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# A REVIEW ON VANET, TYPES, CHARACTERISTICS AND VARIOUS APPROACHES

**Jyoti Jain*, Nidhi Chahal**
Dept of Electronics & Communication Engineering, Chandigarh Engineering College, Landran, Punjab
Assistant Professor of Dept of Electronics & Communication Engineering, Chandigarh Engineering College, Landran, Punjab

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## ABSTRACT

A Vehicular Ad-hoc Network (VANET) is a collection of wireless vehicle nodes forming a temporary network without using any centralized Road Side Unit (RSU). VANET protocols have to face high challenges due to dynamically changing topologies and symmetric links of networks. A suitable and effective routing mechanism helps to extend the successful deployment of vehicular ad-hoc networks. An attempt has been made to compare the performance of two On-demand reactive routing protocols namely AODV and DSR which works on gateway discovery algorithms and a geographical routing protocol namely GPSR which works on an algorithm constantly geographical based updates network topology information available to all nodes in VANETs for different scenarios. Comparison is made on the basis of different metrics like throughput, packet loss, packet delivery ratio and end-to-end delay using SUMO and NS2 simulator. In this paper we have taken different types of scenarios for simulation and then analyzed the performance results.

**KEYWORDS**: VANET, AODV, DSR, GPSR, SUMO.

## INTRODUCTION

**VANET:** A VANET uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns turn participating car into a wireless router or node which allowing cars 100 to 300 meters of each other to connect and create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile network is created. It is estimated that the first systems that will be this technology are police and fire vehicles to communicate with each other for the purpose of security. The connectivity is done among one vehicle to other vehicle and vehicle to road side infrastructure and vehicle or road side infrastructures to the central authority responsible for the network maintenance. The basic tool for message transfer is the short range radios that are being installed in any of the nodes. The short transmission node is used by vehicular node. RSU's are spread sporadically or regularly depending on the deployment of the network in any particular region. In VANET there are different routing protocols. The VANET is very dynamic in nature. Hence the major challenge in VANET is routing packets in effective and efficient manner.There is also lack of infrastructure and shorter communication session. Thus routing protocol plays important role in VANET. Most of the routing protocols use position based and map based approach.

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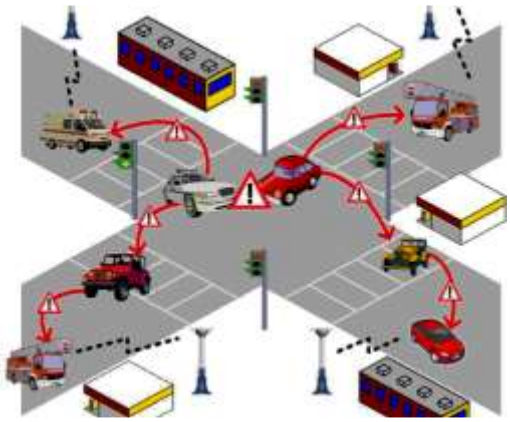

*Fig1.1 VANET*

**Types of Communication in VANET'S:**

Inter-vehicle communication

The inter-vehicle communication configuration uses multi-hop multicast/broadcast to transmit traffic related information over multiple hops to a group of receivers.

Vehicle-To-Roadside Communication

The vehicle-to-roadside communication configuration represents a single hop broadcast where the roadside unit sends a broadcast message to all equipped vehicles in the vicinity.

Routing-Based Communication

The routing-based communication configuration is a multi-hop unicast where a message is propagated in a multihop fashion until the vehicle carrying the desired data is reached.

**Challenges in VANET:**

- A Speed-based Shortest Path Trip generation has been added. Accordingly, we can customize a threshold between high speed street segments and distance to the destination, which may generate a longer but faster path.
- Street Segments includes a speed limitation attribute. For TIGER files, we generate default values based on the State of California Current regulations, or let the user define them in an external file.
- Decoupling the multi-lane feature from the lane changing feature. When multiple lanes are available, each car chooses one lane and keeps it (if available) for the whole trip.
- New Randomized Dijikstra shortest path algorithm. The original Dijkstra's algorithm, given a start and an end point, always selects the same path, even in presence of multiple available paths with same weights. For traffic balancing, cars should be able to select different shortest paths.

**Characteristics of VANET**

VANET is an application of MANET but it has its own distinct characteristics which can be summarized as:

- **High Mobility:** The nodes in VANETs usually are moving at high speed. This makes harder to predict a node's position and making protection of node privacy [2].
- **Network topology:** Due to high node mobility and random speed of vehicles, the position of node changes frequently.
- **Unbounded network size**: VANET can be implemented for one city, several cities or for countries.
- **Frequent exchange of information:** The ad hoc nature of VANET motivates the nodes to gather information from the other vehicles and road side units.
- **Wireless Communication:** VANET is designed for the wireless environment. Nodes are connected and exchange their information via wireless.

