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Energy Efficient Routing in Mobile Ad-hoc Network: A Review

[1]Bava Rinku K., [2]Patel Manish M., [3]Patel Megha B.

[1,2,3] *Dept. of Computer Engineering, Smt. S. R. Patel Engineering College Dabhi-Unjha, Mahesana, India*

Abstract— MANET is kind of mobile ad hoc network. MANETs are having self organizing and self configuring network and there is no centralized base station. Multi hops wireless networks are self organizing in MANETs and process of communication in take part in the all mobile nodes and forwarding the data packets in this process. In routing forwarding the data packets on one node to another node is core problem in the networks. Overcome to this problem to build up challenging task an efficient routing algorithm in MANET. The node's batteries operated in MANET and improve the network lifetime.

Keywords— MANET, Energy Efficient Routing Protocol, Battery power, Ad hoc network.

I. INTRODUCTION

Mobile ad hoc network is also known as MANET.The wireless communication technologies are two types of communication: Fixed wireless communication (infrastructure) and ad hoc (infrastructure less) wireless communication. MANETs are consist of operated nodes having limited energy.Multi hops wireless networks are self organizing in mobile ad hoc networks and process of communication in take part in the all mobile nodes and forwarding the data packets in this process. In routing forwarding the data packets from one node to other node is core problem in the networks. Overcome to this problem to build up challenging task an efficient routing algorithm in mobile ad hoc network.

Challenges of MANET: Limiting power supply, Dynamically Changing Topology, Limited Bandwidth, Security, Battery constraints [4].

Characteristics of MANET :- Nature of wireless link, Features of node mobility, Dynamic topology, Bandwidth, Energy constraints, Limitations of security, Self-creation, self-organization and self-administration [4].

Applications of MANET:- Conferences and meetings, Emergency search and rescue operations, Earthquake or other natural disasters, Military, Institutions and colleges [4].

II. ROUTING PROTOCOLS FOR MANET

Routing protocols are three types in mobile ad hoc network: proactive, reactive & hybrid.

- *Proactive routing protocols:* Proactive routing protocols are also known as table driven protocols and routing information keep up in these protocols before it is required. For maintain routing information to each node in the network. The routing tables are store routes information and the network topology changes of times update [1].

- *Reactive routing protocols:* Reactive routing protocols are also known as On demand routing protocols and the network nodes are do not keep up routing activity, there is no routing information and communication. If any node desires to forward a packet one node to other node then this protocol discover for the route in an On demand order and to send and receive the packet for establish the connection in order. By flooding the route request packets in the network usually occurs the route discovery. For on demand protocols are send and receive packets are used to find one route to a specified destination [1].

- *Hybrid routing protocols:* Hybrid routing protocols are combine two protocols: proactive and reactive. These protocols are the use of distance-vectors for other particular metric to set up a finest route to destination networks, and there is modify in the topology in a network when report routing information. Example of hybrid routing protocol is ZRP [1].

