

# A Review to Various Routing Protocols for VANET

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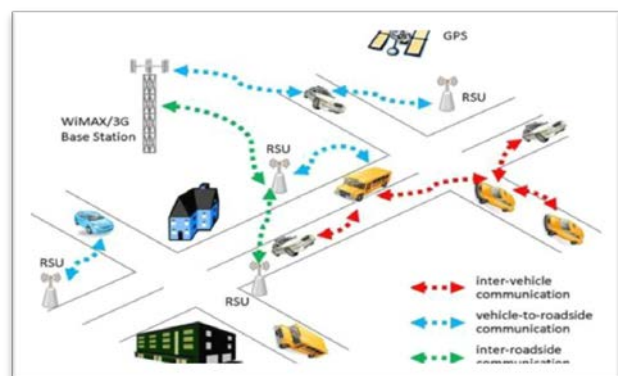
**Abstract:** In the whole world the number of automobiles are increasing day by day therefore lot of problems occurring on roads such as road accidents, less control on traffic etc. To overcome these problems intelligent technologies are introduced for maintaining the traffic. The VANET is best technology which gives the idea of communication between vehicles. A vehicle in VANET is considered to be an intelligent mobile node capable of communicating with its neighbors and other vehicles in the network. In this paper a brief discussion about the VANET (vehicular ad-hoc networks), working of VANET, Various routing protocols used for VANET, comparison between these protocols, their advantages and disadvantages, in the later section we focus upon the GPSR routing protocol.

**Keywords:** VANET, MANET, RSU (road side unit)

**Introduction to VANET:** Vehicular Ad Hoc Network (VANET) is a form of Mobile Ad Hoc Network (MANET) in which communication takes place between (i) two or more vehicles, (ii) vehicles and infrastructure, or (iii) simultaneously. The idea of Vehicular ad hoc network (VANET) comes from MANET (Mobile ad-hoc network) in which mobile nodes make a network which is wireless, self organized, low bandwidth, less infrastructure, changing their positions continuously. Similarly, the VANET has same characteristics but rapid change in the speed of vehicle causes frequent disconnections in network, behavior of the protocol also vary according to the environment like city roads or highway, speed and direction of the vehicle is also essential as it decide whether the communication is stable or not which is not important in the MANET. Vehicular ad hoc network (VANET) technology provides an intelligent transport system. Vehicular ad hoc network not only provides the communication between two vehicles but also added the feature of traffic safety and efficiency. The messages related to the traffic are transferred to the vehicles by utilizing GPS system, intelligent computer system and wireless communication system. VANET has

many different features like safety early warning, driving assistance, highway payment, Traffic information query and voice communication among vehicles.

**HISTORY OF VANET:** VANET is firstly used in police vans, ambulances and fire vehicles to communicate with each other for safety purpose. It's approximately range is 100 to 300meters. Many automotive companies like General motors, Toyota, Nissan, DaimlerChrysler, BMW and Ford promote this term. Intelligent vehicular ad hoc network (VANET) is another term for promoting vehicular networking. VANET integrates multiple networking technologies such as Wi-Fi, IEEE 802.11p, wave IEEE 1609, Wi-MAX IEEE 802.16, Bluetooth, IRA and Zig Bee.



**ROUTING PROTOCOLS IN VANET:** The communication between vehicles in VANET requires a very essential technology which is routing protocol. Routing is the process of selecting best paths in a network along which we can send our message. It is the process of sending a message from source to its destination. The efficiency of the network only depends upon the routing protocol. The routing protocol helps in providing effective path for the effective communication between the vehicles. There are two types of routing protocols.

