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Enhanced Energy Efficient Dynamic Source Routing Protocol in MANET

Foram Changela[1] , Prof. Shyam Kotecha[2]

[1] *M.E. Student, Computer Department, B.H.Gardi College of Engineering & Technology*

[2] *Assistant Professor, Computer Department, B.H.Gardi College of Engineering & Technology*

Abstract-The Dynamic Source Routing protocol (DSR) is a simple and efficient routing protocol designed for wireless ad hoc networks. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network infrastructure. The protocol is composed of the two mechanisms of Route Discovery and Route Maintenance.DSR protocol does not take energy as a parameter into account at all. So that energy consumption is the issue in manet. This paper presents different energy efficient protocols that are based on the basic Mechanism of DSR.

Keywords-Mobile Ad hoc Networks, Challenges, Characteristics, Applications of Manet, Routing Protocols, Energy-aware Routing Protocols, DSR, EDSR, EEDSR, Enhanced-DSR

I. INTRODUCTION

Mobile ad-hoc network (MANET) is the collection of various mobile nodes which are connected together over a wireless medium having no fixed infrastructure. Each participating node in the network acts as both router and host and responsible for forwarding packets for other nodes.[1]

Figure 1. Mobile Ad Hoc Network [3]

1.1 Characteristics of MANET[2]

A. Multihop Communication

The communication between any two remotely located nodes in MANETs is through many intermediary nodes which relay data packets from one point to another for information and data sharing.

B. Infrastructure Less

MANETs do not need any centralized base station or pre-planned infrastructure. They are formed based on collusion between autonomous, peer-to-peer nodes that are dynamic in nature.

C. Dynamic Topology

Since the nodes are arbitrary in nature, the network connectivity is unpredictable and directly proportional to the variations in time. MANETs make itself adaptable to the traffic patterns, mobility and propagation conditions. These arbitrary mobile nodes form their own network dynamically as they move about whenever there is a need.

D. Network Scalability

MANET applications involve large networks with tens of thousands of nodes, due to its nature of being dynamic and infrastructure less, but the scope of deployment of large networks are limited and pose challenges like: addressing, routing, location management, security and configuration management.

E. Short Range Connectivity

MANETs depend upon radio frequency technology to connect to communicating nodes that lie within the transmission range. The direct communication of mobile nodes requires being closer to each other for short range communication.

