

# Co-operative Routing Protocols in Vehicular Ad hoc Network

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**ABSTRACT:** The entire human being in the world needs a vehicle to travel from one place to another. So new model vehicles are developed by the manufacturing companies to attract its customers. All the manufactured vehicles have different advantages as compared with one another. In this case, we introduce another added advantage to the vehicle is establishing inter vehicle wireless communication in VANET (Vehicular Ad hoc Network) which is a subclass of mobile adhoc networks (MANETs). A MANET is a self forming network, which can function without the need of any centralized control. Each node in an ad hoc network acts as both a router and a data terminal. The nodes in the network then use the wireless medium to communicate with other nodes in their radio range. The key difference of VANET and MANET is the special mobility pattern and rapidly changeable topology. This type of inter vehicle wireless communication among vehicles which are moving faster on the road will increase service quality to the passengers and lead safety. The proposed wireless inter vehicle communication will allow vehicles to inter change messages from one vehicle to other vehicle with the help of network communication.

**KEYWORDS:** Ad hoc network, VANET, Routing, Broadcasting,

## I. INTRODUCTION

The magnification of the increased number of vehicles which are equipped with wireless transceivers to communicate with other vehicles to create a special class of wireless networks, called as vehicular ad hoc networks or VANETs [1]. VANET is an emerging mobile ad hoc network paradigm that facilitates vehicle-to-vehicle (Fig 1) and vehicle-to-infrastructure communication. The most important application or motivation of the VANET is for driving safety, traffic efficiency, give assistance to drivers. Road condition-awareness is critical for driving safety. Existing VANET- based systems usually thinks that drivers identify t and report safety related road conditions, which however may be false because, drivers may not be willing to perform these duties, or such duties may distract drivers and thus make driving even unsafe. Therefore, automatic detection without human intervention is desired. It has also been studied how to utilize inexpensive roadside devices, such as sensors, to make collection of information and analysis more easy, especially in the absence of connectivity between vehicles. Due to the difficulty of conducting large-scale experiments on real roads, simulation plays an important role in VANET research.

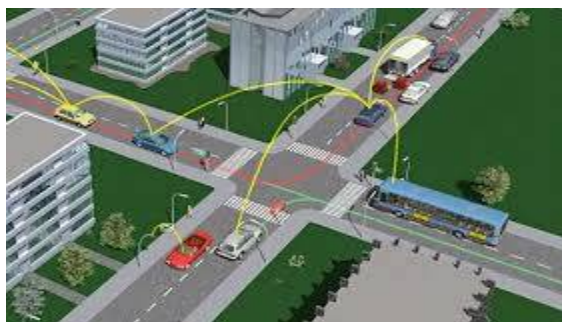


Fig 1 Overview of Vehicular Ad hoc Network

Network Architecture for VANET-

MANETs generally independent on fixed infrastructure for dissemination of information and communication. VANETs follow the same principle and apply it to the highly dynamic environment of surface transportation. As shown in Figure 2, the architecture of VANETs divided into three categories: pure cellular/WLAN, pure ad hoc, and hybrid. At traffic intersections to connect to the internet, VANETs may use fixed cellular gateways and WLAN access points, also to gather traffic information or for routing purposes. The network architecture under this scenario is a pure cellular or WLAN structure as shown in Figure 2(a). VANETs can merge both cellular network and WLAN to form the networks so that a WLAN is used where an access point is available. Stationary or fixed gateways around the sides of roads could provide connectivity to mobile nodes (vehicles) but are eventually unfeasible considering the infrastructure costs involved. In such a scenario, all vehicles and roadside wireless devices can form a mobile ad hoc network (Figure 2 (b)) to perform vehicle-to-vehicle communications and achieve certain goals, such as blind crossing (a crossing without light control). A hybrid architecture (Figure 2 (c)) of combining cellular, WLAN and ad hoc networks together has also been a possible solution for VANETs.