- **Sufficient Energy:** The VANET nodes have no issue of energy and computation resources. This allows VANET usage of demanding techniques such as RSA, ECDSA implementation and also provides unlimited transmission power.
- **Protection:** The VANET nodes are physically better protected. Thus, VANET nodes are more difficult to compromise physically and reduce the effect of infrastructure attack.

**Cognitive Radio**

A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Its transceiver is designed to use the best wireless channels in its vicinity. Such a radio automatically detects available channels in wireless spectrum, then accordingly changes its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location.

**Spectrum Sensing**

The important requirement of cognitive radio network is to sense the spectrum hole. Cognitive radio has an important property that it detects the unused spectrum and shares it without harmful interference to other users. It determines which portion of the spectrum is available and detects the presence of licensed users when a user operates in licensed band. The spectrum sensing enables the cognitive radio to detect the spectrum holes.

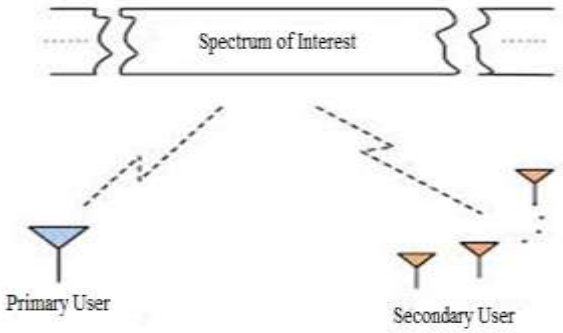


***Figure1.2 Spectrum Sensing***

**CLASSIFICATION OF SPECTRUM SENSING TECHNIQUES:**

**a. Non-Cooperative Detection:** This technique is based on the detection of the weak signal from a primary transmitter. In primary transmitter based detection techniques, a cognitive user determines signal strength generated from the primary user. Basic hypothesis model for transmitter detection can be defined as follows

$$X(t) = \begin{cases} n(t) \\ h\,s(t) + n(t) \end{cases}$$

**b. Energy Detection**

This technique is suboptimal and can be applied to any signal. Conventional energy detector consists of a low pass filter to reject out of band noise and adjacent signals. The detection is the test of the following two hypotheses

$$H_0 : Y[n] = w[n]$$
$$H_1 : y[n] = x[n] + w[n]$$
$$n = 1 \ldots\ldots, N$$
$$N = observation\ Interval$$

**c. Matched Filter Detection**

Matched-filtering is known as the optimum method for detection of primary users when the transmitted signal is known .The main advantage of matched filtering is the short time to achieve a certain probability of false alarm or probability of misdetection.

**d. Cyclostationary Feature Detection**

It have been introduced as a complex two dimensional signal processing technique for recognition of modulated signals in the presence of noise and interference. To identify the received primary signal in the presence of primary users it exploits periodicity of modulated signals couple with sine wave carriers, hopping sequences, cyclic prefixes etc.

## RELATED WORK

**Joanne Mun-Yee Lim et.al [1]** Vehicular communications are important to ensure emergency messages are transmitted on time to prevent accidents. Therefore, in recent years, various standardization bodies and automobile companies have developed vehicular ad hoc network (VANET) to ensure public road safety. The current IEEE802.11p schemes utilize only traffic type to categorize priority levels. However, accidents are prone to occur when vehicles are in close distance.

**Kalkundri Ravi et.al [2]** A Vehicular Ad Hoc Network (VANET) is a part of MANETs that is formed by wireless connections between cars. In VANETs, routing protocols and other routing related techniques must be adaptable to vehicular-specific capabilities and requirements. Along with the routing in VANET, message security is also one of the major concern. Messages are critical and important like a warning message, so that the message must be authenticated which guarantee's the message integrity.

**Scott E. et.al [3]** A Vehicular Ad Hoc Network (VANET) is a part of MANETs that is formed by wireless connections between cars. In VANETs, routing protocols and other routing related techniques must be adaptable to vehicular-specific capabilities and requirements. Along with the routing in VANET, message security is also one of the major concerns. A combination of AODV, ECDSA and VANET can make the scenario more efficient and perform better in terms of routing and time delay in message delivery.

**Hyun Yu et.al [4]** In this paper, author propose a routing protocol that works based on the real-time road vehicle density in order to provide fast and reliable communications so that it adapts to the dynamic vehicular city environment. In the proposed routing mechanism, each vehicle computes the vehicle density of the road to which it belongs by using beacon messages and the road information table. GPSR through NS-2 based simulations and show that our mechanism outperforms GPSR in terms of delivery success rate and routing over-head.

**Alwakeel, S et.al [5]** In VANET'S Safety messages is very much important so that it must have the highest assurance of delivery. But safety message can be rejected due to its low bandwidth. In this message we implement a approach to block minimum numbers of safety messages. But if you kept non safety message it can be penalized you. Through virtually partitioned VANET's bandwidth and by applying P-Persistent scheme to reduce message congestion an improved performance of message dissemination in VANETs can be achieved.

