

# A Review on Efficiency Enhancement of On-Demand Multipath Routing Protocol in MANET

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**Abstract**— *Multipath routing protocols are the one of the main classification of routing protocol in MANET. They provide more advantage over single path routing protocols. Improving throughput, energy efficiency and network lifetime as well as reducing end to end delay and energy consumption are the main requirement of the routing protocols used in the network. The efficiency of the routing protocol can be improved according to each parameter. There are so many methods are used to improve the efficiency of a on demand multipath routing protocol. This paper provide the previous study on efficiency enhancement techniques used in the on demand multipath routing protocols in MANET*

**Index Terms**—AOMDV, efficient routing protocol, MANET, multipath routing.

## I. INTRODUCTION

The communication between nodes can be mainly classified into wireless and wired communication. The wired backbone infrastructure may be not existent for use by mobile hosts for many senses, such as unpredictable natural disasters and radio shadows. Wireless networks allow nodes to move without the constraints of wired connections. Wireless networks play a critical role in military applications and civilian systems. Handheld personal computer connectivity, note book computer connectivity, vehicle and ship networks, and rapidly deployed emergency networks are all applications of this kind of network. Ad-hoc is a wireless multi hop network which contains various numbers of nodes [3]. When the nodes consisting the ad-hoc system are mobile, then the network is called mobile ad-hoc networks. Hosts as well as routers in a wireless network can move around. Therefore, the network topology can be fluctuating. Mobile ad hoc networks (MANETs) are defined by a dynamic topology and limited power at the nodes, where each node carry a battery to provide energy. Because of these characteristics of the network, paths between source nodes with destinations node may be unstable making communication over MANET difficult. Due to some situations the source node can't able to communicate directly with other hosts in a single hop fashion. In this case, a multi-hop scenario used which overcome the difficulty of single hop communication, in which the packets sent by the source node must be passed through several

intermediate nodes before reaching the destination host. Thus, each mobile node in a MANET must act as a router.

As no central administration is available in the network each and every node in the network has to perform the various roles as the initiation of route discovery process, diverts the packets received at a node to its adjacent node, creating the shortest path, selecting the path between sources to destination and sending packets on this path. The nodes are associated with each other by a peer-to-peer network. Traditional routing protocols used for wired networks cannot be directly applied to most wireless networks because some common assumptions are not valid in this kind of dynamic network. One situation which is expected that a node can accept any broadcast message transmitted by others in the same subnet. But it is not true for nodes in a wireless mobile network and introduce more complications in the case of MANET because of the nodes have the mobility. The bandwidth in this type of system usually limited. Thus, this MANET provide great challenges for routing protocols.

## II. ROUTING PROTOCOLS IN MANET

A routing protocol specifies how nodes in the network communicate with each other and delivers packet to its intended destination. Routing is basically a two-step process: to determine the optimal routing paths and transfer the packets through the network. The packet is transmitted hop-by-hop from one node to another node depending on the routing algorithm a routing protocol runs to calculate the route [1].The routing protocols in the manet can be mainly classified into single path routing protocol and multi path routing protocol [2].

### A. Single path routing protocol

In single path routing mechanism a single route between the sources to destination is established. Single-path routing are of type, reactive, proactive and hybrid. In single path routing protocol, when the transmitting route break or fail it needed to repeat the route discovery process again for selecting new route. It provide additional overhead and delay. To avoid this problem multipath routing protocols are used.

**Proactive routing protocol:** Proactive routing protocols are also called as Table-Driven routing protocols. They are called proactive because each and every node in the network maintain routing information even before it is needed. The nodes are constantly looking for changes in the network topology and update their routing table such that each node in

the network knows the route to every other node in the network. They maintain multiple routing tables. One is considered to be active currently in use and other as a backup when the topology changes. The protocols are not suited for large network as they need to maintain route information to each and every node in the network which may cause more overhead leading to consumption of more bandwidth. Examples of proactive routing protocols are OLSR, DSDV and IARP

