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## Improvement of Network lifetime by improving Route discovery phase in multi-path DSR

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**Abstract:** In this thesis energy efficient dynamic source routing algorithms for Ad hoc network is proposed i.e. the modified DSR protocol. In this work we not only focuses on the energy efficiency of participating nodes but tries to improve overall network lifetime of the network to be fruitful in giving us more better results .

**Keywords:** Mobile Ad-hoc network (MANET); EA-DSR protocol, DSR protocol, sniffer packet.

### 1. INTRODUCTION

#### 1.1 AD-HOC network:

Routing as one of the cornerstones of any network including MANET, is needed when it require to send data packets over several nodes to arrive at their destinations. [1]

An ad-hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized authority. MANETs are self-organizing and self-configuring wireless networks where, the topology of network is changing continuously since nodes are moving from one place to another. This is mainly due to the mobility of the nodes. Nodes in Manet utilize the same random access wireless channel, cooperating with each other to engage themselves in multihop forwarding. The node in the network acts as both hosts and as routers that route data to/from other nodes in the network. [2]

The important characteristics of nodes in MANET are:

- They operate without a central coordinator
- Multi-hop radio relaying
- Frequent link breakage of mobile nodes
- Constraint resources like bandwidth, computing power, battery lifetime.
- Instant deployment [5]

#### 1.1.1. Classification of routing protocols in Manet's:

According to the routing phenomena, the routing protocols can be categorized as: Table-driven and source initiated.

##### 1) Proactive routing protocols:

These Routing Protocols are also called as table-driven. They attempt to maintain consistent and up-to-date routing information between every pair of nodes in the network. In this type of routing, each node has one or more tables that contain the latest information of the routes from one node to any other node in the network. Each row of table reaching a node has the next hop for or subnet and the cost of this route. The different table-driven protocols differ in the way the information about a change in topology is propagated through all nodes in the network. [5]

2) On demand routing protocols (reactive): These protocols are also called reactive protocols since they don't maintain

routing information or routing activity at the network nodes if there is no communication. If a particular node wants to send a packet to another node then this protocol searches for the route in an on-demand manner and establishes the connection in order to transmit and receive the packet. [5]

#### 1.2 DSR routing Protocol:

Dynamic Source Routing (DSR) protocol is a distance-vector routing protocol for MANETs.

##### A. Route Discovery

Route Discovery is the mechanism by which a node S (Source) wishing to send a packet to a destination node D obtains a source route to D. Route Discovery plays it role only when S attempts to send a packet to D and does not already know a route to D. The source first check in its "Route Cache" if it knows a suitable route for the destination. In case, if no route is found, then it will have to start a route discovery protocol to find a route to the destination. The route discovery itself consists on a chain of locally broadcasted Route Request (RREQ). The broadcasting occurs until one of the broadcasted RREQ reaches either the destination node or a node who knows a route to that destination. If a node receiving the RREQ has recently seen another RREQ message from this initiator bearing this same request identification and target address, or if this node's address is already present in the route record in the RREQ, this node discards the Request. [7]

##### B. Route maintenance

Route Maintenance is the mechanism by which source node S is able to know, while using a source route to destination D, that the network topology has changed such that it can no longer use its route to D because a link along the route no longer works. The route maintenance indicates that a source route is broken, it then attempts to scan if there exist any other route to D, or can invoke Route Discovery again to find a new route for subsequent packets to D. A link is considered to be broken when a node has been unable to verify the reachability of a next-hop node after reaching a maximum number of retransmission [7]

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## 1.2. Energy consumption in Ad-hoc Network

Ad hoc networks do not have any central administration. So each mobile node is incorporated with routing mechanism. The battery of nodes have limited power supply moreover they are free to move anywhere in network which result in dynamic network but also increase the overhead of nodes which results in limited services and applications that can be supported by each node. As each node is acting both as an end system and a router, additional energy is required to forward packets. Dynamicity of Ad hoc network makes it more difficult for mobile nodes to make a suitable path from source to destination. Depletion of energy in any node can hinder the ongoing communication process and again the path has to be chosen for the specified source to destination. So this regular route updation and route maintenance consumes a lot of energy of the battery which is limited document is a template. [6]

## 2. LITERATURE REVIEW

Sarala.P. [1] EMPDSR provides QoS factors such as end-to-end reliability. Network traffic and battery power factors make an influence over the route discovery process. Cost enabled route discovery route discovery is one of the considerable routing method that enables the cost estimation with different metrics. The EMP-DSR protocol is integrated with fuzzy cost estimation techniques. Distance, network traffic, bandwidth and battery power metrics are used in the fuzzy cost enabled multipath dynamic source routing protocol.