**Varshney, Neeraj et.al [6]** Wireless communication is done like between vehicle to vehicle or between vehicle to road. So security is so much important. In VANET some serious network attacks such as man in middle attack, masquerading is possible. Author introduced a algorithm to overcome these network attacks via low message passing and try to reduce the bandwidth at the time of authentication, message passing.

## APPROACHES USED

**AODV:** AODV is a method of routing messages between V ANET nodes. AODV is an 'on demand routing protocol' with small delay. It is a Reactive algorithm. That means that routes are only established when needed, to reduce traffic overhead.

AODV supports Unicast, Broadcast and Multicast without any further protocols [10]. AODV allows these nodes, to pass messages through their neighboring nodes with which they cannot directly communicate. This is done by discovering the routes along which messages that can be passed. It also makes sure these routes do not contain loops and tries to fmd the shortest route possible, and is also able to handle changes in routes and can create new routes if there is an error. AODV uses symmetric links between neighboring nodes. It does not attempt to follow paths between nodes when one of the nodes cannot hear the other one.

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Input: (r, s), m, Q
1) Verify r, $s\ E[l, n-1]$
2) Compute w = s- I mod n.
3) Compute

$$u_1 = ew\ mod\ n\ and\ u_2 = rw\ mod\ n\ with\ e = H(m).$$

**GPSR:** Greedy Perimeter Stateless Routing (GPSR) is one of the best examples of position based routing. GPSR uses closest neighbors information of destination in order to forward packet. This method is also known as greedy forwarding. In GPSR each node has knowledge of its current physical position and also the neighboring nodes. On the other hand neighboring nodes also assists to make forwarding decisions more correctly without the interference of topology information. All information about nodes position gathered through GPS devices. GPSR protocol normally devised in to two groups:

- Greedy forwarding: This is used to send data to the closest nodes to destination.
- Perimeter forwarding: This is used to such regions where there is no closer node to destination.

**DSR:** DSR is a reactive routing protocol in which the primary aspect is to store the whole path from source to destination in the routing table instead of having the next hop stored (AODV routing protocol). Therefore, the packet header must include all nodes through which the packet must travel to be delivered to the destination. Similar to AODV, the RREQ and RREP are used to perform the route discovery and delivering the reply message back to the source. We will approach it through various applications, each of which is like a picture in a space of lower dimension. One way to reduce the dimensionality is simply to set $H = 0$.Then the two square roots become the same, so that they can be combined to give the familiar paraxial equation:

$$\frac{dU}{dZ} = -iw\frac{2}{v}\sqrt{1 - \frac{v^2 k_y^2}{4w^2}U}$$

## METHDOLOGY

**Phase 1:** In this phase VANET scenario is initialize by defining are of simulation no. of vehicle in direction reverse direction their mobility.
**Phase 2:** In this phase various communications between different vehicles and roadside unit will take place using GPSR protocol for the communication process.
**Phase 3:** In this phase cognitive radio bandwidth has been utilized for the transmission of packets from vehicle to vehicle and vehicle to RSU and RSU to vehicle by sensing channel. The channel is free that can be allocated for communication.

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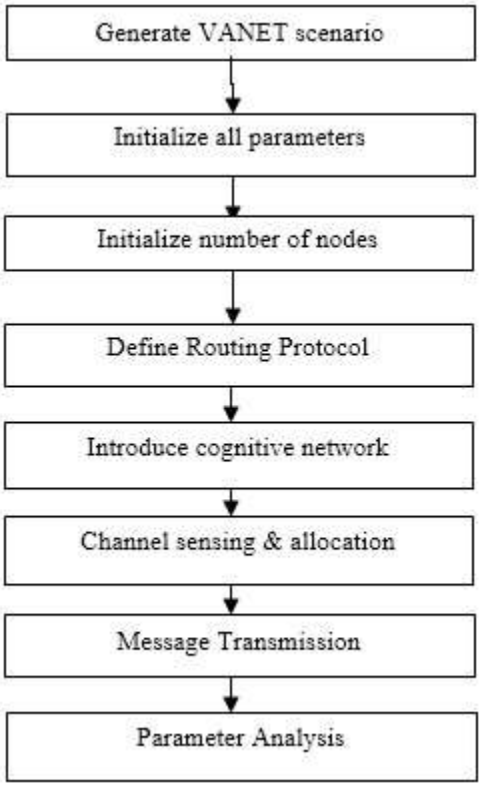


***Fig. 4.1: Flow of Work***

## CONCLUSION

VANET is an extension of MANET; VANET is vehicular Ad-hoc network which is used for intelligent transport system for the drivers the ad-hoc network is used to transmit various types of message over the network. The main issue of road density is due to high load on road message communication get overhead due to less amount of network bandwidth to overcome this issue cognitive radio bandwidth can be utilize for data transmission by channel sensing and message can be transmit through cognitive radio channels. GPRS, AODV, DSR, PUMA these are various routing protocol utilizes for message transmission. Based on the real time road density vehicle establish reliable route for the communication on packet delivery. In various scenarios message transmission is done according to vehicle density available on the road.

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