# MANET for Zone Routing Protocol in Vehicles Ad-hoc Networks

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***Abstract:*** **Mobile Ad-Hoc Network (MANET) is a wireless technology which can be integrated into the vehicles. MANET is the sub class of the vehicles Ad-Hoc Networks (VANET). The basic motivation behind the idea is to provide connectivity to vehicles i.e. between vehicle to vehicle or vehicle to infrastructure for the purpose of enabling Intelligent Transportation Systems (ITS). This survey is done for the comparison of various routing protocol Optimized Link State Routing Protocol (OLSR), Ad-Hoc On-Demand Multi hop Distance Vector Routing Protocol (AOMDV) and Zone Routing Protocol (ZRP) for MANET keeping performance prospective in mind. Current MANET (mobile ad hoc networks) routing protocols fail to fully address these specific needs especially in a city environments (nodes distribution, constrained but high mobility patterns, signal transmissions blocked by obstacles, etc.). In our current work, we propose an inter-vehicle ad-hoc routing protocol called GyTAR (improved greedy traffic aware routing protocol) suitable for city environments.**

***Keywords: Routing Protocol, VANET, MANET, OLSR, AOMDV, ZRP***

## I.INTRODUCTION

The MANET stands for the Mobile Ad-Hoc Network which is a special class of wireless networks.MANET is derived from VANET; this employs some characteristics of MANET in VANET. Both are wireless ad hoc network, works on dynamic topology and are multihop networks. There is also no centrally located authority to manage packet transfer the nodes handle all by themselves. The key difference of VANET and MANET is the mobility pattern and rapidly changeable topology. VANET addresses the wireless communication between vehicle to vehicles (V2V), and between vehicles and infrastructure access point (V2I). Vehicle to vehicle communication (V2V) has two types of communication: one hop communication (direct vehicle to vehicle communication), and multi hop communication (vehicle relies on other vehicles to retransmit) [1]. VANET also has some characteristics apart Mobile Ad-Hoc Networks; the most important characteristics are: very fast mobility, self controlled organization, distributed communication, they have restriction on road pattern and no limitation of network size [2] [3] [4]. It's highly dynamic topology, which is because of the vehicles moving at varied but at a great speed, provides the high processing power and the storage capacity. The VANET is designed for avoiding the road accidents in the urban areas by providing prior information about traffic congestion change of lane.

In the VANET vehicular communication can be in "unicast" that is provided for the vehicles that are one hop away or "multicast" in which packet delivery to destination is made possible through multi-hop[5]. Routing protocols for ad hoc networks can be classifies into several types based on the different criteria. Based on Routing Information and update mechanism we can classify the routing protocols mainly into the three categories: Proactive Routing, Reactive Routing and Hybrid Routing Protocol [6].

## II. MANET ROUTING PROTOCOL

As we have already discussed that based on the routing information the protocol can be broadly classified into three categories [7]:

### *A. Proactive or Table Driven Routing Protocol:*

In the table driven approach the every node periodically exchange the routing information (i.e routing table) in order to maintain the network topology information. The proactive routing protocols are DSDV,
Optimized Link State Routing (OLSR) etc. the advantages of this approach are it requires no route discovery mechanism and also the latency for the real time application is low. The disadvantage of this mechanism is it unused path acquire the significant
amount of the bandwidth [8].

### *B. Reactive or On Demand Routing Protocol:*

The protocol following obtain necessary path when it is required though connection establishment process. Therefore the protocol under this class does not maintain the network topology information. The reactive protocols are Dynamic Source Routing (DSR), Ad-Hoc on Demand Distance Vector Routing Protocol (AODV),
AOMDV, etc. The advantages of this approach are that no periodic flooding is required network to update routing table, flooding is done on demand. It is on demands approach therefore saves the network bandwidth. The disadvantage of this approach is that route discovery latency

mechanism is high and excessive flooding cause the disruption in network node communication [8].