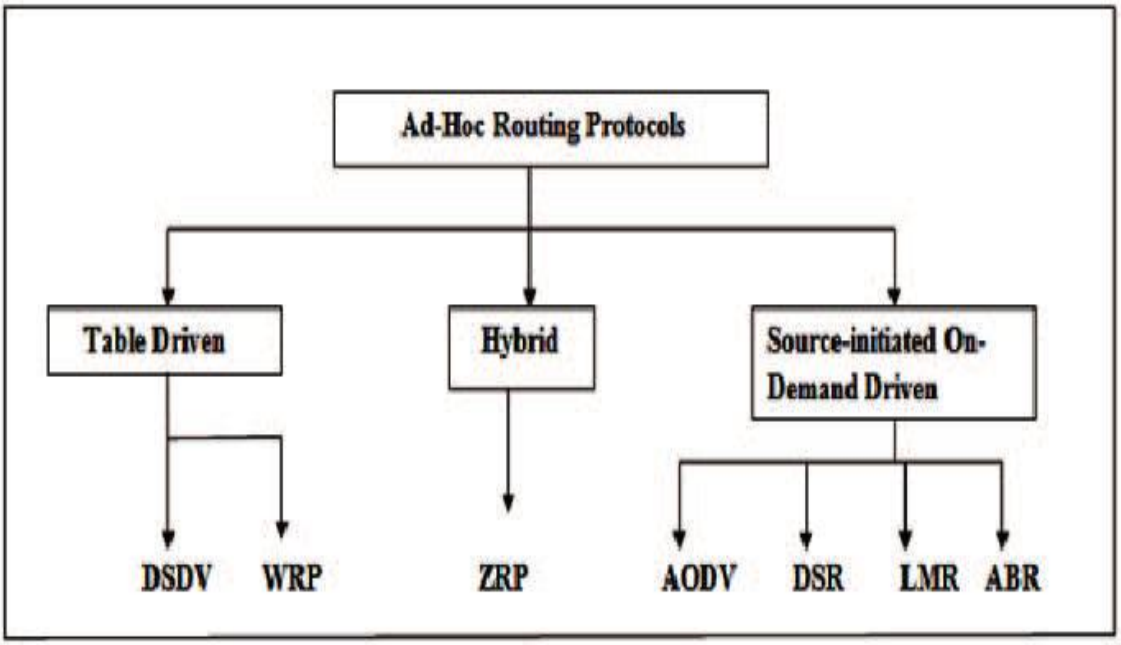

Figure 1. Classification of routing protocol [1]

Adhoc On demand Distance Vector Routing Protocol (AODV) [2]

Adhoc On demand Distance Vector Routing Protocol is one part of reactive routing protocol. When route is needed then AODV is start route discovery and maintain active routes only where as they are in use. The advantage of this protocol is the overhead messaging to be reduced. The disadvantage of this protocol is delay in discovering a new route [2].

- *Route Discovery:* A source nodes wants to forward a packet to various destination nodes and it does not have a substantial route to the destination, it begins route discovery procedure to find the destination. This procedure to communicate RREQ packet to its neighbor's node and forward the packet demand their neighbor's node and the destination to be found an intermediary node with "fresh enough" route [2].

  For forwarding the RREQ of the process, intermediary nodes are stores the addresses of neighbors in its route tables on which the RREQ to be received and reverse path to be established. It will first received RREQ, when RREQ have reach the intermediate node or destination node with "fresh enough" route and the destination nodes are reply with RREP packet reverse to the neighbor nodes[2].

- *Route Maintenance:* A place of successor nodes be keep up entry for every routing table it representing the place of neighbor nodes which apply to entry the path of data packets. When the next hop link breaks that these nodes are notify with RERR packets. Each successor node in go round forward the RERR to its have place of successor successfully erases every routes by the broken connection. The source node is able to re-start the route discovery designed for to destination [2].

Each and every node have limited range for communication, which only to communicate with its neighbor nodes. A node 4 is communicated with its neighbor node 3, but it is unsure about that route. For broadcast RREQ by node 4. It's received that neighbor's node 1 & node 5. In node 5 is does not include some route toward node 3 & so RREQ rebroadcast it and by node 4 is received reverse it. It drops the node 4.

Its drops the RREQ, then sequence number of node 1 is to be greater than RREQ and reply by RREP. But it is not, it forwards RREQ to node 2 then the sequence number updates in routing table. For node 2 is route to the node 3, by forwarding RREP to the node 1 is replies it. A node 1 is forward RREP to the node 4 and the data packets are forwards to the established path node 4, node 1, node 2 and node 3.The data packets are forward to node 4 to node 3 by specific route [2].

