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# Role of VANET in Smart City

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***Abstract—Road safety has become a main issue for governments and car manufacturers in the last twenty years. The development of new vehicular technologies has favorite companies, researchers and institutions to focus their efforts on improving road safety. During the last decades, the evolution of wireless technologies has allowed researchers to design communication systems where vehicles participate in the communication networks. Thus, new types of networks, such as Vehicular Ad Hoc Networks (VANETs), have been created to facilitate communication between vehicles themselves and between vehicles and infrastructure. New concepts where vehicular networks play an important role have appeared the last years, such as smart cities and living labs. Smart cities include intelligent traffic management in which data from the TIC (Traffic Information Centre) infrastructures could be reachable at any point. To test the possibilities of these future cities, living labs (cities in which new designed systems can be tested in real conditions) have been created all over Europe. In this paper review that the framework is to transmit information about the traffic conditions to help the driver (or the vehicle itself) take adequate decisions.Traffic Lights (ITLs) that provide information to drivers about traffic density and weather conditions in the streets of a city is proposed and evaluated through simulations.***
***Keywords— VANET, Smart city and Routing***

## I. INTRODUCTION

Vehicular Ad Hoc Networks (VANETs) are created by applying the principles of mobile ad hoc networks (MANETs) - the spontaneous creation of a wireless network for data exchange to the domain of vehicles. They are a key component of intelligent transportation systems (ITS).While, in the early 2000s, VANETs were seen as a mere one-to-one application of MANET principles, they have since then developed into a field of research in their own right. By 2015, the term VANET became mostly synonymous with the more generic term inter-vehicle communication (IVC), although the focus remains on the aspect of spontaneous networking, much less on the use of infrastructure like Road Side Units (RSUs) or cellular networks. Example applications of VANETs are:

*A.* Electronic brake lights, which allow a driver (or an autonomous car or truck) to react to vehicles braking even though they might be obscured (e.g., by other vehicles).
*B.* Platooning which allows vehicles to closely (down to a few inches) follow a leading vehicle by wirelessly receiving acceleration and steering information, thus forming electronically coupled "road trains".
*C.* Traffic information systems, which use VANET communication to provide up-to-the minute obstacle reports to a vehicle's satellite navigation system.

## II. LITERATURE REVIEW

### *A. Smart city for vanets using warning messages, traffic statistic and intelligent traffic lights research by carolina tripp barba, miguel angel mateos*

Road safety had become a main issue for governments and car manufacturers in the last twenty years. The development of new vehicular technologies has favorite companies, researchers and institutions to focus their efforts on improving road safety. During the last decades, the evolution of wireless technologies had allowed researchers to design communication systems where vehicles participate in the communication networks. Thus, new types of networks, such as vehicular ad hoc networks (vanets), had been created to facilitate communication between vehicles themselves and between vehicles and infrastructure. New concepts where vehicular networks play an important role had appeared the last years, such as smart cities and living labs. Smart cities include intelligent traffic management in which data from the tic (traffic information centre) infrastructures could be reachable at any point. To test the possibilities of these future cities, living labs (cities in which new designed systems can be tested in real conditions) had been created all over europe. The goal of used framework is to transmit information about the traffic conditions to help the driver (or the vehicle itself) take adequate decisions. They focus on, the development of a warning system composed of intelligent traffic lights (itls) that provides information to drivers about traffic density and weather conditions in the streets of a city is proposed and evaluated through simulations.

### *B. An efficient privacy-preserving authentication protocol in VANET research by Jianhong Zhang, Weina Zhen, Min Xu*

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They show the important component of Intelligent Transportation Systems (ITS), vehicular ad hoc networks can provided safer and more comfortable driving circumstance for the drivers. They provided privacy-preserving of the vehicle's identity, to the best of his knowledge, pseudonyms certificate and group-oriented signature was two most widely accepted ways in VANET. However, the two methods existed many efficiency flaws which affect their application. They overcome the above problems which existed in the above two methods. In that researched, they proposed a novel privacy-preserving authentication protocols based on self-certified signature. And they show that his scheme could achieve conditional privacy-preserving and was proved be secure in the random oracle. Furthermore, the scheme had the following advantages: short length of the signature and low computation.

