

# Energy Aware Issues of DSR Routing Protocols in Mobile Ad Hoc Network

Sulaiman Ghaleb  
Research Scholar  
Department of CS,  
Rathinam College of  
Arts & Science  
Coimbatore, India

Salem Ba Hmaid  
Research Scholar  
Department of CS,  
Rathinam College of  
Arts & Science  
Coimbatore, India

Akram S. A.  
Alhammadi  
Research Scholar  
Department of CS,  
Rathinam College of  
Arts & Science  
Coimbatore, India

V. Vasanthi, PhD  
Research Supervisor  
Department of CS  
Rathinam College of  
Arts & Science  
Coimbatore, India

## ABSTRACT

Dynamic source routing protocol (DSR) is an on demand routing protocol that is deemed a suited reactive routing protocol for MANET. Mobile ad hoc network is composed of independent devices communicating with each other directly without the help of any constant infrastructure or centralized administration. In general some nodes in network cut off working because battery run out of power, therefore it is much important to preserve the energy. DSR suffers from energy depletion and that because DSR routing protocol doesn't take the term of energy consumption as a parameter into account at all. DSR routing protocol has main advantages to supply path and transmit data packets from source to destination but its disadvantage is transition energy which is forfeiture when the data packets are drop or when the acknowledgement not receive by neighbor nodes that time these paths not efficient for data packets. This paper presents a summary of different energy efficient protocols that are based on the basic technique of DSR and expands the endeavor and pledge that has been made since last 8 years to turn the conventional DSR as energy efficient routing protocol.

## Keywords

Mobile Ad-hoc Network, Energy Effective DSR Routing Protocol, Energy Depletion, Energy Effective Routing Protocols based DSR.

## 1. INTRODUCTION

MANET [1] is combination of nodes that connect with each other independently. The important of Mobile Ad Hoc network has been increased because the need of using of personal devices, such as Personal Digital Assistants (PDAs), phones and laptops for exchanging the information. These can be connected into network at any time without any aid for centralized administration or constant infrastructure using MANET. It is also utilized for urbanized applications, like transmitting data during a meeting that was harmonious in a short time [2].

There are many features of MANET like: (1) there is not centralized administration. (2) Dynamic movement of nodes through the network that cause changing of routes. (3) The restricted range of wireless transition and (4) Due to the hidden terminal problem packet will be lost [3]. The routing in MANET is complex due to its features. Thus, the routing protocol of MANET plays a critical role in deciding the performance of the network.

It dominates the path establishing time, throughput, Packet Delivery Ratio (PDR) and the consumption of energy of the whole network. In MANET the power is consumed due to the process of route discovery, which includes the transition of overheads. The number of overheads is proportionate to the rate of alteration in the topology of network.

Saving Energy [4, 5] can be accomplished in MANET in three ways:

1. The Energy Save Approach – in Mobile Ad Hoc Network the nodes are destined to sleep for a specific period by utilizing of an efficient scheduling mechanism.

2. The Energy Control Approach – the transmission of power is controlled and the minimal power is utilized to transmit the data packets. It uses the energy based on-distance rule: a short-distance transition [6] consumes less power than a long-distance transmission.

3. The Energy Management Control Approach – In third way the ad hoc power preserving mode of IEEE 802.11 [7], nodes are putted into sleep state using the Adaptive Ad hoc Traffic Indication Message (ATIM) window and beacon interval at the Medium Access Control (MAC) layer. Thus, they enhance the lifetime of network [8]. Energy management encounters three challenges: beacon contention, timing synchronization and neighbor maintenance. Based on the traffic proclamation message, the node wakens until the end of the beacon interval and the other nodes stay in the sleep state to maintain power until the ATIM interval is over. The aggregate energy saving depends on the time spent in sleep state and the number of nodes. Thus, the network lifetime is improved.

## 2. ENERGY EFFECTIVE DSR ROUTING PROTOCOL

Generally the nodes in DSR [9] protocol are moving dynamically so they can share their data packets among each other through the process of communication.

The main idea of routing protocol is to save the energy of network and keep using the power of connected nodes for protracted time. And also it utilizes to make the route between the nodes effective and correct [10].

In MANET the nodes communicate with each other without any need for constant infrastructure and node energy is very fundamental for the convenient functioning of the network. The exhaustion of energy in network can be diminished by the following power effective processes:

- Transition power control
- Load division
- Energy down or sleep

### 2.1 Transition power control process

The transition energy control process decides the best possible routing path that decreases transition energy desired to deliver data packet from a source node to a destination node. To discover a path in MANET the source node flows the packets over the network. The process of overflowing is done using lower energy, the nodes in network have various transferring energy. The transition domain between any nodes should be effective. It should be according to the requirement in such a way that a node can only transfer to other node. It will preserve energy, interference and overcrowding in the network [11, 12].

