# IMPLEMENTATION AND COMPARISION OF DATA LINK QUALITY SCHEME ON ODMRP AND ADMR IN MANETs

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## *ABSTRACT*

*An ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any fixed network infrastructure or centralized administration. In order to enable communication within the network, a routing protocol is needed to discover routes between nodes. The primary goal of ad hoc network routing protocols is to establish routes between node pairs so that messages may be delivered reliably and in a timely manner. The objective of any routing protocol is to have packet delivered with least possible cost in terms of receiving power, transmission power, battery energy consumption and distance. All these factors basically effect the establishment of link between the mobile nodes and liability and stability of these links. In this paper, we implement a data link quality scheme on two protocols ODMRP and ADMR and compare them on the bases link quality and link stability.*

## *KEYWORDS*

*MANET forwarding node, routing information cache, link stability database, multicast routing, stable route.*

## 1. INTRODUCTION

A mobile ad hoc network (no MANET) is a type of wireless networks. This type depends on the mobile nodes and there is infrastructure in such type. There are no routers, servers, access points or cables. Nodes (mobiles) can move freely and in arbitrary ways, so it may change its location from time to time. Each node may be a sender or a receiver, and any node may work as a router and do all router functions. This means that it can forward packets to other nodes. Many applications of MANET's are implemented and used until today like in: meeting conferences; military operations; search and rescue operations, all of them are examples of MANET networks [1].Due to topology changes various constrained occur. There is bandwidth constrained, energy constrained, capacity links constrained and for all these MANETS need a efficient ways to determine network organization, link scheduling and routing protocols. The routing protocols for adhoc networks have been distributed as proactive and reactive routing protocols.

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The main idea behind this paper is to study the ODMRP and the ADMR protocol, then compare the results of both protocols. This paper is organized from five sections; section two will show the related works, Section three will study the problem definition. Methodology of solution and the results will be discussed in section four. Final section represents a summary and conclusion. Many researches studies ODMRP and ADMR protocol, some of them focused on performance, security, multiple paths, and some others studied this protocol comparing with other protocols. This research studied ODMRP comparing with the ADMR.

# 2. RELATED WORK

In the recent period lot of research has been done on MANETS based on multicasting. The multicasting is one of methods that because of group-oriented computing are mostly used in MANET routing [2].But now days link stability and link quality is major topic to be resolved and for this the routing protocol is to prefer stable links than transient links. For link stability and link quality signal strength is also measured. It is based on Route lifetime Assessment based routing[5]. In this a link is considered to be stable if it exists for a time of at least $A_{thresh}= 2r_{tx}/v$, where $r_{tx}$ the transmission range and v denotes the relative speed of two devices [3]. Signal Stability Adaptive Routing (SSA) [4] follows a similar approach. It distinguishes strongly connected from weakly connected links where a link is considered to be strongly connected, if it has been active for a certain predefined amount of time.

The protocol, termed ODMRP (On-Demand Multicast Routing Protocol), is a mesh-based, rather than a conventional treebased, multicast scheme and uses a forwarding group concept (only a subset of nodes forwards the multicast packets via scoped flooding). It applies on-demand procedures to dynamically build routes and maintain multicast group membership. ODMRP is well suited for ad hoc wireless networks with mobile hosts where bandwidth is limited, topology changes frequently, and power is constrained [6].

The research on ODMRP has been done and a multi coded paths technique is also used. Thus due to route diversity and overcoming single route breakage, our approach can improve PDR from source to destination .An enhancement of ODMRP with the refresh rate dynamically adapted to the environment which reduces the normalized packet overhead. R-ODMRP, added to the ODMRP multicast ad hoc protocol for better results. This NACK based protocol increases overall data packet delivery by adding data storage and retransmission operations coordinated by the multicast source.

ADMR [8] is an on-demand protocol, thus it does not maintain route information regularly. Member nodes that constitute the tree are refreshed as needed and do not send explicit leave messages. In ADMR, group membership and multicast routes are established and updated by the source on demand.

