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# A Systematic Survey of Vanet Routing Protocols based on Transmission Strategies

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## Abstract

Vanet is a super class of Manet with some unique features High speed vehicles moving on roads exchange information among them which helps in making a decision that ensures more safety. Since the vehicles move in high speed the link between any two vehicles exists for only few seconds so within that time period the information transfer has to take place. This could be possible only when the design of routing protocol is reliable and efficient. Communication of information is done in three ways. Point to point routing deals with one source to one destination. Multicasting deals with one source to group of destination and broadcasting deals with one source to all destinations in the network. Challenges are different for different types of routing; depending on the applications the routing pattern is going to be different. This paper discusses about these three types of routing and issues and challenges involved in each of this routing is analyzed. The pros and cons of different routing are discussed which would help in designing a protocol for specific applications.

**Keywords:** Broadcasting, ITS, Multicasting, Manet, Point to Point, Vanet

## 1. Introduction

Vanet is a promising means considered by Industry community and the research community to improve the safety and comfort of driving. Accidents are considered as a serious issue in our day today life. There should be some technology to overcome this issue. Already some techniques were partially implemented by researchers industrially as well as academically. VANET a subclass of MANET is an upcoming technology which makes the vehicle to vehicle communication[1-5] possible and provides a path for Intelligent Transportation System (ITS). In this technology a vehicle which is mounted with onboard communication unit can act as a node and can transfer data among themselves. Vehicles often move at high speed but their mobility is within regular constraints and predictable. An accurate estimate of vehicle's position can be made available through GPS systems or on-board communication unit. VANETs are used for high-speed car to car, communication and between vehicles and roadside infrastructure units[6]. Communication scenario between vehicles and roadside units is shown in Figure 1.

Some applications of Vanet are Co-operative collision warning, intersection collision warning and emergency electronic brake, Information from other vehicles. Both in academia and industry, Current area of research in VANET is routing[7] highly dynamic nature of the nodes is a key challenge for efficient routing. So, there arises a need

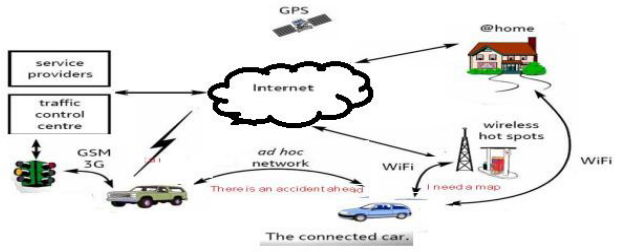


**Figure 1.** Connected car scenario.

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for a routing protocol which provides enhanced information delivery without route breakage. Routing in VANET is broadly classified in to the following types

- Point to point routing
- Multicasting
- Broadcasting

## 2. Point to Point Routing

These routing deals with one source to one destination. They are basically formed protocols to enable the communication between vehicles in Vanet[8-11].These protocols are primarily intended for comfort and commercial requirements such as internet connectivity, multimedia content exchange access, requesting for nearest gas station, restaurants, querying for parking availability, free flow tolling, etc. Figure 2 shows the classification of this routing.

### 2.1 Proactive Routing Protocols

Proactive routing as the name indicates routes are readily available. If a node requests a data to some other node the path to that node is almost available[12]. Most of the times this routing does not have to go through a tedious method of finding a path to the destination. In this routing the packets are flooded in the network and the routes to the next hop nodes are stored. Since the routes are almost readily available this routing happens in a faster way, the time consumption is less. But the disadvantage in this method of routing is that the nodes requires large bandwidth to store the data of routing information Therefore the bandwidth consumption of this routing is very high which makes it not suitable for applications which requires low bandwidth[13].

### 2.2 Reactive Routing Protocols

Reactive routing creates path between the nodes in an on demand fashion. If a node is ready for communication it checks for a route. If a route to destination is found then it uses this path to send the data. If the route is not found then it places a RREQ in the network this RREQ is carried by the next neighbor node which again searches in its routing table the path to the destination. If a path is found then it sends the path to the concerned source node if not then it places the RREQ again in the network. This RREQ will be passed on in the network until a path to the destination is found. After finding a path to the destination a RREP packet is send to the source node and the source sends the data in the path found. This method of routing requires a tedious route discovery process but it does not have to waste the bandwidth of the network and that is considered as a big advantage of this protocol[14].