1.2 Applications of manet

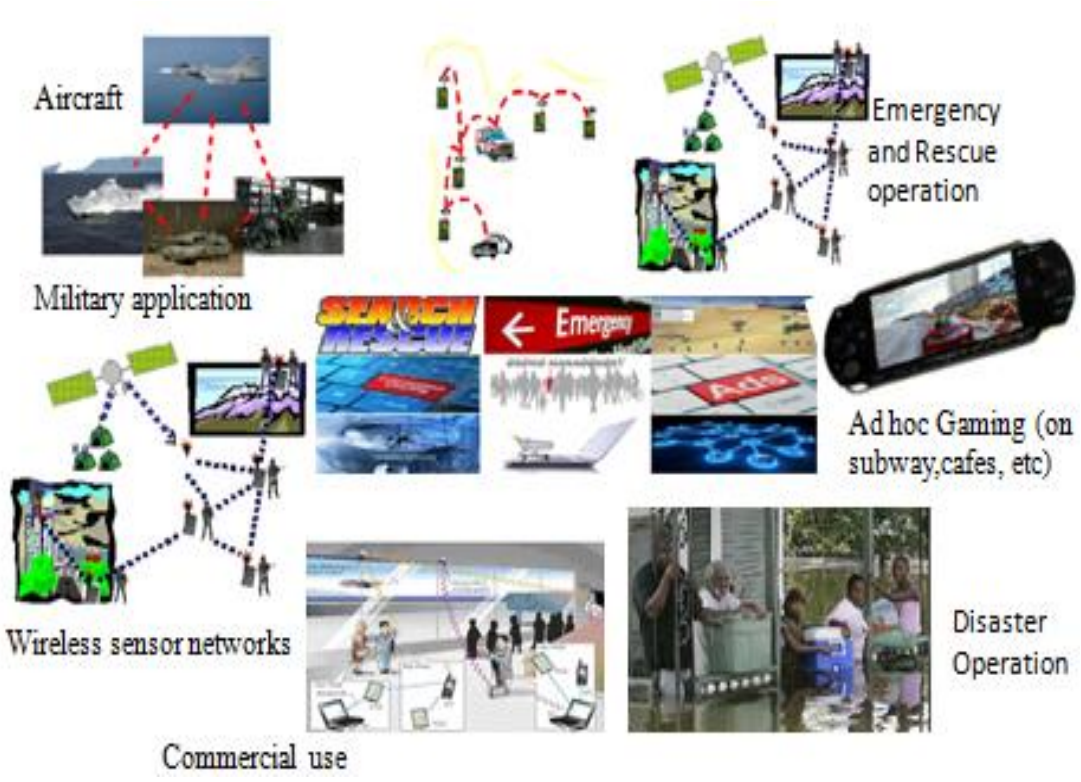


Figure 2. Applications of manet [1][2][4]

1.3 Challenges[1]

Routing
Security
Reliability
Energy Efficiency
Dynamic topology
Lack of central authority

1.4 Routing protocols

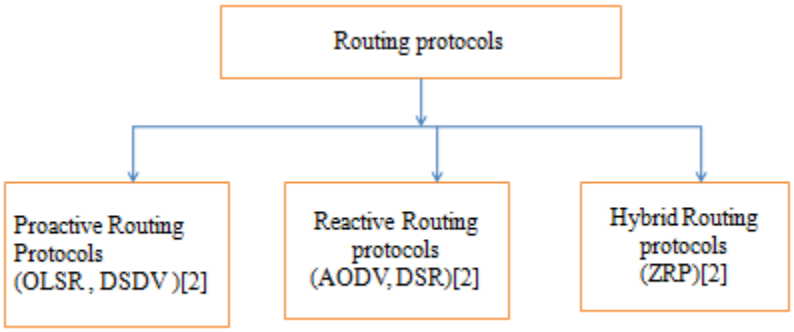


Figure 3. MANET routing protocols [2]

Proactive Routing Protocols[5]
Proactive routing protocols continuously evaluate the current network to find out the possible routes, so that, if user wants to forward a packet from source to destination node, the route is already known and can be immediately used.[5]
Ex.. Optimized Link State Routing (OLSR),Destination Sequenced Distance Vector (DSDV) [5]

Reactive Routing protocols[5]
Reactive routing protocol performs a route discovery procedure, in on-demand basis only, i.e., when the route is required.[5]
Ex. Ad-hoc on demand Distance Vector (AODV) routing, Dynamic Source Routing (DSR) etc.[5]

Hybrid Routing Protocols [5]
A hybrid routing protocol uses a mixture of both proactive and reactive approaches, as it has two states of functions viz., intrazone and interzone routing protocol. Intrazone routing protocol uses proactive routing protocol and interzone routing protocol uses reactive routing protocol to find optimal routes.[5]
Ex. Zone Routing Protocols (ZRP) [5]

II. DYNAMIC SOURCE ROUTING

Dynamic source routing protocol is a reactive protocol. Source specifies the complete concrete and full route-path to the desired destination as a part of packet header. Each intermediate node in this path works as a router and forwards the packets to the very next node given in that path. Route caching is used to cache all routers a node as has seen so far to use immediately in future. So a source first tries to find a route from its route. If an existing route can be found, the source uses that only. Otherwise, the source tries to discover a fresh and new route by initiating route discovery process.

As a part of the route discovery process, the source subsequently tries to flood the network with a packet asking for the route called query packet. Destination or any other intermediate nodes replies to this query packet which is stored in source's route cache. Each packet has an ID and a field to store information about a path. When a node receives a query, if it has already processed that ID or if it finds its own address in the path information, it simply discards the packet stops further broadcasting also called flooding. Else, it modifies the query message by appending its own node address in the path list and floods the query packet to the network which will to its neighbors. If a node can find route for the packet from cache, it sends a reply to the source without flooding the network then after . DSR is suitable for the network in which very few numbers of nodes communicate as source nodes with very rarely used destinations. This may introduce very large end to end delay and large amount of processing overheads in very high dynamic network. Sometimes DSR is not suitable from the scalability point of

view. In scalability, if the network grows, all packets like control and data become larger as they have to carry addresses of all the nodes associated in a specific path. This degrades performance because ad hoc networks are often bound by limited bandwidth .[6]