Tanu Preet Singh [2] An ad-hoc network is a local area network (LAN) that is built spontaneously as devices connect. These nodes does not rely on a base station to coordinate the flow of messages to every node in the network, the network nodes forward packets to and from each other. In Latin, "Adhoc" is actually a Latin phrase that means "for this purpose." which show that these solutions are developed for a specific purpose. In computer a network, an ad hoc network refers connection established in a network for a single session and does not require a router or a wireless base station. In this paper, the other routing protocols are also studied i.e. AODV, DSR, DSDV.

N. Kumar [3] A Mobile Ad-hoc Network (MANET) is a self-configuring network composed of mobile nodes without any fixed infrastructure. The most important issue for mobile ad-hoc networks is to find the route between source and destination that is a major technical challenge due to the dynamic topology of the network. The application and network architecture could be the factors on which routing protocols for manets differ. The author presents a survey on energy efficient routing protocols for Ad-Hoc wireless networks. The Survey mainly focuses on recent development and modifications in this widely used field. This discussion is basically centered on proposed power saving algorithms. Besides it the author will discuss about the conventional protocols and also see how these are modified to make these protocols energy efficient.

Dalia I. Elewely. [4] The author discusses the energy consumption problem and summaries the existing power saving techniques in ad-hoc wireless networks. The main

objective of this paper is to introduce a new power aware multi-path node disjoint routing scheme based on the Dynamic Source Routing protocol (DSR), which can prolong MANET's lifetime, reduce routing delay and increase the reliability of the packets reaching its destination. Therefore, a comprehensive study of DSR protocol has been drawn using NS-2 simulator, to evaluate the performance of DSR as a routing strategy and investigate its efficiency in saving wireless networks resources, as a prelude to avoid its performance shortcomings in our proposed routing scheme.

Abhishek Singh [5] Conventional routing protocols do not consider the power budget where the routes between nodes are built by the shortest path routing algorithms, the most important of which are the Multipath Dynamic Source Routing Protocols. When the same algorithm is used in MANETs it may lead to a quick depletion of the energy of a few nodes because Multipath Dynamic Source Routing Protocols used more than one path for the same transmission of packets. These multiple paths allow load balancing and faster delivery. So the author proposes an efficient algorithm, which increases the network lifetime by minimizing the power consumption during the source to destination route establishment in Multipath Dynamic Source Routing Protocols. The scope of this thesis is to develop technique to check the remaining energy for each node and uses a cost function to choose the best power saving route and deals with the broken routes due to the nodal energy depletion and node mobility in MP-DSR.

Kavita Sharma [6] Mobile Ad-hoc Networks (MANET) are consisting of nodes that have limited battery power so the energy efficiency is one of the important metrics of interest. Energy efficient routing is a major concern in MANET. In this paper energy efficient dynamic source routing algorithms for Ad hoc network are surveyed.

Deepika Thakral. [7] Objective in this paper is to develop Energy Efficient Power Aware Multipath Dynamic Source Routing based on DSR. The author analyzed Minimum Battery Cost Routing (MBCR) to minimize the path battery cost so as to maximize the total remaining battery capacity. The cost function  $f$  in Minimum Battery Cost Routing (MBCR) is defined such that the lower the remaining battery capacity  $c$  of a node  $j$ , the more reluctant the node is to receive and forward a packet. In this paper the author proposed a new route discovery algorithm that considers the remaining energy for each node and uses a cost function to choose the best power saving route. And a new route maintenance algorithm that deals with the broken routes due to the nodal energy depletion and node mobility

KULBIR NAIN [8] This paper proposes a set of minor extensions to the DSR protocol, that are proposed by the IETF MANET team, by implementing the reputation based scheme on it, which enables to increase the performance of the network. In this proposed mechanism a node autonomously evaluate the "reputation" of its neighbors based on the completion of the requested services. Simulations will show the decrease in routing overhead and data drop, increase in

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throughput and packet delivery ratio on the basis of some network metrics used.