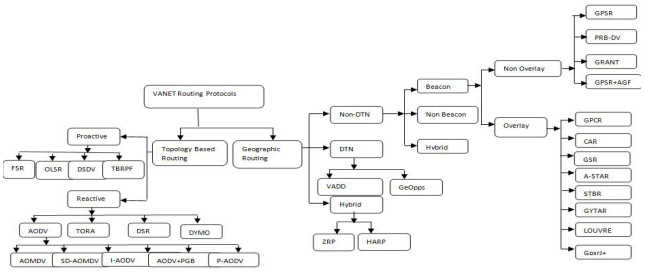


**Figure 2.** Classification of point to point protocols.

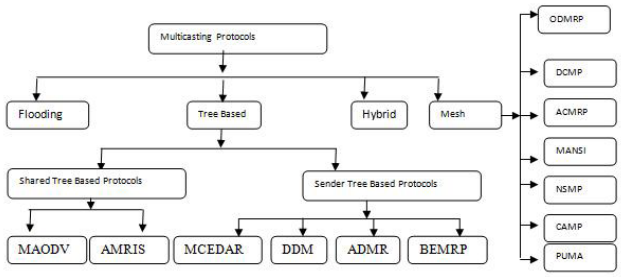


**Figure 3.** Classification of multicasting protocols.

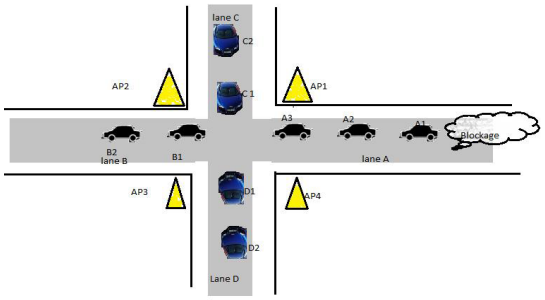


**Figure 4.** A multicast scenario.

## 3. Multicast

Message passing from a source to a group of destinations[15-17]. Broadly two methods are employed. Using geographic addresses geocasting messages from a single source to group of destinations. Otherwise dividing the network into a group of clusters and assigning a cluster heads to each group which in turn takes care of com-

munication between the clusters. Figure 3 shows the classification of multicast protocols.

## 4. Flooding

Flooding is the simplest method to provide multicasting in Vanets. If a node decides to send a message to a group of nodes then it simply floods the data packet in the network.

### 4.1 Tree-based

Tree-Based Multicast Routing creates a multicast routing tree and share among the group or one tree for each group will be created.

### 4.2 Mesh-based

Frequent topology change in the network makes use of mesh-based multicast protocols which provides an alternate path.

### 4.3 Overlay-based

Overlay-based protocols keeps state information only in multicast group members, thanks to that the control overhead while the number of sources increases is more scalable. In overlay-based protocols, a virtual network is built over the VANET topology only among multicast group members and the links among the virtual network nodes are unicast tunnels in the VANET. The virtual topology remains static even if the underlying topology changes. A multicast scenario is shown in Figure 4. This scenario consists of four lanes and if a blockage is found in lane A this message has to be send to the vehicles from other lanes which comes towards the lane A.

## 5. Broadcasting

Safety related messages and public information messages like blockage in the road, accident information, sudden protest, road failure notification, lane change assistance, emergency electronic brake, post-crash notification and cooperative collision warning messages are broadcasted, such that all the vehicles get the information. So broadcasting[18] is passing the data from one to many destinations. Since the data is broadcasted the chance of getting duplicate messages increases which increases the redundancy. Figure 5 shows the classification of broadcasting protocols.

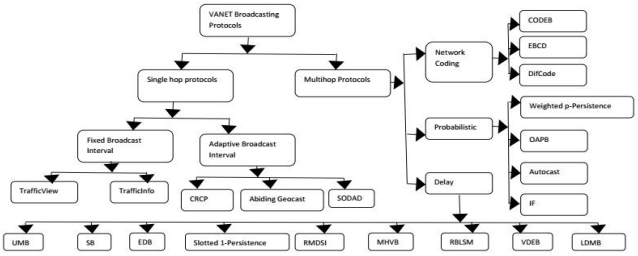


**Figure 5.** Classification of broadcasting protocols.

The main objective of broadcasting is to reduce the redundant messages. Routing protocols like DSR, AODV will not be suitable in VANETs for Broadcasting[19-22]. There are three different Traffic of operation in VANET.

Regular Traffic: In case of regular traffic some nodes may have very few neighbors while some other nodes have many neighbors.

Dense Traffic: Nodes simply broadcasting the packets leads to many collisions and conflicts in transmission among neighboring nodes.

Sparse Traffic: The traffic is sparse therefore message sending takes lees time or more time to reach the destination.

## 6. Conclusion

Vanet is a special type of Manet which forms a path for intelligent transport on roads. Vehicles communicate among themselves which helps in reducing the accidents on roads. Data transfer in Vanet can be of three types they are point to point routing, multicasting and broadcasting. Depending on the application the type of data transfer in Vanet is going to be different.In this paper, a survey based on the data transfer in Vehicular Ad hoc network is made. Every protocol has its own advantages and disadvantages. Before starting to design any protocol, details of existing work is necessary. These issues, along with other improvements helps to develop a new protocol which handles the packet loss, routing overhead, bit error rate, end to end delay, hidden node problem, broadcast storm problem in an efficient way.

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