*C. Hybrid Routing Protocol:*

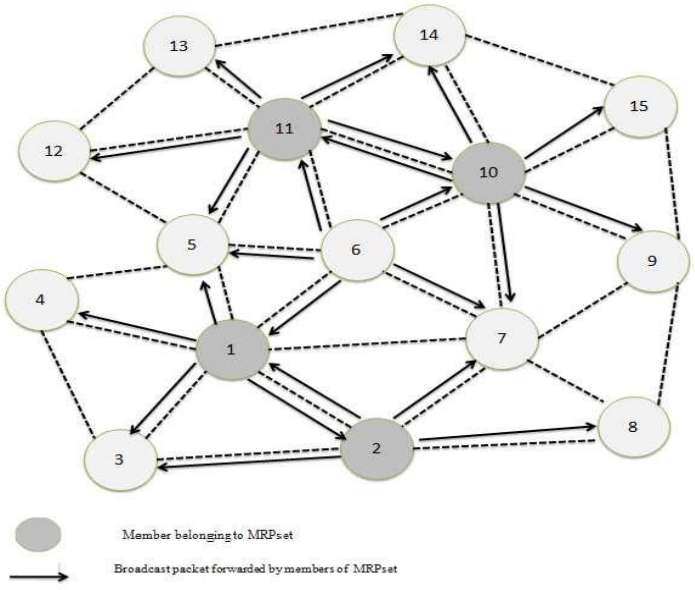
This approach uses the features of both the proactive and reactive routing strategy. In this for the node which is within the geographical region from another node follows the proactive approach while for the nodes beyond the geographical region follow the reactive approach. Some example of the hybrid protocols are Zone-Based Hierarchical Link State Routing Protocol (ZHLS) and the Zone Routing Protocol (ZRP).

## III. RELATED WORK

*A. Optimized Link State Routing Protocol (OLSR):*

Optimized Link State Routing Protocols (OLSR) is proactive and point-to-point routing protocol based on the traditional link-state algorithm. It uses a technique called Multipoint Relaying to optimize Network overhead due to flooding process for route setup or route maintenance. The algorithm minimizes the number of active relays for covering the neighbors and it is called Multi-Point Relays (MPR) [6]. The OLSR protocol was introduced accuracy and stability for routing the information network.
Advantages of OLSR routing protocols are:
i. It reduces routing overhead and number of broadcast associated with table-driven approach.
ii. It has low connection establishment time.

Disadvantage of OLSR routing protocol
i. It needs more time rediscovering a broken link
ii. It has wide delay distribution.




*B. Ad-Hoc On-Demand Multihop Distance Vector Routing Protocol (AOMDV)*:

AOMDV protocol is a multi path on-demand protocols it's an extension of the AODV protocol, it discovers multiple route from source to destination in a single route discovery process. It is used in highly dynamic ad hoc networks where the link breakage occurs frequently due to high velocity of vehicles. After each link failure in AODV routing protocol, a route discovery procedure is needed. Route discovery after each link failure results in high overhead and latency. Thus, this limitation can be overcome by having multiple paths available. Route discovery process in this approach will be is preformed when all routes to destination or source fails. The AOMDV protocol is strove to employ routing information. If all the path to either source or destination fails, then in AOMDV route discovery procedure is applied. AOMDV routing protocol is strive to employ routing information available in under laying AODV protocol along with the little modification. This modification in AODV is required as in AOMDV approach calculation of multiple path is required. The AOMDV protocol includes two main sup-procedures [5]:

i. Calculating multiple loop-free paths at each node.
ii. Finding the link-disjoint paths by deployment of distributed protocols.

Former approach for the discovery of the multiple paths in AOMDV defines a new a methodology for the advertised hop-count. If for the source node s and the destination d, the publicized hop-count is delineated as the maximum hop-count of the multiple routes for d available at s, by usage of the maximum hop-count, the publicized hop-count may not be changed for the same sequence number. But alternate routes with lower hop- counts could only be accepted by applying this protocol which is necessary to guarantee loop-free paths. In AOMDV, publicized hop-count and route-list replace the hop-count and next-hop in AODV respectively, in addition to introducing the multiple next hops with respective hop-counts. Later approach works on restrictions of the loop free mechanism that my lead us to the disjointness process as it enables node to join the multiple path towards the destination. This disjointness can be of two types either node disjointness one that don't have any node in common or the link disjointness does not have any link in common. A simple modification makes AOMDV routing protocol to be able to apply either node-disjoint or link disjoint process which is adding a flag and controlling it [15]. AOMDV with Accessibility predication and Link breakage prediction (AOMDV-APLP) [16] is proposed to enable AOMDV protocol to predict the relative state of the node .using the ordinary and routine routing information to be utilized for reducing control overhead in future. Additionally, link breakage algorithm is applied to enable nodes to switch to the other available routes based on signal strength. The Fig 2 represents the AOMDV protocol.

