BEHAVIOURAL STUDY OF VANET PROTOCOLS

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ABSTRACT

VANETS is the most popular network which is called Vehicular Ad Hoc Network. The researchers make a lot of work in this network. Several unexpected disastrous situations are encountered on road networks daily, many of which may lead to congestion and safety hazards. If vehicles can be provided with information about such incidents or traffic conditions in advance, the quality of driving can be improved significantly in terms of time, distance, and safety. One of the main challenges in Vehicular adhoc network is of searching and maintaining an effective route for transporting data information. In this paper, the author will make an attempt for identifying major issues and challenges associated with different vanet protocols and to select the optimal vanet protocol for the prediction of future.

Keywords: *VANET, Efficient Routing, Congestion.*

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I. INTRODUCTION

For people living in developed countries the sheer volume of road traffic can be a daily nuisance. In addition, the road traffic conditions affect the safety of the population since 1.2 million people worldwide are estimated to be killed each year on the roads [1]. For this reason, nowadays the automotive industry and governments invest many resources to increase road safety and traffic efficiency, as well as to reduce the impact of transportation on the environment. The application of communications and information technologies for this purpose has opened a new range of possibilities. One of the most promising areas of research is the study of the communications among vehicles and road-side units, or more specifically the Vehicular Ad-hoc Networks (VANETs). This kind of networks are self-configuring networks composed of a collection of vehicles and elements of roadside infrastructure connected with each other without requiring an underlying infrastructure, sending and receiving information and warnings about the current traffic situation (see Figure 1.1). Nowadays, Wi-Fi (*IEEE 802.11 based*) technologies are the most commonly used for deploying VANETs. The vehicles are equipped with wireless network interfaces which use either IEEE 802.11b or IEEE 802.11g standards for access media. However, these are general purpose standards and they do not fit properly the requirements of high dynamic networks such as VANETs. Currently, DSRC (Dedicated Short-Range Communication) [2] has been proposed as the communications standard specifically for VANETs, it is a short medium range communications service that offers very low latency and high data rate. DSRC is based upon the standards IEEE 802.11p and IEEE 1609 family.

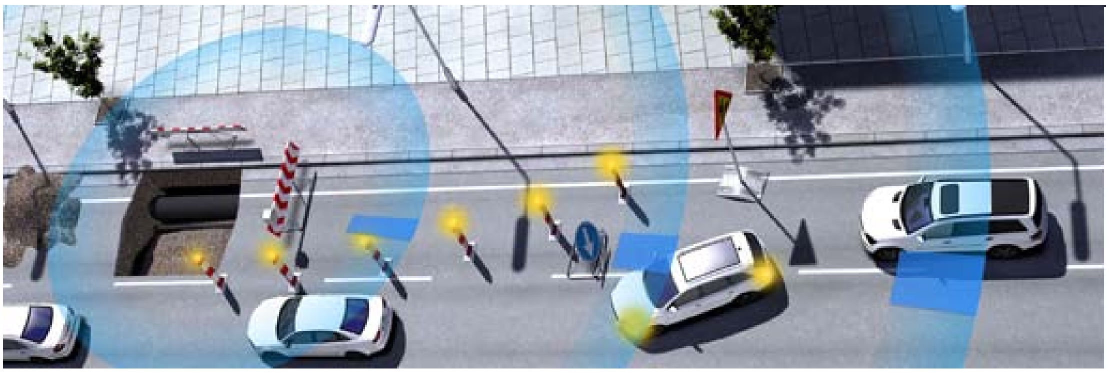

Fig 1.1:VANET use case: Warn of Obstacle in the road

The use of IEEE 802.11 standards describes that vehicles communicate within a limited range while moving, thus exhibiting a topology that may change quickly and in unpredictable ways. In such kind of networks, previous to its deployment, it is crucial to provide the user with an optimal configuration of the communication protocols in order to increase the effective data packet exchange, as well as to reduce the transmission time and the network usage(with their implications on higher bandwidth and lower energy consumption). This is especially true in certain VANETs scenarios in which buildings and distances discontinue communication channels frequently, and where the available time for connecting to vehicles could be really short. The efficient protocol configuration for VANETs without using automatic intelligent design tools is practically impossible because of the enormous number of possibilities (*NP-problems*). It is especially difficult (e.g., for a network designer) when considering multiple design issues, such as highly dynamic topologies and reduced coverage.

Special Characteristics of Vehicular Networks

Vehicular networks have special behaviour and characteristics, distinguishing them from other types of mobile networks. In comparison to other communication networks, vehicular networks come with unique attractive features, as follows:

1) Unlimited transmission power: Mobile device power issues are usually not a significant constraint in vehicular networks as in the case of classical ad hoc or sensor networks, since the node (vehicle) itself can provide continuous power to computing and communication devices.

2) Higher computational capability: Indeed, operating vehicles can afford significant computing, communication, and sensing capabilities

3) Predictable mobility: Unlike classic mobile ad hoc networks, where it is hard to predict the nodes' mobility, vehicles tend to have very predictable movements that are (usually) limited to roadways. Roadway information is often available from positioning systems and map based technologies such as GPS. Given the average speed, current speed, and road trajectory, the future position of a vehicle can be predicted.

4) High mobility: The environment in which vehicular networks operate is extremely dynamic, and includes extreme configurations: on highways, relative speeds of up to 300 km/h may occur, while density of nodes may be 1–2 vehicles 1 km on low busy roads. On the other hand, in the city, relative speeds can reach up to 60 km/h and nodes density can be very high, especially during rush hour.