*C. A smart city frame for intelligent traffic system using VANET by Ganesh S. Khekare and Apeksha V.Sakhare*

The total number of vehicles in the world had experienced a remarkable growth, increasing traffic density which results in more and more accidents. Therefore the manufactures, researchers and government was shifted focus towards improved the on road safety rather than improved the quality of the roads. The good development in the wireless technologies emerged various new type of networks, such as Vehicular Ad Hoc Network (VANET), which provided communication between vehicles themselves and between vehicles and road side units. Various new concepts such as smart cities and living labs are introduced in the recent years where VANETs plays an important role. A survey of various Intelligent Traffic Systems (ITS) and various routing protocols with respect to his proposed scheme is described. It also introduced a new scheme consisted of a smart city framework that transmit information about traffic conditions that will help the driver to take appropriate decisions. They consisted of a warning message module composed of Intelligent Traffic Lights (ITLs) which provided information to the driver about current traffic conditions.

*D. Attacks on security goals (Confidentiality, Integrity,Availability) in VANET: A survey by Irshad Ahmed Sumra, Halabi Bin Hasbullah and Jamalul-lail Bin Ab Manan*

In recent years, the VANET has received a greater attention among researchers in academia and industry due to its potential safety application and non safety application. Malicious users are one of the types of attackers in VANET and create the security problems. Confidentiality, integrity and availability (CIA) are major components of security goals. The increasing research interest, potential applications, and security problem in VANET lead to the needs to review the attacks on security goals. In which described, the aim is to presented the survey of attacks on security goals and to described in details the nature of attacks and the behavior of attackers through different scenarios in the network. They also provided a better understand of security goals and finally it provided an analysis and classified the attacks on the basis of security goals into different threat levels that can helped in the implementation of VANET in real life. They showed that his scheme can achieved conditional privacy preserved and was proved be secure in the random oracle. And the proposed scheme had the followed advantages: short length of the signature and low computation.

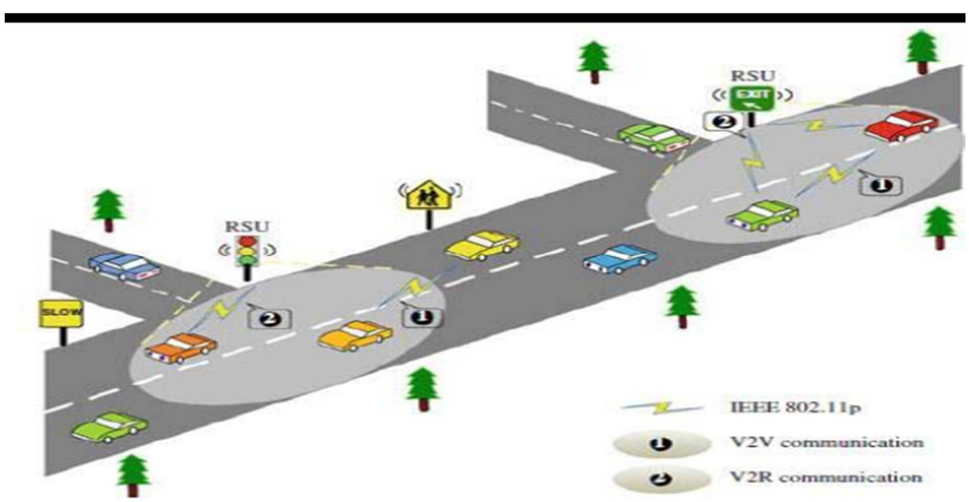


Figure 1 communication between V2V and V2R

## III. DESCRIPTION

*A. Smart City Framework*

The smart city framework we have designed includes ITLs set in some of the crossroads. These ITLs collect real-time traffic data from the passing vehicles and calculate traffic statistics such as traffic density in the adjacent streets (between consecutive crossroads). ITLs are placed. To cover all this area the antenna pattern used is an omni directional propagation pattern. Therefore, each ITL receives data from all passing vehicles on its cover range. It is assumed that vehicles have a global positioning system (GPS) device, a driver assistant device, full map information of the city including the position of the ITLs. Thus, vehicles can easily select which is the nearest ITL.

