Abstract- A mobile ad hoc network (MANET) is a wireless communication network and the nodes that are not lies within the direct transmission range of each other depend on the intermediate nodes to forward data. Opportunistic data forwarding has drawn much attention in the research community of multi hop wireless networking, with most of the researches conducted for stationary wireless networks. Opportunistic data forwarding has not been widely utilized in mobile ad hoc networks (MANETs) and the main reason is the lack of an efficient lightweight proactive routing scheme with strong source routing capability. So, in the existing method, a lightweight proactive source routing (PSR) protocol is used. PSR can maintain more network topology information than distance vector (DV) routing to facilitate source routing, although it has much smaller overhead than routing protocols. But the disadvantage of this method is network overwhelming due to the route update. Furthermore, due to mobility of the nodes more energy is consumed. So in the proposed system an innovative technique is introduced which is called delay and energy-aware routing (DEAR) for reducing energy consumption and reduce the overhead. In this technique the delay is selected until the end of the cycle so that only one update is broadcast in each period. Furthermore, due to the dynamic topology, node consumes more energy while roaming. The topology control approach has been introduced to reduce the energy consumption of nodes. In topology control approach, two cases are considered, i) Energy consumption of the node and routes, ii) Link stability and location stability. An experimental result shows that when compared to the existing method there is less energy consumption and high network lifetime in the proposed system.

Index Terms- Proactive routing, mobile ad hoc networks (MANETs), opportunistic data forwarding, route update, routing overhead control, source routing, and tree based routing.

I. INTRODUCTION

The proliferation of mobile computing and communication devices (e.g., cell phones, laptops, wearable computers, personnel digital assistants, digital devices) is driving a revolutionary. Mobile users can use their cellular phone to browse over internet, to check e-mail, travelers can surf the internet with portable computers from airports, railway stations, Starbucks and other public locations; tourists can use Global Positioning System (GPS) terminals installed inside rental cars to locate driving maps and tourist attractions, researchers can exchange files and other information by connecting portable computers via wireless LANs while attending conferences from home, users can synchronize the data and the can also transfer portable devices and desktops anywhere. Not only are mobile devices are compact, cheaper in market, more convenient to use, and are more powerful. They can also run more applications and network services, commonly leads to the growth of mobile computing equipment market.

In particular, the error-prone communication links and the unstable network structure are two of the most critical aspects in networking. Numerous efforts have been exerted to address these issues so that a multi hop wireless network could be as good as a wire line network. In contrast, interest is increasing in utilizing a wireless communication channel by harnessing its broadcasting nature directly. Indeed, it is this nature that separates wireless networks from the rest, and no requirement exists to turn wireless links into wired lines. Only by a direct approach can we make full use of these networks and make wireless networks better than wire line networks. The network layer has received a great deal of attention in the research on MANETs.

As a result, abundant routing protocols in this network with differing objectives and for various specific needs have been proposed. In common, the two most important operations at the network layer (data forwarding and routing) are distinct concepts. Data forwarding is method by which packets are taken from one node through a link and put on another. Routing determines a path through which a data packet should be transmitted from source to destination. Opportunistic data forwarding represents a promising solution to utilize the broadcast nature of wireless communication links [8]. Opportunistic data forwarding refers to a way in which data packets are handled in a multi hop wireless network. In the traditional IP forwarding, an intermediate node looks up a forwarding table for a dedicated next hop, but in case of opportunistic data forwarding, it allows potentially multiple downstream nodes to act on the broadcast data packet.
One of the initial works on opportunistic data forwarding is selective diversity forwarding. To support opportunistic data forwarding in a mobile wireless network as in ExOR, an IP packet needs to be enhanced such that it lists the addresses of the nodes that lead to the packet’s destination. This entails a routing protocol where nodes see beyond merely the next hop leading to the destination. Therefore, link state (LS) routing [e.g., optimized LS routing (OLSR)] or source routing [e.g., dynamic source routing (DSR)] would seem to be good candidates. In this paper some of the important routing protocol for mobile ad-hoc network has been discussed.

II. LITERATURE SURVEY

The lack of a fixed infrastructure in ad hoc networks implies that any computation on the network needs to be carried out without a centralized control. Many of the important problems in ad hoc networking can be viewed as problems in distributed computing. In this section, we survey various aspects of the research on networking protocols, i.e., location service, routing and data forwarding, and Transmission control Protocol (TCP).

For ad hoc networks, proactive routing protocols follow the DV or LS paradigm and attempt to keep routing information for all the nodes up to date, e.g., OLSR, DSDV [6]. When the topology of an ad hoc network is under constant flux, however, LS generates large number of link state changes, while DV suffers from out dated state. The growing size of the network and the nodes mobility are two hurdles in the design of scalable routing protocols.

