at a node to its neighbours in a short packet.

4) Route Discovery using BFS and DFS[5] The route discovery procedure is performed by Breadth First Search (BFS) and Depth First Search (DFS) in the wireless network. These search techniques work separately in the nodes of MANET. BFS and DFS algorithms are performed by two separate neighbour nodes of the source node. The optimized

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result is selected by such scheme and transfers the packet on the network. We can easily understand this process with Fig that shows the data flow diagram.

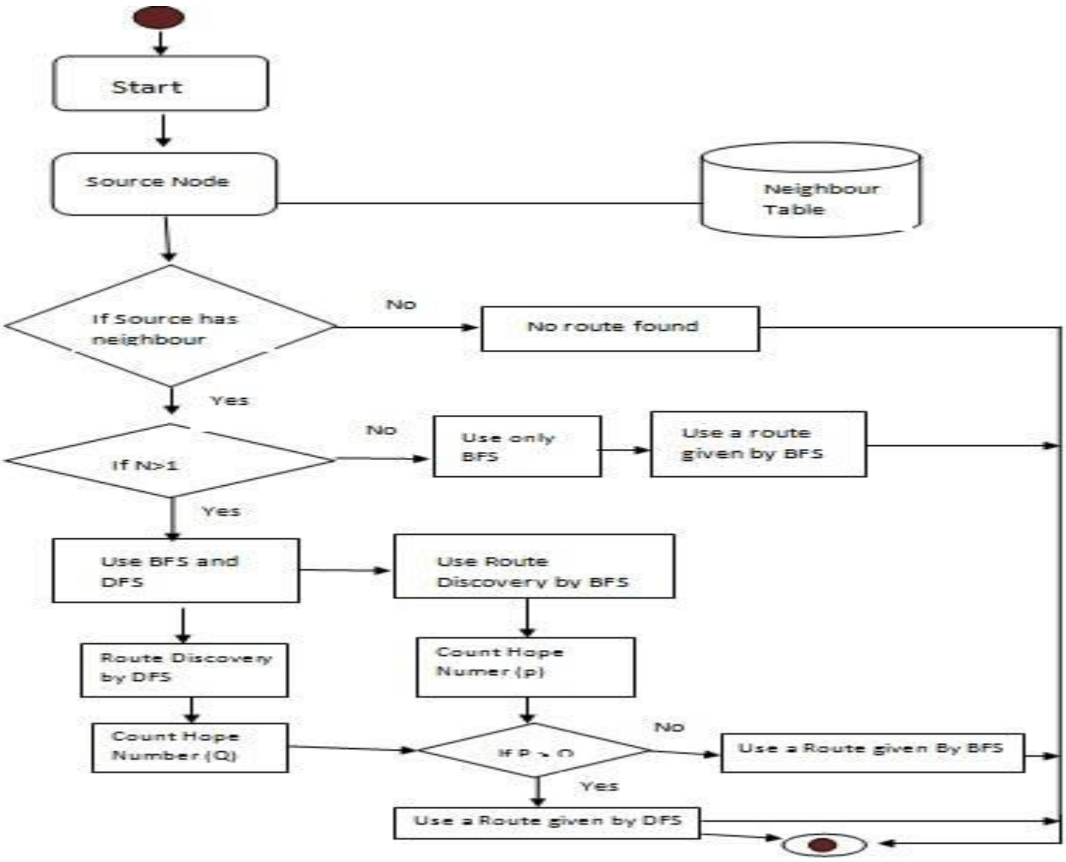

Fig5:Data flow diagram

V. RESULT AND DISCUSSION

We may study the performance of PSR using computer simulation with Network Simulator 2 version 2.34 (ns-2). We may compare PSR against OLSR [7], DSDV [8], and DSR [8], which are three fundamentally different routing protocols in MANETs, with varying network densities and node mobility rates. For the simulation of the proactive routing we use the algorithm shown in figure 5. We may measure the data transportation capacity of these protocols supporting the Transmission Control Protocol (TCP) and the User Datagram Protocol (UDP) with different data flow deployment characteristics. For finding the next data forwarder in the network,we are using Breadth First Search Algorithm as shown in figure 3.In this the next forwatder is identified. All three baseline protocols can be configured and tested out of the box of ns-2. Network Simulator (NS-2) help in testing and implementing to this project for effectively reduced to the overhead in the data transportation.

VI.CONCLUSION

This project has been motivated by the need to support opportunistic data forwarding in MANETs. we put forward a tree-based routing protocol, i.e., PSR, which is inspired by the PFA and the WRP.It uses only one type of message, i.e., the periodic route update, both to exchange routing information and as hello beacon messages. Second, rather than packaging a set of discrete tree edges in the routing messages, we package a converted binary tree to reduce the size of the payload by about a half. Third, we interleave full-dump messages with differential updates so that, in relatively stable networks, the differential updates are much shorter than the full-dump messages. To further reduce the size of the differential updates, when a node maintains its routing tree as the network changes, it tries to minimize alteration of the tree.

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