There are basically two phases in DSR : 1) Route discovery 2) Route maintenance

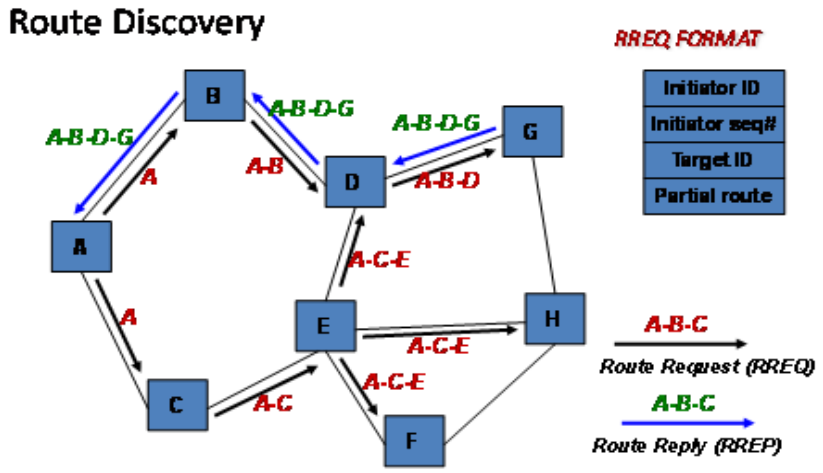


Figure 4. Route Discovery in DSR

III. LITERATURE REVIEW

3.1 Existing Dynamic Source Routing Protocol in MANET

3.1.1 Nodes energy aware modified DSR protocol for energy efficiency in MANET[7]

Here authors propose the modification for route discovery in basic DSR protocol for energy efficient route establishment. In this paper , routing overhead is less as compared to basic DSR protocol.

In this paper, route discovery can be done on the basis of consumption energy of nodes for transmit and receive single packet instead of considering minimum number of hops in the network. If distance between two nodes is more, the required power for transmission and reception for packet exchange will also be more because both try to stay in range of each other. This may show that, energy consumption by nodes may be higher than the energy consumed by the route having more number of hops which are located near to each other.

3.1.2 Novel Approach for Reliable Communication Using Energy Aware Routing Protocol in MANET[8]

In this paper, authors propose to sort out the problem of energy constraint. Nodes within an MANET are battery dependent. There is a no external source of battery replacement and charging. Since these energy sources have a limited lifetime, energy or power availability is one of the most important constraints in the ad hoc network.

The aim of this paper is to overcome the problem of limited battery power due to the problem of energy constraint.This paper is focused on method of power saving and awareness in communications between nodes. This idea is applied to DSR protocol that works on a reactive approach and make use of alternate paths by satisfying a set of energy and distance based threshold area. So they can achieve the following:

- Increse lifetime of the whole network
- Improve packet delivery ratio by preventing nodes from dying out due to energy failure.
- Energy aware and location aware algorithm are used for developing a new protocol for MANET.

3.1.3 Implementing a new power aware routing algorithm based on existing dynamic source routing protocol for mobile ad hoc networks[9]

The authors propose modifying DSR to select energy efficient path for communication. The main functionalities of modified DSR are:

(i) to minimise energy consumed per packet
(ii) to minimise maximum node cost
(iii) to maximise network lifetime

However, some intermediate nodes might act selfish and drop the packets for other nodes.

The proposed algorithm can find selfish nodes and deal with them by using a modified DSR protocol, which we call as an efficient DSR (EDSR). In this, packet delivery ratio is increased in the network. The average node lifetime of proposed EDSR model is 45–60% longer than that of DSR model. This paper defines an extension of DSR protocol that allows the routing of most packets without an explicit source route header. Further, it reduces the overhead of the protocol while preserving the fundamental properties of DSR's operation. Once sending node has discovered a source route through route discovery mechanism, the flow state mechanism of efficient DSR allows the source node to establish hop-by-hop forwarding state within the network. Based on this, each node is enabled to forward the packet to the next hop Flow state is dynamically initialized by the first packet using a source route and then flow is same without use source header in packet. The goal of this paper is to increse the network lifetime by improving the power utilization of the routing mechanism in mobile ad hoc networks.

3.1.4 Energy Efficient EE-DSR Protocol for MANET[10]

Here authors propose DSR algorithm which is better than normal DSR. The new algorithm is based on energy-based routing which choose the best path among the different paths. The route discovery part is the most important part in DSR algorithm so it takes the major attention while setting up of ad hoc network. This process also includes the route cache updating. There is no doubt that the new algorithm is lengthier but it helps a lot during route maintenance phase. Because the best path is always stored in the cache so that route maintenance increasing its speed and reliability. Another advantage of this algorithm is that it prevents back flooding of the packets. If a node is already added to the packet path then no more flooding of packets occur to that particular node. This saves the network congestion and also increases the lifetime of the network. Hence this algorithm is a better for route discovery rather than the DSR algorithm because it provides the best path between any source and destination node.