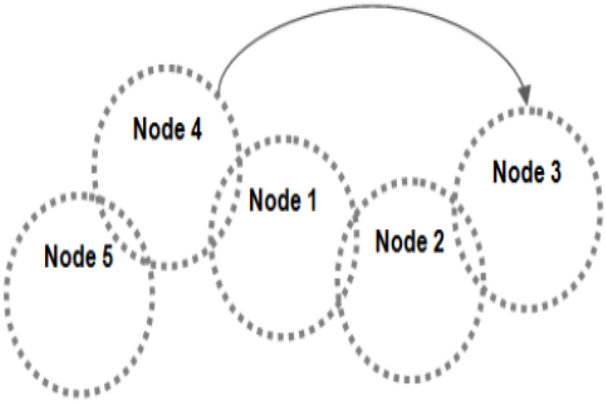

Figure 2. Communication between nodes in MANET [2]

Energy Conservation

Energy conservation is a limiting feature in the MANET, since nodes are probable to depend on manageable, power sources are limited. Also, energy saving is really demanding multi-hop environment; wherever the wireless nodes must too save energy to route packets for another nodes & toward secure connectivity of the network. For various technique can be use to decrease the energy save through sending and receiving in the MAC layer, moreover, when the node is inactive then, alert procedure may roll off the wireless tool. At the network layer, by dropping the end-to-end power required toward transmit the packet to perform route selection process. If the network layer can include access the information about of energy, battery-level can be used in routing procedure [3].

III. LITERATURE REVIEW

AODV Algorithm EERP [1]

- *Route establishment:* This phase, giving out and forwarding a route request which include comparison the received signal value (RSS) with current threshold value of RSS. This comparison will be decided that when forwarding node should be there. [1].

- *Route handling:* This phase, changes completed in giving out and forward the route reply procedure. Now, the current threshold value of signal is compare with the current RSS value of signal. On the beginning of it, the route reply phase in transmission power is reduced by close node [1].

- *Route Termination:* This phase, changes completed which rearranges the transmission power of node into route ending process [1].

Energy Efficient based on Stable Multipath Routing Protocol (EESMRP) [3]

The network in this process is high load balancing and lowest energy conservation this process. This process is considered multipath routing, stability and model of energy conservation. Each node is transmission mode, in classify to reach lowest energy consumption. But single node is in transmission mode within multipath routing, another node will be into sleep mode toward continuing lowest energy utilization level. In multipath provide more network lifetime and high throughput in EESMRP [3].

Some verification technique is used in multipath. Discover the capable route to improve network lifetime is used hop to hop authentication. This authentication called as multipath authentication. It want to minimum degree of connectivity then multiple disjoints paths are used. Determining and maintain set of displace routes among two communication ending points not easy in multipath, compare to a particular path. For more stability of route is used into multipath routing [3].

Stable routing with power factor [4]

This method is take concern of on demand routing beside with a new idea of backbone nodes with power factor. Collection of backbone nodes is completed ahead accessibility of nodes and battery status. For number of backbone nodes are attaching it an entry in each route table and their battery status [4].

This method is explained by the example of shown in Figure 3. Suppose to the source node 1 is while destination is then node 4.The shortest path is 1—2—3—4, then node 3 is power status in dangerous region, other than the other established path is 1—2—5—8—9—10—4 in conditions of active power condition is selected. In Figure 3. if the node 8 moves away and the 1—2—5—11—9—10— 4 will be established new route [4].

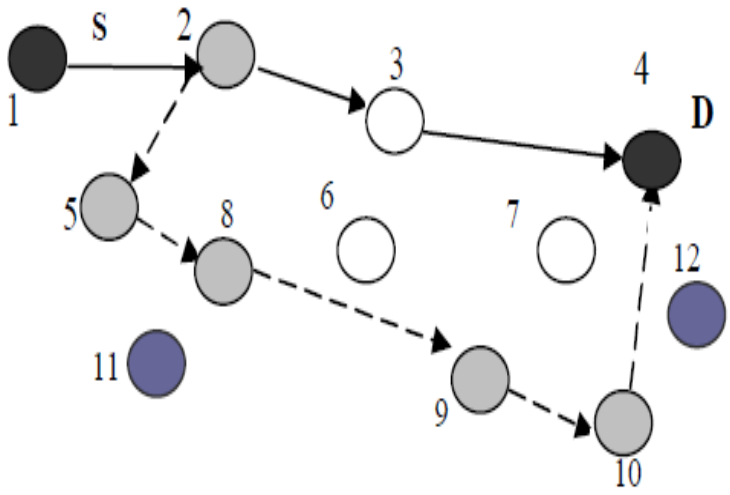

Figure 3. Stable routing with power factor [4]