### 2.2 Load division process

While choosing the path between source node and destination node, load division process is utilizing to balance the usage by averting over used nodes. In Load division process we will improve battery power. If we will choose shortest route then some over used nodes may go out of network which will influence the network lifetime. So load is divided according to the underutilized nodes rather than shortest path. It will prohibit a node from overloading and perform in longer network lifetime [13].

### 2.3 Energy down/sleep process

In MANET, if any node is not in active mode then to preserve the power of this node is by placing it into a sleep mode.

#### *Power effective matrices*

- □ Overall Transition power: this matrix gives the total amount of power through all the intermediate nodes faced in path between source node to destination node.
- □ Remaining Energy Capacity: it shows the residual energy which still left in the node through Network.
- □ Maximum node cost in network each node in the route is remarked with the maximum node cost.
- □ power exhausted /Packet: supplies the minimal power depletion path over which overall energy exhaustion for delivering a packet is reduced. DSR routing protocol is

deemed as the best choice for energy effective routing protocols. For many years, many routing protocols have been suggested to find out the perfect solution for energy effective routing. After some modulations in DSR routing protocol, in the next session, there are some energy efficient routing protocols based DSR.

## 3. RELATED WORK

E2DSR [14] has proposed in 2010 to create an algorithm for route selection, route cache and carried out an energy table. It is presented as a novel structure for control packets to exchange the activity of nodes in the network. By stratifying data structure an array, an energy field is added in Route Request packet. The residual battery energy of a node was conserved in this field that is transmitted with this Route Request packet. Source node will choose the best path by route priority function. E2DSR will choose the path with high energy level. Best path will be selected according to parameters such Delay, Length, Jitter, Packet delivery ratio, Energy of path, Freshness. But the restriction of this protocol it appears in a greater script, it required an integral test of protocol execution, using the protocol scalability and represented metrics.

ECDSR [15] Energy conscious DSR routing protocol was designed to be utilized in route discovery period, the purpose of this routing algorithm is to choose the nodes with more high energy, rather than those with a minimum hop count. If the energy of node reaches the less beginning value, then it will be removed and the nodes transmit the error message to the destination. To continue the connection the source will find out a new route. Packet delivery, remaining residual, network lifetime, throughput of the network was better in Energy conscious DSR (ECDSR) as compared to the DSR. The result of comparison showed that consumption of energy per successful delivery of data, number of dropping nodes was less in ECDSR. This protocol has constraints in case if there only single source and single destination that make the execution of multiple sources and multiple destinations could not be found. Other constraint of ECDSR the mobility of node was not deemed, so it has to notice the execution in dynamic network. And finally it had overhearing and stale path problem, which leads to packet forfeiture and over consumption of energy.

EDSR [16] proposed to enhance the lifetime of network by minimizing the battery power consumption of each node. The main purpose of this protocol is to decrease the consumption of power battery. This modifying DSR routing protocol utilized to select the energy efficient routes. It is used to find out selfish intermediate nodes which drop the packets and maintain their battery power. When we compare between the performance between EDSR and DSR, the execution of EDSR is performed better than DSR in less overhead and high mobility. But this protocol still has restriction in test of 100 pause time in the initial stage EDSR exhausts more power than DSR.

EEDPSR [17] Energy Efficient Preemptive DSR protocol that used to explain the energy conservative method to improve the efficiency of routing protocol. The main

objective of this protocol is to minimize the routing overhead throughout of the network. EEPDSR routing algorithm estimated the conserved energy level. This protocol showed better result than DSR in terms of packet delivery ratio and end to end delay. In EEPDSR the performance should be examined and analyzed for more intense network with some other energy effective routing protocols.

E-Ant-DSR [18] proposed Enhanced DSR which is deemed as an enhanced version of the well-known Dynamic Source Routing (DSR) scheme based on the Ant Colony Optimization (ACO) algorithm, this protocol can produce an elevated data packet delivery ratio in small end to end delay with low routing overhead and low energy consumption. In E-Ant-DSR the process of selecting the best route is by the pheromone level of the route. it calculates the pheromone level of a route based on the number of hops in the path, the congestion along the route and end to end path reliability of the route. The route with the most elevated pheromone count will be chose for data packet delivery. E-Ant-DSR shows better performance in data delivery ratio, broken route, routing overhead, and energy consumption than DSR.