3.1.5 Enhanced DSR: An Efficient Routing Protocol for MANET[11]

In this paper, authors propose Enhanced DSR which is called DSRl. It reduces the flooding of RREQ (route request) packets in the network. So that congestion and energy consumption can be reduced. In this when a node receives a RREQ packet, it checks its own residual battery, received signal strength and speed. If the defined threshold value for the node is less than these mentioned parameters then the RREQ packet will be forwarded in the network. Otherwise node will discard the RREQ packet. Hence the DSR1 algorithm prevent the unnecessary flooding of RREQ packets which is improved system performance.

Controlling the flooding of RREQ is very important task in mobile ad hoc network because it consumes more power and bandwidth of the network which lead to high congestion and delay in the network. The DSR1 provides a better solution to overcome this problem.

IV. PROPOSED WORK

1. Sender will send RREQ packet to the neighboring nodes.

2. Neighbour node will Check sender's energy and compare with threshold value.

3. If sender's energy is less than threshold then node will discard the RREQ and delete all path from that sender otherwise intermediate node check its own energy.

4. If own energy is less than threshold then node will double sender timeout value else forward RREQ to next node.

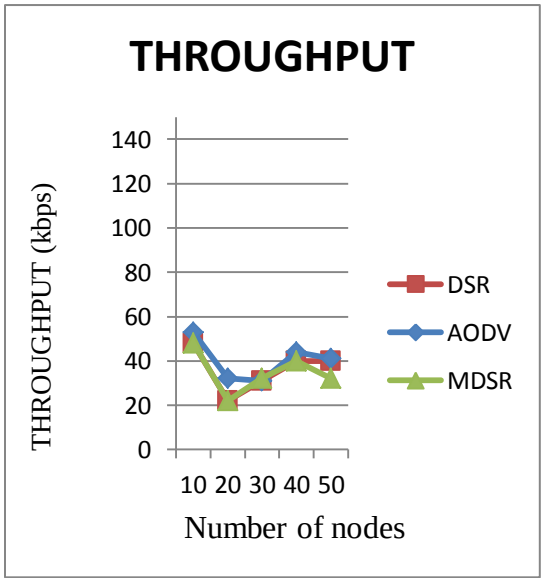
5. Next node will check itself as destination node or not.

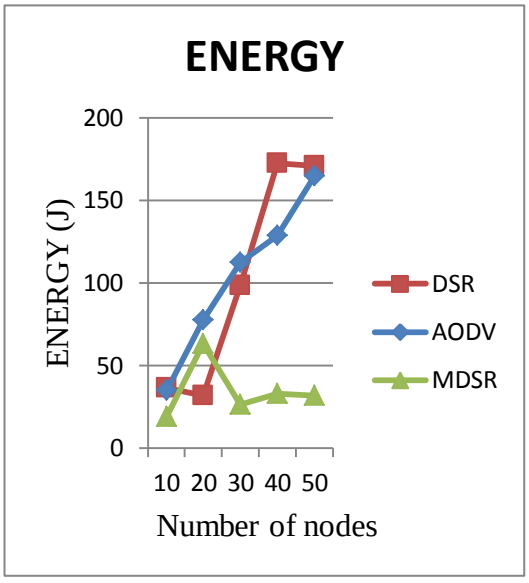
6. If node is destination node then path is estlablished and RREP via that path otherwise go to step 4.

V. SIMULATION & RESULT ANALYSIS

Table 1.Simulation Environment

Parameter	**Value**
Channel	Wireless Channel
Simulation Run time	60 s
Routing protocol	DSR,AODV,MDSR
No. of Nodes	10,20,30,40,50
Propagation Model	Two Ray Ground
N/W interface type	Wireless Physical
MAC type	802.11
Antenna type	Omni Antenna





VI. CONCLUSION

In this paper I have discussed, one of the important issue that is energy consumption problem in MANET. It is required to design energy efficient routing protocols in order to overcome energy problem. From result we can conclude that MDSR is better than DSR. In future we can take different parameters and for simulation also we can use different routing protocol because by using this we can improve the network performance in terms of ene to end delay, packet delivery ratio, energy and throughput

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