# 3. PROBLEM ISSUE

node needs to send data to receiver nodes and vice versa. For this, we shall be implementing a data link quality scheme in ODMRP which will be a mesh based configuration of network and another protocol ADMR which will be tree based. The objective of any routing protocol is to have packet delivered with least possible cost in terms of receiving power, transmission power, battery energy consumption and distance. All these factors basically effect the establishment of

link between the mobile nodes and liability and stability of these links. Due to inherent nature of the ad-hoc network where mobility rate place a very critical role in doing variations with respect to link quality and stability factor. Therefore, how expensive the particular route is very important factor of study. The large part of energy in this network is consumed when there is link breakage during transfer of data packet and the process again starts for maintaining a link after link breakage. To overcome this problem, the data link quality scheme should be implemented in which there will be a stable links when a source

### 3.1 On Demand Multicast Routing Protocol (Odmrp):

ODMRP is mesh based routing protocol and uses the concept of forwarding group. In this only a subset of nodes will be allowed to forward multicast packets. In this protocol multiple routes are established and updated by source on demand. In this a source node broadcast a JOIN-QUERY if it does not have any route to send its data packet. This JOIN-QUERY periodically broadcasted to refresh the membership information and update routes. When an intermediate node receives a join-query, it stores the source ID and sequence no in its message cache to detect any duplicates. When the join-query packet reaches a multicast receiver, it creates and broadcast a JOIN-REPLY to its neighbors. When a node receive a join-reply, it checks whether the next hop node ID of one the entries matches its own id or not. If it does, the node realizes that it is on the path to source and thus it is part of forwarding group [6][7].

## 4. DATA QUALITY SCHEME ALGORITHM:

ODMRP is a based on multicast mesh and ADMR is based on multicast tree and for creation of stable routes in multicast mesh and tree various control packets such as route request, route reply and route error (RE) packets are used. In ODMRP and ADMR when link stability is to be implemented the route request has following database:

1) Source Address: It is the address of source node which is originating the packet.
2) Sequence Number: It is assigned to every packet for identifying the packet.
3) Route request flag (RR flag): This flag is set for the duration of forward travel of RR packet from source to destination.
4) Power: This is the power at which a node has transmitted the packet to neighbor.
5) Antenna gain: This is gain of antenna at the forwarding node to forward RR packet to its neighbor.

When the ODMRP and ADMR is implemented in which it calculates the link stability, it has following algorithm for Route Request Phase:

1) Source node S broadcast packet to find the route for two multicast receiver R1 and R2.
2) Nodes A,B and C receive RR packet from S. The node update the paths to S in its memory cache by using next hop as S.
3) It also updates link stability database and stability factor.
4) Node A broadcast RR packet to its neighboring node and to R1. Similarly, B and C broadcast to R2,R1 and its neighbors.
5) If any of neighboring node find that packet it receive is duplicate, it discard that packet.
6) R1 and R2 update memory cache and link stability database.
7) Now, the R1 and R2 have a path from source node S.

The steps for Route Reply In ODMRP and ADMR when link stability is to be implemented:

1) R1 broadcasts RP packet to source S through A and B.
2) Nodes A and B receives RP packet from R1. These nodes update the path to R1 in its memory cache.
3) It also updates the link stability database.
4) Node A compares the next hope address in memory cache with the next hop address of RP packet and if match found , it set flag status.
5) Now, S has path from R1 and R2 that is R1-A-S, R1-B-S

## 4.1 Quality Scheme Database:

When a multicast mesh and tree and to create stable paths in mesh from source to multicast destination, there is following parameters which to be calculated for better results and some database points are also following:

1) Node ID: It stores the neighbor node ID.
2) Power level: Whenever a packet (either RR or RP packet) is received from its neighbor, this field stores the ratio (Pwij ) of measured value of the power received (Pr) at the node to the power transmitted (Pt) by neighbor node.
3) Distance: This field stores the distance between the neighboring nodes. The distance is computed by using the free space propagation model [7] [8] given in equation 1.

$$\mathbf{P}_r(d) = P_t G_t G_r \lambda/(4\pi)d^2 L \qquad \text{equation 1}$$

where *Gt* and *Gr* are the antenna gains of the transmitter and the receiver, respectively. *L* is the system loss, λ is the wavelength and *d* is the distance between two MANET nodes.