In contrast to proactive algorithms, reactive routing protocols cache topological information and update the cached information on-demand. Reactive protocols avoid the prohibitive cost of routing information maintenance of proactive protocols, and tend to work well in practice. While the idea of aggressive caching and occasional update results in good average performance, the worst-case latency could be high. Examples of reactive protocols are Dynamic Source Routing (DSR) [4], Ad-hoc On-Demand Distance Vector Routing (AODV).

ExOR [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 cooperative diversity schemes, deferring forwarding decisions until or after the reception allows ExOR to try multiple long but radio lossy links concurrently, leads to high expected progress per transmission. But, unlike cooperative methods, ExOR uses only a single node to forward each packet, so that ExOR works with existing radios. The main problem in realizing ExOR is ensuring that only the “best” receiver of each packet forwards it, in order to avoid duplication. Ex-OR operates on batches of packets in order to reduce the communication cost of agreement. The source node includes in each packet a list of candidate forwarder prioritized by closeness to the destination. Based on the list, the receiving nodes successfully receive packets and save them in its buffer. After that each node waits for the batch to be completed. The forwarder which has the highest priority then broadcasts the packets present in its buffer, including its copy of the “batch map” in each packet. The batch map contains the highest priority node from the sender’s perspective to have received each packet. The other forwarders in the list then transmit packets in the priority order, but they can send only packets that are not acknowledged in the batch maps of higher priority nodes. The forwarders tries number of iterations to send packets through the priority list until the destination has 90% of the packets. The remaining packets are transferred with traditional routing mechanism.

The Dynamic Source Routing protocol, DSR [2] allows the network to be completely infrastructure less, self-organizing and self-configuring network. The DSR protocol allows nodes to dynamically discover a source route across multiple network hops to any destination in the ad hoc network. During the transmission each data packet which is forwarded carries the complete path as prioritized list of nodes by which the packet must pass through. It allows source routing to be loop free and avoid the intermediate nodes to have updated route information. By inserting the possible source route to the header of each data packet, other nodes (either forwarding or not) overhearing all or any of these packets can also easily get this routing information and store them for future use. The DSR protocol is composed of two mechanisms that work together to allow the discovery and maintenance of source routes in the ad hoc network.

1) Route Discovery: It is the mechanism by which a Source node S wishing to send a packet to a destination node D obtains a Source route to Destination route.

2) Route Maintenance: It is the mechanism by which node S is able to detect, when the network topology has frequently changed as it can no longer use its route to D because a link along the route no longer works. Whenever a source route is broken, S can be allowed to use any other routes.
available to node D, otherwise it can invoke the operation Route Discovery to find a other route. Only when S needs to send packets to D the mechanism Route Maintenance is used.

These two mechanisms operate purely on demand. DSR does perform any periodic routing update, sensing link status, or packet detection by neighbor and does not depend on these functions from any underlying protocols. Due to purely on-demand behavior with no periodic activity allows the overhead caused by DSR to scale to zero. Because all of the nodes are considered as stationary with respect to each other and all routes needed for current communication have already been discovered. Whenever the nodes begin to move more or as communication patterns change frequently, packet overhead of DSR automatically scales to only that needed to track the routes that are currently in use. In the process of a single Route Discovery (as well as through routing information from other packets overheard), a node may learn about multiple routes to any destination and cache them. This allows the reaction t routing changes to be much more drastic, since a source node with multiple number of routes to a destination can try another route which is cached, in case of any failure in the previous route. This caching of multiple routes also avoids the overload of needing to perform a new Route Discovery each time a route breaks. The two operations used in DSR are designed to allow unidirectional links and asymmetric routes to get support easily. Because in wireless networks, there is possibility that a link may not work equally well in both of the directions, it may be due to differing antenna or propagation patterns or sources of interference. DSR uses that kind of unidirectional links to improve the overall performance and network connectivity in the system.

DSDV[4] routing method allows a collection of mobile computers, which may not be close to any base station and can exchange data along changing and arbitrary paths of interconnection, to afford all computers among their number a (possibly multi-hop) path along which data can be exchanged. Packets are transmitted between the stations of the network by using routing tables which are stored at each station of the network. The routing table, which is maintained at each node, lists all available destinations, and the number of hops to each route. Each route table entry is provided with a sequence number which is originated by the destination station. Each station periodically transmits updates, and also when significant new information is available to maintain the consistency of routing tables in a dynamically varying topology. Since we do not assume that the mobile hosts are maintaining any sort of time synchronization, we also make no assumption about the phase relationship of the update periods between the mobile hosts. These packets indicate which stations are accessible from each station and the number of hops necessary to reach these accessible stations, as is often done in distance-vector routing algorithms. It is not the purpose of this paper to propose any new metrics for route selection other than the freshness of the sequence numbers associated with the route; cost or other metrics might easily replace the number of hops in other implementations. The packets may be transmitted containing either layer 2 (MAC) addresses or layer 3 (network) addresses.