E-E-DSR [19] is energy aware dynamic source routing protocol which is used to promise a secure routing by choosing high and efficient energy nodes as intermediate nodes. EEDSR is used to exhaust less energy over the network in Mobile Ad Hoc Network. Moreover the elevated power nodes are only utilized for data transition and low power nodes are left over. This routing algorithm is examined and the analysis and results portray promising execution enhancement. This protocol shows that the energy exhausted by the proposed EE-DSR better than DSR routing protocol. EEDSR still needs improvement in the term of delay time may be higher. And that need to be tested with other routing protocols.

ESDSR [20] Energy Secure DSR utilizes basic technique of existing DSR with little modification to enhance DSR performance of energy consumption. ESDSR used to take a route from source to destination in a manner that every middle node will include more elevated amount of power at a particular time. So as reluctant to taking minimal hop count technique in the process of node discovery stage, this protocol utilizes to choose ways whose intermediary nodes have high left over battery energy. The performance of ESDSR is better than DSR on the premise of supplying more lifetimes to the network. It needs for enhancement in execution and that require test and analyze with others routing protocols.

EM-DSR [21] an efficient multipath routing protocol based on DSR. The major objective of this routing algorithm is to discover multi-paths from source to destination by taking the consideration of the maximum residual energy of the path to transfer the data. The comparison between EM-DSR and DSR shows that, EM-DSR is outperforming in terms of residual transition energy and transmission energy. EM-DSR still demands improvement in cost metric.

EECDSR [22] enhanced energy conscious dynamic source is utilized to minimize the consumption of energy with the firmness of the ECDSR. In enhanced ECDSR each and every node can be traced by its GPS signal and by this approach, it can find out the suitable location of each node. This helps in choosing the intermediate nodes between source and destination. The experimental results between EECDSR show improvement of network lifetime and individual node. This paper doesn't take the consideration of the mobility of the node, it awards some diverse results when same protocol will be used for the dynamic network.

#### **4. CONCLUSION**

This article discussed one of the important matters that is consumption of energy problem in MANET. This paper has explained few energy effective routing protocols which are obviously based on the DSR routing protocol. These protocols have evidenced the conventional DSR can also be performed as an energy effective routing protocol. Because DSR is deemed as one of the unconventional routing protocol which does not interested about energy consumption at all. As there are many energy efficient routing protocols exist, it is very difficult to compare them directly since each method has diverse assumptions and has different means to fulfill the goals. It is very complicated to conclude which one of the protocol is the best between all energy efficient routing protocols, because all these protocols are based on diverse methodologies, performances matrices, various implementation environments and several techniques. But all these protocols have evidenced that they are better than the DSR routing protocol. Still many scopes are there in DSR to join on new functionally and to modulate the basic mechanization of DSR as an Energy Efficient Routing protocols. For the future direction there is a plan to propose a new algorithm for enhancing the energy in DSR routing protocol.

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## 6. AUTHOR'S PROFILE

**1. Mr. Sulaiman Ghaleb** received his BCA from St. Philomena's College, Mysore, and M.IT from Dr. G.R. Damodaran College of Science, Coimbatore. Presently he is pursuing his Ph.D. in the field of Ad-hoc networks at Rathinam College of Arts and Science, Bharathiar University, Coimbatore, India. His research interests include in Computer Networks and MANETs.

**2. Mr. Salem Ba Hmaid** received his BCA from St. Philomena's College, Mysore, and M.IT from Dr. G.R. Damodaran College of Science, Coimbatore. Presently he is pursuing his Ph.D. in the field of Ad-hoc networks at Rathinam College of Arts and Science, Bharathiar University, Coimbatore, India. His research interests include in Computer Networks and MANETs.

**3. Mr. Akram S.A Alhammadi** received the B.Tech degree in Computer Science & Engineering from Future University, Yemen. M.Sc. in computer communication from Bharathiar University. His area of research is Cloud Computing. He is currently pursuing Ph.D in Computer Science from Rathinam College of Arts and Science, Bharathiar University, Coimbatore, India.

**4. Dr. V. Vasanthi** pursued M.Sc (CS), M.Phil. And Ph.D. Computer Science from Karpagam University, Coimbatore in 2014. She is currently working as Professor in Department of Computer Science from Rathinam College of Arts and Coimbatore, since 2015. She has published more research papers in reputed international journals including Thomson Reuters (SCI & impact factor) and conferences including IEEE & Springer and it's also available online. Her main research work focuses on Ad-hoc and Sensor Networking.