Every ad-hoc node (i.e., ITLs and vehicles) set on the scenario was configured with Ad hoc On-Demand Distance Vector (AODV) routing protocol. The advantage of AODV is its simplicity and widespread use. The main drawback is that AODV needs end-to-end paths for data forwarding, which is difficult to handle because in VANETs end-to-end paths last not much due to high speeds of vehicles.

*B. Management of Traffic Density*

The messages sent by each vehicle to an ITL include the type of message (a new message called Statistic Message(SM), the identification of the vehicle (Ci) sending the message, the current value of the number of neighbours (NoNi) in its coverage range at that moment, the moment in which the message was sent (ti) and the IP address of the ITL destination (ITLi). This message is sent by the vehicles each 2 sec. This way, a car (v=40 km/h) sends 5 messages while it crosses a 100 m.street shown in figure (b).

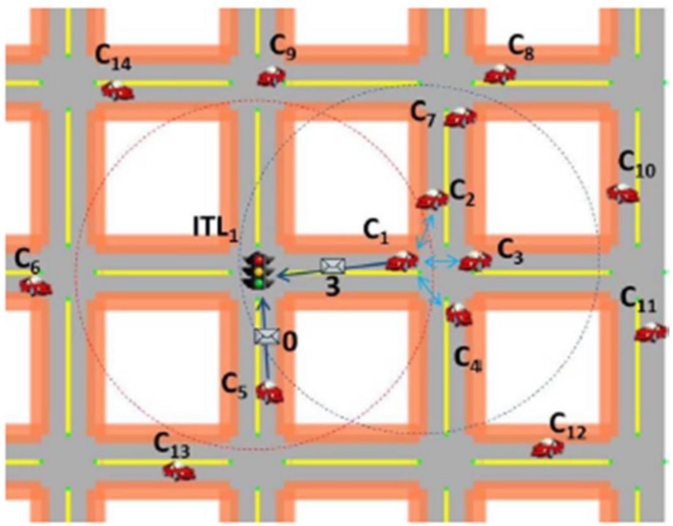


Figure.1 Distance between road side unit and vehicles

The day has been divided into five periods due to the usually variable traffic densities in a city throughout the day. Thus, every ITL updates the traffic density per periods: TDst6□9, TDst9□12, TDst12□15, TDst15□18, TDst18□21. For instance, TDst6□9 gathers the average traffic density in the city, during week days, from 06:00 AM to 09:00 PM. The value TDst6□9 will continuously be updated using where w is a small weight (e.g. w=0.25) to smooth out isolated deviations, TDst6□9;i is the updated average in iteration i and TDst6□9 is the last value received by that ITL. The same computation will be done for the other periods of the day.
The ITLs of the city share that traffic information and after that, each ITL will send back to each passing vehicle a message with the updated traffic statistics of the city on that period of time. With this information, the driver's assistant device can take proper trip decisions (e.g. avoiding congested roads). Designed a smart city framework for VANETs that include intelligent traffic lights (ITLs) that transmit warning messages and traffic statistics. Simulation results show that the use of ITLs in smart cities can not only improve road safety but also the driver's quality of life.

## IV. CONCLUSIONS

Above all technologies are studied, in which conclude that the AODV is best suited for VANET. Different works about Intelligent Traffic System (ITS) are compared and a new scheme is proposed. The key idea behind the proposed scheme is to create a smart city framework for VANET that consists of Intelligent Traffic Lights (ITLs) which transmit warning messages and traffic statistics. The goal is that on board unit can take a appropriate trip decisions and hence avoid congested roads, which results in reduction in

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pollution and trip time as well and definitely enrich the drivers' quality of life. Also various routing protocols has been discussed and compared. AODV is best suited with respect to our proposed scheme as it provides good throughput and minimum delay.

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