### 3. PROPOSED WORK

In most existing protocols, a mobile node may consume all its energy to participate in the operation without considering the remaining energy. In the proposed energy efficient DSR protocol each node will only use part of energy to transmit the data packets. This is implemented through a route discovery procedure.

The main objectives are:-

1. To propose a new route discovery algorithm that considers the remaining energy for each node and uses a cost function to choose the best power saving route.
2. To propose a new route maintenance algorithm that deals with the broken routes due to the nodal energy depletion and node mobility.

### 4. SIMULATION RESULTS

NS-2 simulator is used for performance evaluation. The network is a collection of 50 nodes deployed on square area of 1200mx1200m. Communication between nodes is modeled by CBR (Constant Bit Rate) traffic over UDP. A total of 8 connections were generated. With the help of table 1, fig.1, table 2 and fig.2 we can compare the results of DSR and DSR-PW.

#### 4.1. Comparison of basic DSR with DSR-PW

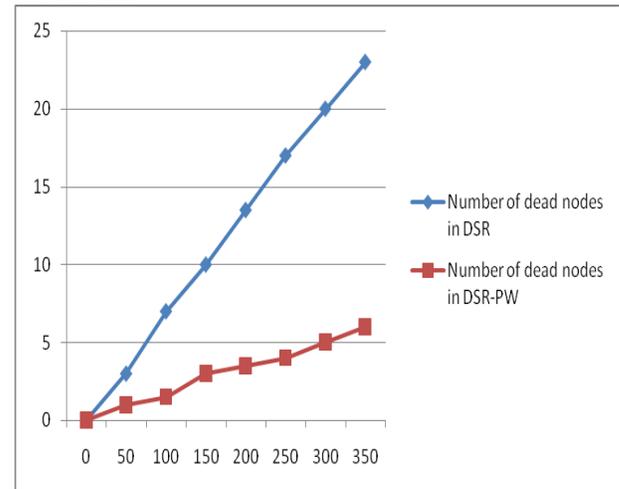
The key parameter of study is the network lifetime. We vary the different parameters and study their effects on this metric. The network lifetime is defined as:

1. It may be defined as the time taken for % of the nodes in a network to die.
2. It might be the time taken for the first node to die.
3. It can also be the time for all nodes in the network to die.

For analysis the first & third definition is adopted. Network lifetime of DSR and DSR-PW are compared.

**Table 1:** First dead nodes with simulation time

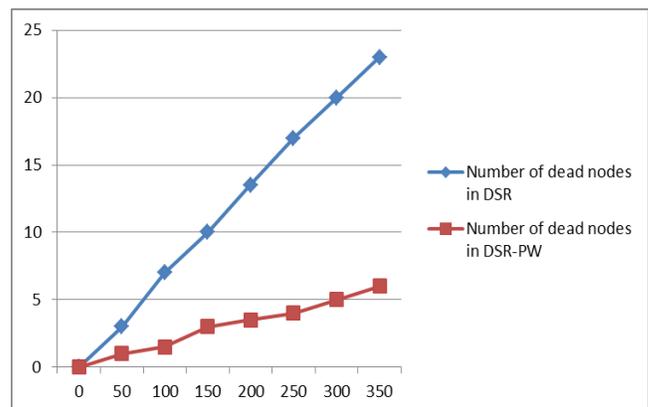
Simulation Time	Number of dead nodes in DSR	Number of dead nodes in DSR-PW
0	0	0
50	3	1
100	7	1.5
150	10	3
200	13.5	3.5
250	17	4
300	20	5
350	23	6



**Figure.1.** Graph for all first nodes with simulation time

**Table 2:** Comparison of all dead Nodes with Simulation time

Simulation Time	Number of dead nodes in DSR	Number of dead nodes in DSR-PW
0	0	0
50	3	1
100	7	1.5
150	10	3
200	13.5	3.5
250	17	4
300	20	5
350	23	6



**Figure.2** Graph for all dead nodes with simulation time

### 5. CONCLUSION

Since nodes have limited energy they get out of energy results in interruption in communication link and decrease network lifetime. So the routing protocol must keep energy aspect in

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consideration. Therefore, we have introduced the mechanism in which a source node periodically sends out Sniffer Packets (SP), containing the route record information, along all the primary routes and backup routes.. So by introduction of the concept of sniffer packets we consider energy consumption during path establishment and keep track by exchange of information with the neighbor nodes and thus keeping the energetic nodes in routing to increase network lifetime

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