<b>A) Topology based routing protocols</b>	<b>B) position based routing protocols</b>
<b>1) Proactive :</b> a) Destination Sequenced Distance Vector (DSDV) b) Fisheye State Routing (FSR) <b>2) Reactive:</b> a) Ad-hoc On-demand Distance Vector (AODV) b) Dynamic Source Routing (DSR) c) Temporally Ordered Routing Algorithm (TORA)	<b>1) Delay Tolerant Network (DTN)</b> <b>2) Non Delay Tolerant Network (Non DTN):</b> a) Greedy Perimeter Stateless Routing (GPSR) b) Reliability Improving Position-based Routing (RIPR) <b>3) Hybrid Position-based Routing:</b> a) Hybrid Location-based Ad-hoc Routing (HLAR)
<b>C) Broadcast routing protocols</b>	<b>D) Cluster based routing protocols</b> <b>E) Geo Cast Routing</b>

Classification of routing protocols

**A) TOPOLOGY BASED ROUTING PROTOCOLS:** Topology-based routing protocols make use of routing tables for storing the link information as a basis of packet forwarding from

source node to destination node. These protocols are further categorized into two types these are Proactive and Reactive routing protocols.

<b>Proactive routing protocols (Table-driven)</b>	<b>Reactive routing protocols (On-demand)</b>
<b>Advantages</b> 1. Route discovery is not required. 2. Real-time application latency is low.	<b>Advantages</b> 1. On-demand flooding of the network occurs to update the routing table. 2. Saves bandwidth as these protocols are beaconless
<b>Disadvantages</b> 1. It provides poor performance in small ad hoc networks. 2. Have knowledge only about neighbor nodes & don't have knowledge about distant nodes. 3. With the increase in network size the storage complexity and the processing overhead of routing table also increase	<b>Disadvantages</b> 1. Have high route determining latency. 2. High flooding in the network causes disturbance in node 3 AODV takes more time while setting up of connection and requirement of extra bandwidth.

Various advantages and disadvantages of proactive and reactive protocols

**B) POSITION BASED ROUTING PROTOCOLS:** IT depends on the position or location of node during the routing mechanism. The source node sends information data packet to the destination making use of the packets location instead of utilizing the network address. During this protocol mechanism, every node decides its position and determining the position of neighbor node. GPS- Geographic Position System which helps to find the position of nearer neighbors. The node determines the location of its neighbor inside the radio range of the current node. Once the source node sends its data packet, it saves the location of the destination in the header of the packet that aids in sending the data packet to the destination node there is no need of route discovery, route maintenance or any awareness of topology. Hence, position-based routing protocols are considered to be appropriate and stable for highly mobile

**1) Delay Tolerant Network (DTN) Routing Protocol Delay Tolerant:** DTN protocol uses a store, carry and forward strategy within the network where all the nodes help each other in forwarding the data packets.

**Disadvantages:**

- 1) Each node features restricted transmission range, thus packet transmission takes long delays.
- 2) We cannot ensure that disconnectivity will not occur.

**2) Non Delay Tolerant Network (Non DTN) Protocols:** It does not take into account the disconnectivity problem instead assume that a large amount of nodes exist to attain successful communication, which implies that the protocol is more appropriate for dense networks. The source node forwards the message to the closest neighboring node to the destination node.

**Disadvantage:**

This strategy can also fail, if no such nearest neighboring node exists but only the current/forwarding node.

## TYPES OF NON DELAY TOLERANT NETWORK

### i) Greedy Perimeter Stateless Routing (GPSR):

During this protocol routing, every node sends a data packet to different intermediate nodes that are close to destination node, until the data reaches the destination. If there are not any neighboring nodes nearer to messages destination, it makes use of perimeter forwarding technique to come to a decision to which node the message should be delivered.

#### Advantages:

There is surety that every message reached on destination by using GPSR routing protocol because it takes dynamic forwarding packet decision.

### ii) Reliability Improving Position-based Routing (RIPR):

This protocol determines the vehicle speed and direction in which it moves on the roads. Here, the source selects a nearby node to send the data determining the mobility for the intermediate nodes. The source node creates a routing table storing positions with mobility speeds of neighboring nodes. This algorithm is used to select the next forwarding node i.e the next intermediate node by using characteristics of the route and therefore the position of node after the exchange of message is done.

