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## VEHICULAR AD-HOC NETWORK: VANET

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**Abstract:** - Vehicular Ad-hoc Networks, (VANET) are a particular kind of Mobile Ad Hoc Network, (MANET), in which vehicles act as nodes and each vehicle is equipped with transmission capabilities which are interconnected to form a network. The topology created by vehicles is usually very dynamic and significantly non-uniformly distributed and this technique is also known as Intelligent Transportation System (ITS). VANETs is a kind of special wireless ad hoc network .VANET has become an active area of research, standardization, and development because it has tremendous potential to improve vehicle and road safety, traffic efficiency and convenience as well as comfort to both drivers and passengers .The aim of this review paper is to give an overview of the vehicular ad hoc networks, its characteristics , the existing VANET routing protocol, Security and privacy, applications.

**Keywords:** VANET, dynamic topology, ITS, wireless, routing protocols.

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### 1. INTRODUCTION

During the past decades researches on ad hoc network has focused on a large and different variety of applications, most of them working for MANET's i.e. mobile ad-hoc networks and other one is VANET's i.e. vehicular ad-hoc network. It is also called as "Network on Wheels".

VANET's are particular kind of Mobile Ad Hoc Networks that are shaped between moving vehicles on as-needed basis. Vehicular ad-hoc networks are responsible for the communication between moving vehicles in a certain environment. A vehicle can communicate with another vehicle directly which is called Vehicle to Vehicle (V2V) communication, or a vehicle can communicate to an infrastructure such as a Road Side Unit (RSU), known as Vehicle-to-Infrastructure. The vehicles may not have a direct Internet connection; the wireless roadside equipment may be connected to the Internet that allowing data from the vehicles to be sent over the internet.

The key advantages are improved knowledge based real time signaling systems, improved safety of vehicular traffic and reduced vehicular emissions. Researchers in communications engineering and traffic management systems are engaged for more than a decade to develop suitable Vehicular Ad hoc Networks (VANET) for traffic safety systems.

VANET is self-configuring like MANET. It is infrastructure less network of mobile devices connected by wireless .Each device is free to move in a VANET in any direction but within its link.

In this review, an overview of the technologies and ongoing research areas is provided related to VANETs.

## 2. LITERATURE REVIEW

Md. Humayun Kabir proposed “Research Issue on Vehicular Ad hoc Network” (2013). This paper is presenting the aspect related to this field to help researchers and developers to understand and distinguish the main features surrounding VANET. According to this paper the researchers can know distinguish aspects of VANET regarding characteristics, layers and model, applications etc.

Sabih ur Rehman proposed “Vehicular Ad-Hoc Networks (VANETs)-An overview and Challenges” (2013). This paper is presenting state-of-the-art of VANET and discusses the related issues. According to this paper main finding that an efficient and robust VANET is one which satisfies all design parameter such as QoS, minimum latency, low BER and high PDR and some key research areas and challenges in VANET are presented at the end of the paper.

Wenshuang Liang proposed “Vehicular Ad Hoc Networks: Architecture, Research Issues, Methodologies, Challenges and trends” (2014). This paper is presenting basic architecture of networks and also discuss three popular research issue and general research methods, and ends up with the analysis on challenges and future trend of VANET's.

Sherali Zeadally proposed “Vehicular ad hoc networks (VANET's): status, results, and challenges” (2010). This paper is presenting the research challenges in VANET and also makes fine secure VANET architectures, protocols, technologies and services.

Ram Shrinagar Raw proposed “Security Challenges, Issues and their solution for VANET” (2013). This paper is presenting the techniques and security challenges and also discussed some major attacks and solution that can be implemented these attacks.

Ankita Agrawal proposed “Security on Vehicular Ad Hoc Networks (VANET): A Review Paper” (2013). In this paper main aspect is to overcome the previous research done in VANET.

## 3. VANETs

VANET is an ad-hoc network formed between vehicles as per their need of communication. In order to develop a VANET every participating vehicle must be capable of transmitting and receiving wireless signals up to range of three hundred meters. VANET communication range is restricted up to one thousand meters in various implementations. The performance of a VANET remains optimum within one thousand meters and beyond that it is not feasible to communicate among vehicles because of high packet loss rate. Finding optimum path is typical task for dynamic protocols as management of vehicle movement is quite complex. There is a need to update entries in the route finding node.