Here the backbone node (BN) is node 11 it is used for node 5 and the node 8. Similarly the node 12 can be backbone node (BN) for the nodes with the indices 7, 10 and 4 [4].

Adhoc On demand Multipath Distance Vector Routing Protocol [5]

AOMDV: All routes in the process of selecting path is to discover the nodal residual energy and select the path with minimum nodal residual energy and nodal residual energy is arrange the all routes base on the downward categorize. Another path with better nodal residual energy is ever-increasing, it is over another time select to forward have a relax of the data packets. It can build up the personal nodes battery control operation & so expand the whole networks lifetime [5].

The entire network lifetimes improving for various steps are concerned:

1. Route discovery process is discovering the nodal residual energy of every route.
2. Minimum nodal residual energy is discovering the valid route.
3. A nodal residual energy is set all together every one of the routes base upon the descending value.
4. To forward the data packets to build a choice on the route through maximum nodal residual energy.

Two main components are E-AOMDV protocol [5].

1) The route discovery process is discovering route minimum nodal residual energy of every route.

2) In descending nodal residual energy is arranging multiple-route and to forward the data packets use the route by maximum nodal residual energy.

Energy Efficient Scheme Based on Battery Status [7]

The method provides robust and longest path from initial point i.e. source to final point i.e. destination. It can be used to

manage data traffic at different level. This protocol is base on modifications over AODV, for improving the performance of on demand protocols [7].

There are three types of battery status:

1) In Danger state, (Battery Status<20%)
Then El <E Thr

2) In Critical State, (20% >Battery Status <50%)
Then El<=E Thr

3) In Active mode, (Battery Status>50%)
Then El> E Thr

Algorithm

1. Source node S transmit route request message contain threshold value Thr, & expected distance DS on Source to the destination.

2. A neighbor node N

If El > E Thr && Tc - T(N) < DS
A respond message active reply include the
route length be send

Else if El < E Thr
No reply is send

wherever, El is energy level of node, E Thr is pre-define threshold, Tc is current time and T(N) is time when end packet to be forward D during N correspondingly and DS is the current expected distance of the node on the destination.

3. Source node S

Outputs are the expected messages in form of active reply. The data is forwarded to the neighbor which is having shortest active route and remaining nodes are stored in form of other node coming in the breakdown while occurrences. The selected node to the sent RREQ message.

4. RREQ message receives by node. If active route available then forward it. On the reverse path for the destination node D forwards reverse RREP.

5. When source S receives RREP, path is established. Data is forwarded more than the established path.

IV. CONCLUSION AND FUTURE SCOPE

The mobile nodes are moving arbitrarily without any centralized organization in MANET. In routing forwarding the data packets from one node to other node is core problem in the networks. Overcome to this problem to build up challenging task an efficient routing algorithm in mobile adhoc network. The node's batteries operated in MANET and improve the network lifetime. Energy Efficiency depends on some parameter like link stability, link availability, stability of multipath and energy exhausted on communication point to support packet forwarding. There are various methods of AODV algorithm in EERP, Energy Efficient stable multipath routing protocol, stable routing with power factor, Adhoc On demand multipath distance vector routing and Energy Efficient scheme based on battery status used in MANET.

Our future work is take energy parameter like Received Signal Strength, Residual Energy and uses their threshold value so that link doesn't break frequently and energy efficiency is maintained. This means to find out energy efficient route to transmit a packet from source to destination along with an energy efficient route.

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