4) Stability factor: It is the value computed for a link to a neighbor based on the power level, distance and link quality. Stability factor *Sij* of a link between nodes *i* and *j* is defined by equation 2.

$$S_{ij} = [Pw_{ij} * Q_{ij} / d_{ij}] \qquad \text{equation 2}$$

where *Pwij , qij* and *dij* are the signal strength, link quality and the distance between nodes *i* and *j*, respectively.

5) Link quality: This field stores the value of the link quality of neighboring nodes. It is approximated by ratio of the number of bits in error to the number of bits received (bit error rate). This value gets updated for every packet received at a node over a certain period.

SFN selection among all forwarding nodes in the mesh is an important process since it helps in establishing stable path from receivers to source or vice versa among many alternate paths already found. A forwarding node checks for higher value of stability factor *Sij* in its MRIC for next hops corresponding to group id / destination address. Forwarding Node selects one of the next hops as SFN using equation 3,

$$SFN = \max NEXTHOPi(S) \quad (3)$$

# 5. RESULTS

The desired parameters to be evaluated by implementing ODMRP and ADMR in MATLAB are: link quality and link stability that indicates the stability of link and tells us which link has high quality. Having a link of high quality and more signal strength is more stable link. Now we show how a mesh and tree creates link. The links created is randomly. The total number of nodes are 50 nodes and the links will made within these nodes that are in range.