**Reactive Routing Protocol:** On-Demand routing protocol is another name for reactive routing protocol. It gets its name because of the fact that nodes are active only when there is a need to set up communication to transfer data. They do not maintain any routing information or routing activity in the network if there is no communication. Only when there is a need to transfer data communication is established by the source, looking for a route to reach to the destination. The route discovery is done by flooding the network with route request packets. Due to its on-demand nature these protocols have less overhead, are bandwidth efficient and suitable for large networks. Since they do not have any back up route in case of the change in the topology the source node needs to initiate another route discovery process which makes route maintenance a little expensive. Examples of such protocols are AODV and DSR

remaining one or more alternate paths are available between sources to destination. A source node in this technique is having the ability to discover multiple routes between sources to destination in a single route discovery process. AOMDV is a reactive routing protocol which is an extension of the older AODV routing protocol. Main advantage of AOMDV over AODV is that it will determine multipath routes between source and destination, where AODV determine single path. so in the case of AODV when that route fails it needed to start again to determine the route. It is time consuming as well as make much overhead. AOMDV take a little overhead more than AODV to compute multiple paths. But it is not at all big problem when we think about the route failure in AODV. AOMDV will determine multiple loop free path and link disjoint path so AOMDV is a solution of route failure in MANET. By using AOMDV instead of AODV we get efficient recovery of packets.

### III. EFFICIENCY ENHANCEMENT OF MULTIPATH ROUTING PROTOCOL

An optimized ad hoc on demand multipath distance vector (AOMDV) routing protocol [5] avoids route cutoff and frequent route discovery process of AOMDV. When there are one or more common intermediate nodes in a pair of link-disjoint paths, it cannot find both of the reverse paths. This is called route cutoff problem. To avoid this problem route reply acknowledgement RREP\_ACK control packet is used. It provides improvement to AOMDV. Ordinary AOMDV loses an amount of the reverse path but by using OAOMDV we get more number of reverse path compared to AOMDV because of using RREP packet.

Load balancing is an important criterion in the case of MANET. The efficiency of MANET can be achieved by well load balanced network. In the case of multipath routing protocol load balance can be taken as the remedy for the congestion in the network because of the number of large nodes. so a new protocol LB-AOMDV introduced [6]. The main difference between load balanced AOMDV from AOMDV is that it determines the route from source to destination with lower congestion. But in the case of AOMDV it determines the route with lower hop count. Lower congestion means traffic through the route is lower. Sometimes the route with lower hop count with higher congestion makes more delay. So to avoid this problem we can use LB-AOMDV. It is an energy efficient routing protocol compared to ordinary AODV routing protocol. Because when we consider the hop count for determining the route. if it is a higher congestion route then the batteries are drained out easily. By LB-AOMDV we can improve the lifetime of the node as well as the end to end delay can be reduced.

End to end link reliable energy efficient multipath routing (E2E-LREEMR) is an extension of AOMDV routing protocol, which is introduced to reduce the amount of the link failure and route breaks between communicating entities [8]. Mainly this routing protocol uses two metrics such as path link quality estimator and path node energy estimator for finding the reliable paths.

In the case of a MANET the number of packets to be sent is very large because of the number of nodes connected to a single

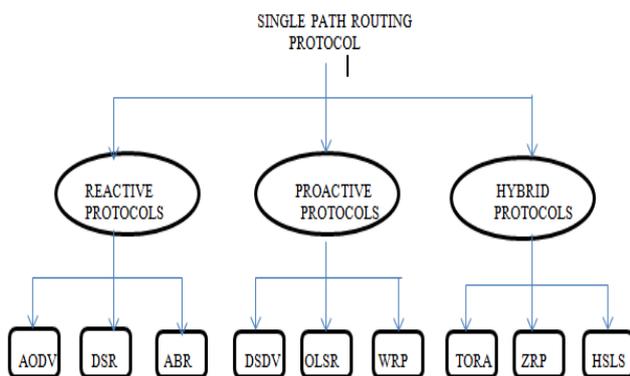


Fig: Different routing protocols

**Hybrid Routing Protocol:** An hybrid routing protocol makes use of the advantage of both proactive and reactive routing protocol. Depending on the type of application they are for, the nodes can be active only until they reach to every other node in the network and then operate in an on-demand manner. Examples of hybrid routing protocols are CBRP and FSR.