The DSDV protocol requires each mobile station to transmit, to each of its current neighbors, its own routing table, by broadcasting. The entries in this list may change fairly drastically over time, so the transmission must be made often enough to ensure that every mobile node can almost always locate every other mobile node in a network. In addition, each mobile node forwards data packets to other node upon request. These transmissions give the ability to determine the shortest number of hops for a route to a destination; we would like to avoid unnecessarily disturbing mobile hosts if they are in sleep mode. By doing so a mobile computer may exchange data with any other mobile computer in the group even if the target of the data is not within range for direct communication. If the notification of which other mobile computers are accessible from any particular computer in the collection is done at layer 2, then DSDV will work with whatever higher layer (e.g., Network Layer) protocol might be in use.

In [5], a multi hop wireless network, where there is usually no central control authority at the link layer, it requires an effective and efficient distributed coordination of nodes in transmission. The implementation of link-layer diversity for the layer above the physical layer requires more sophisticated and efficient coordination. It is particularly challenging for multi hop wireless networks that are void of centralized control authorities. The most predominant medium access control (MAC) for such networks is the IEEE 802.11 DCF. This MAC protocol essentially is a carrier-sensing multiple access with collision avoidance (CSMA/CA) scheme. IEEE 802.11-based networks usually operate with a simple two-way handshake of DATA/ACK frames between the sender and receiver. The optional RTS/CTS control frames are used to precede a DATA/ACK to address the hidden terminal problem, where two transmitters are out of carrier- sensing range of each other. The reason that such a four-way handshake usually is not preferred is its high overhead. Link-layer diversity is built on the broadcasting nature of wireless channels. Thus, any
eligible relay (e. g., as prescribed by the routing module) with good transient channel quality could potentially forward the packet.

![MANET node model, R-router, H-host](image)

**III. PROPOSED METHODOLOGY**

A source routing (PSR) protocol is introduced, which is proactive in nature. The proposed methodology is used to make the opportunistic data forwarding available for MANETs. The proposed protocol maintains a breadth-first search spanning tree of the whole network rooted at the node itself with each nodes present in the network. The neighboring nodes periodically exchange updated network topology information. Thus, PSR provides every node to have the whole route information from every node to all other neighbouring nodes present in the network. This concept allows the protocol to support both routing from source and the traditional method IP forwarding. Let us model the network as an 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 neighbourhood, i.e., \( \{u \in V \mid (u, v) \in E\} \). Similarly, we use \( N[v] \) to denote its closed neighbourhood, i.e., \( N(v) \cup \{v\} \).

The proposed system consists of the following modules,

**A. Route update**

Due to its proactive nature, the update operation in PSR has more iteration and is distributed among all nodes in the network. At the beginning, node \( v \) is only aware of the existence of itself; therefore, there is only a single node in its BFST, which is root node \( v \). By exchanging the BFSTs with the neighbours, it is able to construct a BFST within \( N[v] \). In each of subsequent iteration, nodes exchange their own spanning trees with their neighbours. From the perspective of node \( v \), toward the end of each operation interval, it has received a set of routing messages from its neighbours packaging the BFSTs. More nodes may be situated within the transmission range of \( v \), but their periodic updates were not received by \( v \), may be due to bad channel condition.

**B. Neighbourhood trimming**

The periodically broadcast routing messages in PSR also double as “hello” messages for a node to identify which other nodes are its neighbours. When a neighbour is deemed lost, its contribution to the network connectivity should be removed; this process is called neighbour trimming. The procedure is triggered at \( v \) about neighbour \( u \) by either of the following two cases,

1) When no routing update message, data packets has been received from this neighbour for a given period of time.
2) A data transmission to the node has failed, which is given as the report by the link layer.

**C. Streamlined differential update**

In addition to dubbing route updates as hello messages in PSR, 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. In this paper, we further streamline the routing update in two new avenues. First, to halve the size of these messages, a compact tree representation in full-dump and differential update messages is used. Second, every node attempts to maintain an updated BFST as the network changes so that the differential update messages are even shorter.

**D. Performance evolution**

We compare PSR against OLSR, DSDV [4], and DSR [2], which are three fundamentally different routing protocols in MANETs, with varying network densities and node mobility rates. We 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. Test shows that the overhead of PSR is indeed only a fraction of that of the baseline protocols. Nevertheless, as it provides global routing information at such a low cost, PSR offer even better data delivery performance.

**IV. CONCLUSION**

Simulation results shows that proposed protocol has only minimum amount of the total
overhead of traditional protocols, and offers a data transportation capability which is greater than or equal compared with these protocols. Therefore, in research on multi hop wireless networking, it usually makes sense to minimize any impact on the network’s communication resources even if there is penalty in other aspects. When it comes to the case when a node should share its updated route information with its neighbours, we chose to delay it until the end of the cycle. So that in each period, only one update is broadcasted.

REFERENCES