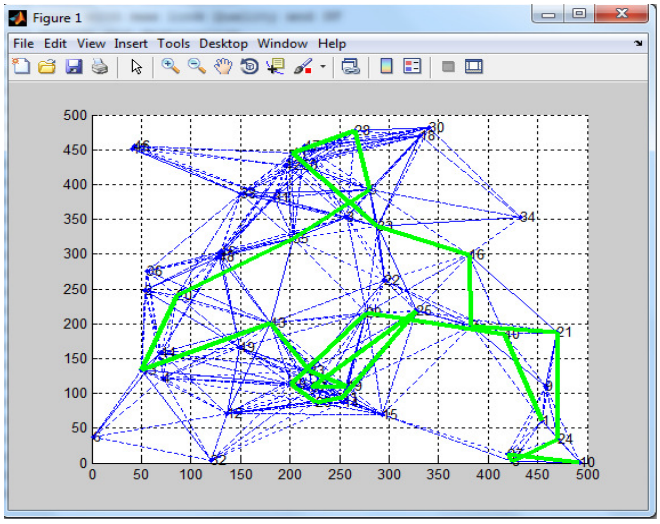


Figure 1:Path creation for ODMRP

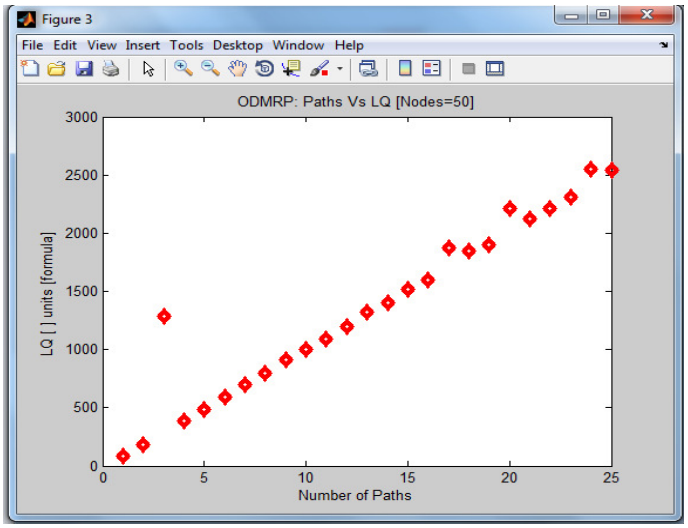


Figure 2:Paths vs Link Quality for ODMRP

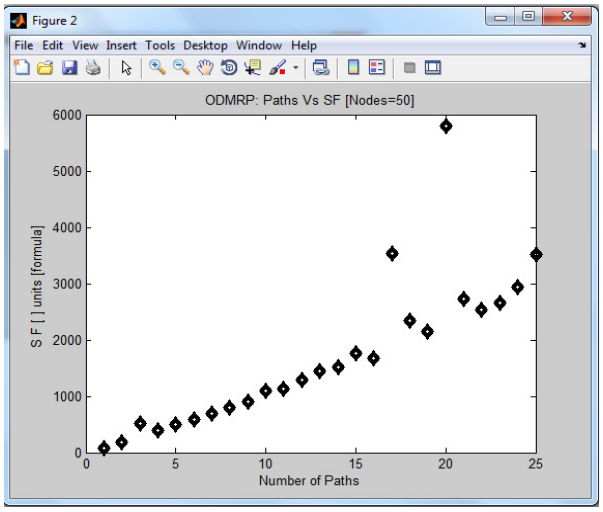


Figure 3: Paths vs Stability Factor for ODMRP

The figure 1 shows the creation of paths for ODMRP.It shows that there are total 50 nodes and it got 25 paths.The figure 2 shows the link quality of each path.The figure 3 shows the satbility factor of each path.

Finally we see the comparision of ODMRP and ADMR and see which will give better results by implementing data link quality scheme.

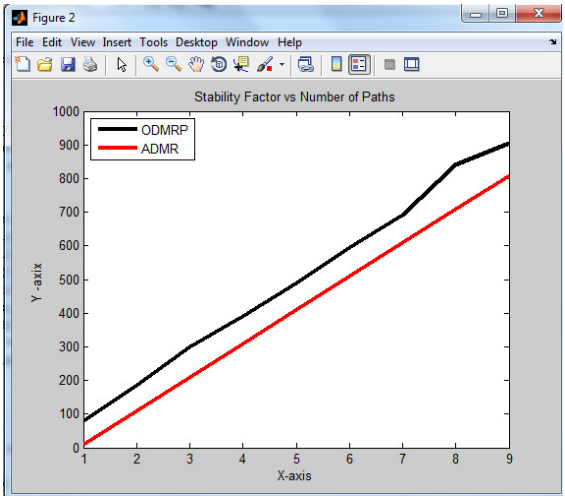


Fig 4:Stability factor of ODMRP andADMR

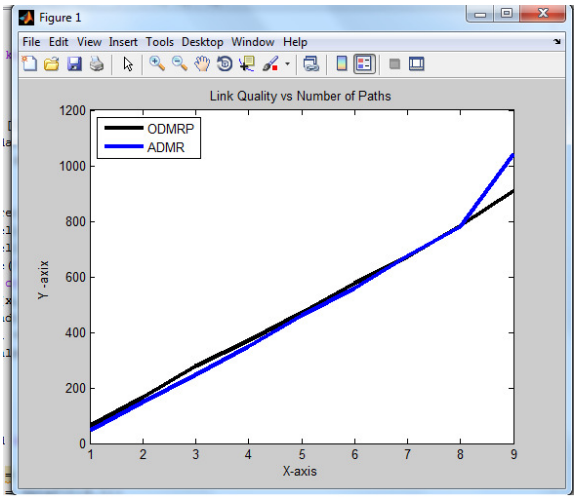


Fig 5:Link Quality of ODMRP and ADMR

The Figure 4 and Figure 5 shows the graphs of stability factor and link quality for ODMRP and ADMR. The graphs shows the results of 9 paths but the total paths we find are 25 paths which are created randomly when we run the code. These graphs shows that the ODMRP gives better results for both metrics than ADMR protocol.

## 6. Conclusion:

The above mentioned scheme considers both link quality and link stability. This scheme is expected to provide highly stable, reliable, robust disjoint paths. As the paths are disjoint and stable , energy drain rate of paths is expected to be less and hence longer lifetime. As the paths are selected completely satisfying stability and quality constraints, this technique fully complies better results than protocols implemented without this technique.

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