VANET is not restricted up to Vehicle-to-Vehicle communication, it takes benefits of road side infrastructure that can also participate in communication between vehicles, but our main focus is on Vehicle-to-Vehicle communication. There are various challenges for VANET such as high speed of vehicle, dynamic route finding, building, reflecting objects, other obstacles in path of radio communication, roadside objects, different direction of vehicles, concern about privacy, authorization of vehicle, security of data and sharing of multimedia services. High speed of vehicle requires regular update of routing table whereas dynamic route finding would result into high time loss before static communication. Various user group among VANET are mostly it is used in traffic management agencies, getting popular, highway safety agencies, law enforcement agencies and emergency services.

### 3.1 VANET Characteristics

#### A. Predictable mobility

Unlike MANETs, the network nodes (here vehicles) of VANET move in a predefined way because roads layout are fixed and vehicles have to obey and follow road signs, traffic signals, as well as respond to other moving vehicles.

#### B. Mobility and rapid changing topology

Vehicles move very fast especially on roads and highways. Thus, they remain within each other communication range for a very short time, and links are established and broken fast which results to rapid changes in network topology. Moreover, driver behavior is affected by the necessity to react to the data received from the network, which causes changes in the network topology. The rapid changes in network topology affect the network diameter to be small, while many paths may be disconnected before they can be used.

### *C. Geographic position available*

Vehicles can be equipped with modern, accurate positioning systems integrated by electronic maps. For example, global positioning system (GPS) receivers are very popular in cars which help to provide location information for routing purposes.

### *D. Variable network density*

The network density in VANET varies depending on the traffic load, which can be very high in the case of a traffic jam, or very low, as in suburban areas.

### *E. High computational ability*

As vehicles are nodes in VANET, they can hold a sufficient number of sensors and enough communication equipment such as high speed processors, large memory size, advanced antenna technology and modern GPS. These resources increase the computational power of the node, which help to create reliable wireless communication and to collect accurate information of node's current position, speed and direction.

## **3.2 Routing**

A very important design aspect of VANET is to develop an efficient, reliable and secure routing protocol. The main objective of any routing protocol is to find an optimal way of communication between nodes (vehicles).

Routing is a process of finding a path from source to destination. High mobility of nodes and rapid changes of topology are the main factors that influence the need of generating an efficient routing protocol which can deliver a packet in minimum period of time. VANET routing protocol which is capable of handling a number of nodes.

Types of Routing Protocol

- 1) Proactive
- 2) Reactive

## **3.3 Security and Privacy**

To address the security and privacy issues, many approaches have been proposed in the literature over the past few years. Most of them pay more attention to two main aspects: communication and architecture of VANETs. Security architecture from several different viewpoints such as the functional layer view, The organizational/component view, the reference model and the information centric view. Some security requirements should satisfy the following requirement.

- 1) Authentication
- 2) Availability
- 3) Non-Repudiation
- 4) Privacy
- 5) Data verification

## **3.4 Application**

Application in vehicular environment usually can increase the road safety, improve traffic efficiency and provide entertainment to passengers.

## **4. SIMULATION MODEL**

Simulation can be used to evaluate different simple or complicated or innovative solution before implementation. The simulation of VANETs requires two different components:

- 1) A Traffic Simulator: Traffic simulators are needed to generate position and movement information of single vehicle in VANETs environment.
- 2) A Network Simulator: Network simulator should possess some features including a comprehensive mode, efficient routing protocol.

## 5. CONCLUSION AND FUTURE SCOPE

In research it has been concluded that VANETs are very efficient way of communicating between travelling nodes. VANETs are a promising technology and with the substantial advancement in wireless technology, vehicles are becoming a vital part of global network. VANETs introduce a new challenging environment for developers and communication engineers. There are many different hot topics to be studied by researchers as follows:

Mobility modeling  
Scalability issues  
Security frameworks  
Quality of Service (QoS)  
Broadcasting

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