5) Partitioned network: Vehicular networks will be frequently partitioned. The dynamic nature of traffic may result in large inter vehicle gaps in sparsely populated scenarios, and hence in several isolated clusters of nodes.

6) Network topology and connectivity: Vehicular network scenarios are very different from classic ad hoc networks. Since vehicles are moving and changing their position constantly, scenarios are very dynamic. Therefore the network topology changes frequently as the links between nodes connect and disconnect very often. Indeed, the degree to which the network is connected is highly dependent on two factors: the range of wireless links and the fraction of participant vehicles, where only a fraction of vehicles on the road could be equipped with wireless interfaces.

II. ISSUES AND CHALLENGES

Maxim Raya and jean-Pierre Hubaux proposed in [1] a model that identifies the most relevant communication aspects; they have also identified the major threats. Since VANETs is vehicular ad-hoc networks are likely to become the most relevant form of mobile ad-hoc networks. The communication b/w vehicle and to the road side infrastructure should be free from all type of attacks so that the vehicles can share information in a secure network. They provide a set of protocols, and shown that public key cryptography is fit for the security of these networks by analyzing their robustness. V.Gligor et.al proposed in [3] that among civilian communication systems, vehicular ad-hoc networks emerge as one of the most convincing and yet most challenging instantiations of the mobile ad-hoc networking technology. They outline security requirements for the vehicular communication systems and provide models for the system and communication, as well as models for the adversaries. They also proposed a set of design principles for future security and privacy solutions for vehicular communication systems. Gabriele Goldacker el.al proposed in [4] security architecture follows a clean and modular design. By description of different architectural perspectives, they identify the stakeholders and their responsibilities. Then, they focus on the functional layer view and highlight the concepts which jointly secure the vehicular communication. Based on these concepts, they present an implementation approach which introduces the security concepts into the protocol stack of vehicular communication syste Kung el.al proposed in [5] security architecture for vehicular communication. The primary objectives of the architecture include the management of identities and cryptographic keys, the security of communications, and integration of privacy enhancing technologies. Their design approach aims at a system that relies on well-understood components which can be upgraded to provide enhanced security and privacy protection in the future.

III.VANET PROTOCOLS

VANET classifies routing protocols in five different categories: Topology, Position, Cluster, Geocast and Broadcast methods. Each method has its own advantages and disadvantages which is the primary discussion in this section. Advantage of proactive routing protocols is that it does not adopt any route discovery mechanism since destination location is stored in the background, while its disadvantage is that it provides low latency time for real time service applications.

Several studies have been published comparing the performance of routing protocols using different mobility models or performance metrics. Work by Das et al [4] compared a large number of vanet protocols. Jing Tian proposed" geographic source routing' (GSR), which combines position-based routing with topological knowledge, as a promising routing strategy for vehicular ad hoc networks in city environments. Ch.vijay Durga et al, in [6] proposed a DV-CAST protocol on highways under multiple traffic conditions. This works efficiently under the conditions of heavy traffic during rush hours, very light traffic during certain hours of the day and low market penetration rate of cars using DSRC technology. Raphal Frank et al. present in [2] a TrafRoute, an efficient and robust forwarding scheme for vehicular networks, suitable for both Vehicle-to-Vehicle and Vehicle-to-Infrastructure communications. TrafRoute introduces a novel approach to routing that involves landmark-based routes and forwarder self-election, exploiting the knowledge of the underlying road network. M. chuan et al proposed a robust data transfer protocol(RDTP). That support two types of vehicular services, namely the traffic monitoring and the roadside message transfer applications. The traffic monitoring application (TMA) allows drivers to query traffic conditions at some distance ahead of themselves so that they can make decisions on route changes. The roadside message transfer application (RMTA) allows data messages to be delivered between roadside entities e.g. emergency messages via moving vehicles. RMTA, RDTP achieves higher data throughput and lower delivery latency when compared to an existing approach.

The interest in realistic mobility models for VANETs had included large number of survey studies to be carried out to understand and evaluate the performance of VANETs in urban traffic or highway traffic conditions. The performance results show that these models generate urban specific spatial and temporal dependencies, where the real mobility parameters differ from the initial and controlled ones. Performance comparison had become unfair and arguable.

Routing Method	Protocol	Issues	Application/Service
Proactive	Fisheye TORA	Mobility increases	Routing tables are updated.
Geo cast	DIR[7], IVG.	Network partition unfavourable.	Control flooding of packets.
Cluster	COIN[9]DYMO New cluster protocol[8].	Depends upon density of nodes.	Provision QoS over vehicle to vehicle and networks.
Broadcast	DV_CA-ST, newscast	Flooding packet leads to packet loss, latency.	Overcome interference packet loss and hidden terminal problems.
Position/ Geo cast	GPCR, STBR, GPSR [10].	Introduce long delays, not efficient.	Success at higher packet loads and traffic rate

Table 1: Routing Scheme Survey Analysis

IV. CONCLUSION

This paper deals with study of different kinds of vanet routing protocols. It determines the application and characteristics of vehicular adhoc network. After that a detailed study of routing protocols and their comparison in different perceptions are examined. In general, the survey summarizes that routing protocol of VANET needs improvement in routing traffic load, overall throughput, end-to-end delay, control overhead, and handoff and session connectivity time. This paper highlights the concerned issues and challenges which may be helpful for the upcoming researchers to carry on their work.

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