#### B. Multipath Routing Protocol

In multipath routing protocols it determines all available paths from source to destination in the route discovery process. If one route fails it selects another route from the predetermined routes. Route recovery process is started in multipath reactive routing mechanism rapidly and dynamically if a route fails in a network. This feature attracts many researchers to invent multipath routing algorithms for the network. More than one paths are established from source to destination node. Amongst these several routes, at least one path is main and

node is large. Energy is the very important constraints in the case of communication network, especially the node energy, so the energy efficient protocol for a MANET is a highly needed one. Here introduced a routing protocol EAOMDV which is an energy efficient multipath routing protocol [11]. It is determined by giving slight variation to the AOMDV protocol. The variation is that in the case of AOMDV it selects routing path as hop count as constraint. But in a congestion system energy will be the highly priority constraint. Working of EAOMDV is similar to AOMDV like it first the node which wants to send packet will generate RREQ packet which is attached with a cost function generated by the same node. The nodes which are neighbour to the source node receive the RREQ packet and it checks the value of cost function of that node with cost function value of the RREQ packet. If it high then no change will occur otherwise it is overwrapped with new value. This process will continue till it reaches at the destination. When the RREQ packet reaches at the destination it will start a timer, to collect the RREQ packet from the various path. The RREQ packet will not be collected after timer from the received packet it selects optimized route.

Another approach which provides better packet delivery reliability in MANET by using a method of multipath routing protocol with fixed delays [10]. It avoids the retransmission of nodes because the lost packets reconstructed using the redundant packets at the regenerating nodes. It reconstructs the lost packet using packet level FEC. This method reduces the packet loss rate between source and destination nodes and provides better packet delivery reliability in MANET.

The main challenge for routing protocols in MANET is the route failure. A multipath energy aware on demand source routing protocol is introduced to reduce the amount of route discovery process to provide considerable global energy gain. The reduction in route discovery process will also balance energy consumption. In MEA-DSR the primary route is selected by minimal residual route energy to route length ratio.

Another drawback of AOMDV is the link failure, which degrade the performance of the network. This is mainly occurred due to the movement of the nodes in the network. To overcome this problem a dynamic queue is introduced which consist of threshold values for load balancing in MANET[12]. A hop count and time based MANET routing protocol is a new routing protocol which enhances the efficiency by considering the hop-count and a time based variable[14]. In ht-AOMDV, it take some modifications to existing AODV by adding a new field Packet travel time(PTT) into the routing table. The source and destination node which initiate RREQ and RREP packet append a time stamp on it. PTT is calculated by the receiving node using the time stamp value. Using the PTT value an efficient path is determined

In AODV like multipath routing always looks the route with lowest hop count. For reducing end to end delay it determine the zone disjoint path instead of link/node disjoint path[7]. The RREQ process is as same as AODV routing protocol which means source RREQ packets to its neighbour. Neighbour receives RREQ if it is not a destination it again sends to its neighbours. In this paper a new field is added in

the RREQ packet called active Neighbour Count and it is initiated with a value zero.

Node energy is one of the main parameter which depends on lifetime of any networks, so always need a mechanism which prevents the energy consumption as well as improving the network lifetime. A new routing protocol, ad-hoc on demand multipath routing with lifetime maximization (ADMR-LM) is introduced to overcome the drawback of the routing protocols[15], which are not concern about the energy of nodes when selecting routes. It is a multipath routing protocol because single path routing protocol produce delay and wastage of node resources. Every node in mobile ad-hoc networks are attached with a battery. The network lifetime will be decreased, When the battery of the node exhausted. The battery charge reduced according to the transmission of packet between nodes ADMR-LM selects the routes according to the energy level of nodes. The node energy is classified into three classes' high low and average, So when a packet want to send a packet from a node, it broadcast RREQ message which contain an addition field, the residual energy of the node. In each stage of the node add the residual energy of each nodes in its passing towards the destination to the field, the destination selects the route with highest residual energy path. To define the classes of each node, ADMR-LM sets an energy threshold and energy coefficient.

#### IV. CONCLUSION

This paper investigates the different efficiency enhancement techniques for the multipath routing protocol in MANET. The main parameter which concerned to improve efficiency is the node energy. By reducing the number of link failure we can improve the energy efficiency. Delay, load and distance are the constraints which are discussed here for improving the quality of the network.

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