#### Advantages:

RIPR protocol reduces link failure drawback that occurs due to storage of the data of wrong intermediate node.

**3.) Hybrid Position-based Routing:** Hybrid routing is the position-based routing that reduces control overhead/traffic and do not want to maintain the table since they make use of the location information about the neighboring nodes and destination node which makes position-based routing more scalable.

#### Disadvantages:

- 1) According to the positional accuracy, the position routing protocol performance may decrease as the precise location information is a factor to have a better performance in the position routing.
- 2) If no nearest neighboring node to the destination exists, position routing may lead to link failures.

**ISSUES IN VANET:** There are some following issues in VANET-

#### A. Dynamic Topology and High Mobility:

Vehicles are the mobile nodes in VANETs and move according to the road pathways which restricts the mobility of the nodes. This causes the disruptions in communications and changing topology. For routing protocol development, we should traumatize dynamic topology. A solution to give effective information dissemination not

withstanding fast changing topology may be broadcast based communication.

**B. Fault Tolerance:** Since a VANET has fast changing topology; several vehicles could enter or exit the network periodically. If during the communication, a node leaves the network, a new route should be created by the routing protocols to manage the network. This problem can be solved if the route failure is known in advanced, this requires lot of updated information exchange leading to un-scalable communication.

**C. Flexibility and Scalability:** Area decides the number of vehicles, for e.g. number of vehicles in rural area is low without road side units, it becomes difficult to maintain the network connectivity. For development of the road side units, large investments are required, therefore less power constraints can be used by increasing communication ranges with higher transmission power to form every node reach its destination without support of the roadside units. On the contrary, urban area is very large and crowded having a huge range of vehicles running. The routing protocols need to reduce the overhead and control of data packets as a larger number of vehicles need to communicate. It should provide safety communication rather than control overhead.

#### D. Delay Constraints and Real-time

**Transmission:** To deal with sudden occurring situations, drivers do not have enough time to respond as the information is distributed in the real time. If information is received on time, accidents can be avoided. Hence the routes are to be maintained and constructed for real time applications.

**E. Security Enhancement:** Security [2] stands the most important and challenging issue in safety applications of VANETs. If no security is provided in routing protocols, a malicious node can enter the network and cause damage. This could lead in misleading of information which can be used by terrorists to trap innocent people as dead end tunnel. So in turn to protect the information; authentication, integrity and non-repudiation must be achieved such that there is

no entry of any unauthorized vehicle into the network and no modification of the data packets is allowed during the communication. Hence, security is an important issue as future research area.

#### CHALLENGES AND FUTURE TRENDS:

Although researchers have achieved much great progress on VANETs study, there are still some challenges that need to be overcome and some issues that need to be further investigated for example communication, security, applications,

stimulation, verification, services. In the following discussion, we will summarize the key challenges.

**Standards:** The original IEEE 802.11 standard cannot well meet the requirement of robust network connectivity, and the current MAC parameters of the IEEE 802.11p protocol are not efficiently configured for a potential large number of vehicles [15]. Thus, researchers must do more work about standards.

**Routing Protocols:** There are many effective routing protocols and algorithms such as CMV (cognitive MAC for VANET) and GYTAR (greedy traffic-aware routing), the critical challenge is to design good routing protocols for VANETs communication with high mobility of vehicles and high dynamic topology.

**Connectivity:** The management and control of network connections among vehicles and between vehicles and network infrastructures is the most important issue of VANETs communication. Primary challenge in designing vehicular communication is to provide good delay performance under the constraints of vehicular speeds, high dynamic topology, and channel bandwidths.

**Cross-Layer:** In order to support real-time and multimedia applications, an available solution is to design cross-layer among original layers [37]. In general, cross-layer protocols that operate in multiple layers are used to provide priorities among different flows and applications.

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