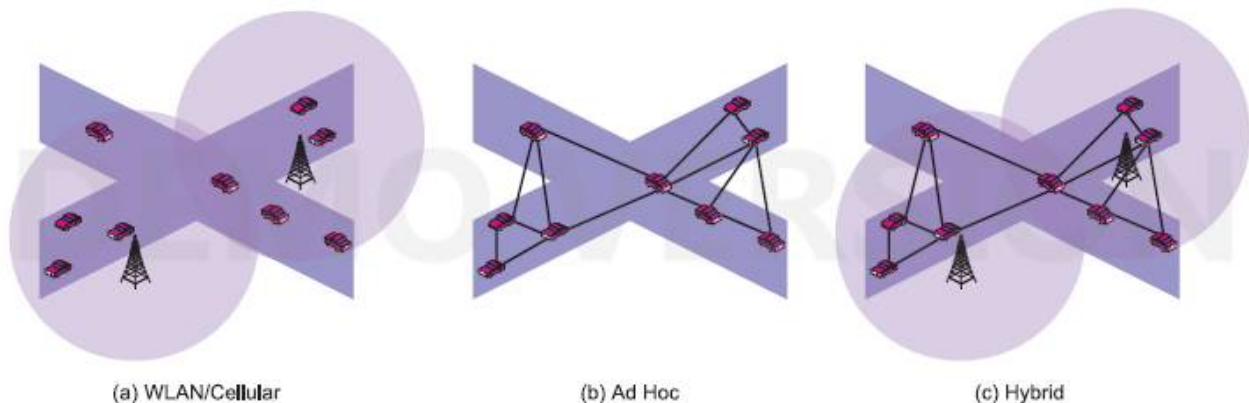


Fig 2 Network architectures for VANET

**II. ROUTING PROTOCOL**

As MANET routing protocol has some difficulties from finding stable routing paths in VANET environments, MANET routing protocol is not useful for VANET. So, many routing protocols have been developed for VANETs environment, which can be distinguished, according to different aspects; such as: protocols characteristics, techniques used, routing information, quality of services, network structures, routing algorithms, and so on. Some research papers classified VANETs routing protocols into five classes:

1. Topology-based routing protocols
2. Position-based routing protocols
3. Cluster-based routing protocols
4. Broadcast routing protocols
5. Geo-cast-based routing protocols

Above classification is based on the routing protocols characteristics and techniques used [5], [6], [7]. As well, other papers classified VANETs routing protocols according to the network structures, into three classes: hierarchical routing, flat routing, and position-base routing. Moreover, they can be categorized into two classes according to routing strategies: proactive and reactive [8].

1. *Topology-based routing protocols*

Topology based routing protocols which finds the route and maintains its routing information in a table before the sender starts transmitting data.

2. *Position-based routing protocols*

Position routing protocol is depend on the positional information in routing process, where instead of network address ,the source sends a packet to the destination using its geographic position. This protocol required each node is able to decide its location and the location of its neighbours through the Geographic Position System (GPS) assistance. The node identifies its neighbour as a node that located inside the node's radio range. When the source need to send a packet, it usually stores the position of the destination in the packet header which will help in forwarding the packet to the destination without needs to route discovery, route maintenance, or even awareness of the network topology.

3. *Cluster-based routing protocols*

This protocol divides the network to clusters, where nodes have the similar characteristics, like same direction or same velocity. Each cluster has a cluster head, its task is to manage communication processes inside, and to outside its cluster. Nodes inside the cluster communicate by direct paths, but their communication with other nodes outside the cluster is achieved by their cluster header, and this creates a virtual infrastructure for networks. This scheme can provide a good scalability for large networks; however it may increase network overhead and delays in highly dynamic network.

4. *Broadcast routing protocols*

Broadcasting in VANET is very critical issue area of research. Broadcasting in VANET is different from broadcasting MANET due to several reasons such as network topology, mobility patterns, and traffic patterns at different times. Because of the vehicles moving at high speeds in VANET, dynamic changes in topology happens frequently, which results in changes in routing information. Broadcasting in VANETs can disseminate assistant traffic condition messages to all vehicles within a certain geographical area. The simplest way to implement a broadcast service is **flooding**; in which each vehicle rebroadcast messages to all its neighbours except the one it received from. Flooding guarantees that the message will eventually reach all the nodes i.e. vehicles in the network.

5. *Geo-cast-based routing protocols*

Main objective of geo-cast routing protocol is to dispatch packets from source node to other nodes within specified geographical region.

### III. VANET Vs MANET

VANET is a subclass of Mobile ad-hoc networks (MANET). MANETs consist of both mobile, semi-mobile nodes. It does not have any pre-established infrastructure. They establish multi-hop routes and they connect in a self-organising decentralised manner [2]. The main property which distinguishes MANET from VANET is that the nodes in VANET are larger in number and moves in high average speed. Even though many unicast routing protocols[3][4] have been created for MANET, it cannot be directly implemented on VANET due to its unique characteristics. It is unrealistic and very expensive to install 802.11 access points to cover all the road area, and any nodes can be easily deployable without the involvement of infrastructure, which makes vehicular ad-hoc networks highly suitable in vehicular environments. Like MANET, VANETs self-organize and self-manage information in a distributed fashion without a server dictating the communication norms or the presence of a centralized authority. In VANET, nodes employ themselves as both servers and clients, thereby exchanging and sharing information like peers

### IV. CONCLUSION

In this paper an overview of various routing protocols in VANET are presented. Though a number of types for handling routing and information dissemination in vehicle networks exist, few may be able to handle the requirements of safety applications. This is mainly due to the overhead in discovering or maintaining routes and positions of node in

highly mobile networks of uncoordinated vehicles. Position of the vehicle is one of the most important data for vehicles. Position based routing protocols need the information about location of the participating vehicles to be made available. After scrutinizing the survey of protocols, it is found that the position based routing has better performance because there is no creation and maintenance of global route from source node to destination node. In the position based routing protocol, all the packets are received with small average delay, better throughput, and effective utilization and also helps to prevent the accidents on the road effectively. Overall, routing vehicle safety communications remains a challenging topic requiring innovative approaches.

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