Advantages of the AOMDV protocol are:

i. Routes are established on demand and to find the multiple loop-free routes to destination.

ii. It is the distributed protocol to discover link disjoint paths.

iii. It reduces overhead by providing the multiple paths.

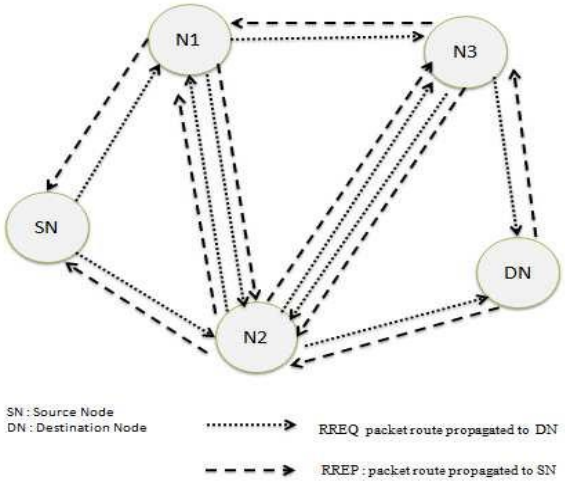
Disadvantage of AOMDV protocol are:

i. It has additional overhead for route discover for RREP.

ii. Because of periodic route discovery it consumes extra bandwidth.

*C. Zone Routing Protocol (ZRP)*

The ZRP was proposed limit the drawback of the proactive and reactive routing protocol. The ZRP reduces the control overhead of proactive approach and reduces the latency caused by search operation of reactive approach.ZRP is based on the concept of zones and divides the network into two zone i.e. Inter-Zone and Intra-Zone based on vehicular node distances. Based on the concept of zone ZRP can follow two different routing approaches. The first is proactive routing approach which is Intra-Zone Routing Approach (IARP). IARP is used when destination is inside a zone (i.e. local zone).



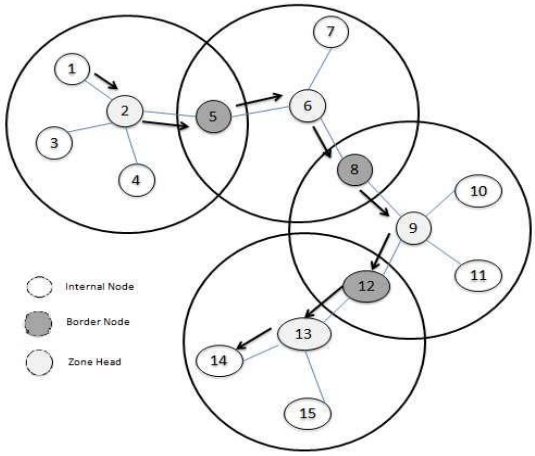

The other approach is reactive approach which is an Inter-Zone Routing Approach (IERP). The IERP approach is used when the destination is not present inside the local zone is located in other zone. The behavior of the ZRP is adaptive depending upon the current configuration of the network and nature of the user. The Fig 3 represents the ZRP approach.

Advantages of ZRP are:

i. It is adaptive and has less bandwidth

ii It is scalable and maintains the updated network map.

iii. It requires fewer messages sending time.




Disadvantages of ZRP are:

1. It has shorter latency for new route discovery.
2. There is always delimitation for decision about network size and network formation.

## CONCLUSION

Establishing end-to-end connections for data delivery among Delay-Tolerant Mobile Networks becomes impossible as communication links only exist temporarily. In such networks, routing is largely based on nodal contact probabilities. To solve this problem, an exponentially weighted moving average (EWMA) scheme is employed for on-line updating nodal contact probability. In this paper we had studied about the overview of MANET. It was discussed about the classification of the MANET routing protocol. We had also discussed about the OLSR routing approach which is proactive or table driven routing protocol which maintains the routing information before it is required. In reactive routing approach we had discussed the AOMDV routing methodology which is on demand routing protocols. And last we had discussed about the hybrid routing approach i.e. ZRP protocol. We had also discussed about working, the advantages and the limitation of the various approaches. In our future work we aim at analyzing the OLSR, AOMDV and ZRP protocol and comparing their performance matrices on the bases of packet delivery ratio,

throughput and end to end delay. We also describe some major design decisions still to be made, which in some cases have more than mere technical implications. We provide a set of security protocols, we show that they protect privacy and we analyze their robustness and efficiency.

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