

A Critical Review of Vehicular Ad Hoc Networks with various Applications

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Abstract - Vehicular Ad Hoc Networks (VANETs) are most emerging type network in the used in many applications has communication between two network systems, gives safety measurements, information about traffic. So, in this paper authors discussed the information all basics of VANETs, applications of VANET and challenges concern for the security solutions in VANETs for different vehicular applications.

Index Terms – Security, VANET, applications, end user,

I. INTRODUCTION

In the past few years, there is an advance development in the intelligent transport systems (ITSs) have enlarged substantial attention from research and automobile industries. The ITS has majorly used in the road safety precautions, traffic flow control and entertainment services in the automobile vehicles [1]. To optimize the traffic flow, communication between the vehicles and to provide safety measures there is need of wireless communication system with the embedded sensors [2]. These wireless communication and embedded sensors network are called as VANETs [3]. A VANET is the one of the type of the mobile ad hoc network (MANET) which is used to provide traffic safe and driving experiences. The basic components of VANETS comprises of three branches named as Road Side Unit (RSU), Trusted Authority (TA) and Onboard Unit (OBU) [4-5]. The main applications of the VANETs are the used in the security development in the transport systems. In the implementation of security the system may possible to go in cybercrimes, To avoid these cybercrimes, researchers are working and also they find the many advancement solutions. The order the paper is as follows, Introduction is section 1, VANET ariectecture as section 2, In section 3deals the challenges in VANETs , section 4 gives the security issues in VANET, and section 5 as VANET Applications, Section 6 has Simulation Tools of VANETs and Conclusion has section 7.

II. VANETS ARIECTECTURE

Basically the VANETs has several components given as (OBU),Trusted Unit (TA) and (RSU). The function of the RSU is host an

application used to communicate with various network elements. Next the OBU is used to receive and collect the information data from nearby vehicles. The information data parameters are speed, fuel, traffic etc. The TA is head for all the components which are in VANETS. The RSU is also interconnected with each other through TA.[6].

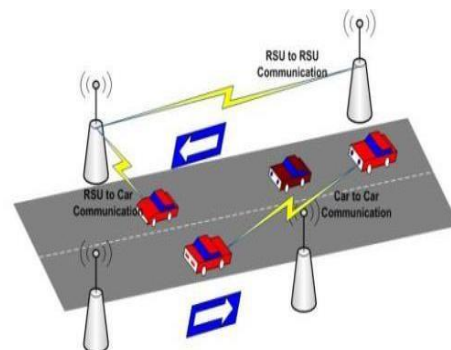


Fig. 1 Architecture of Vehicular ad-hoc network (VANET)

A. VANET CHARACTERISTICS

VANETs is basically a wireless sensor network which is highly reliable, dynamic nature and occur in various multiple services. For various applications VANETs are fixed on the high mobility transport vehicles. VANETs are specific characteristics which used for various security applications when compared with other existing mobile networks.

The main characteristics are high mobility [8]. The main advantage of high mobility is reduces the communication time between networks and nodes [8-9]. Next characteristics for VANET are good wireless communication between the different

networks. The VANET is also have Dynamic network topology which has changes promptly due to mobility vehicles.

The VANET as driver safety which improves traffic flow with advantage of communication between nodes to different networks. The VANET having limited power transmission coverage of distance upto 1 km[10].

The other good characteristics of VANET are network strength which is depends on traffic flow and also VANET has large network size .

III. RELIABILITY CONCERNS AND CHALLENGES IN VEHICULAR AD HOC NETWORKING

The security issues of VANETs are given below sections. The types of security issues are

- Security threats to Availability
- Threats to Authenticity
- Threats to Confidentiality

The Fig.2 Shows the tree diagram for the types of security issues in the VANET.

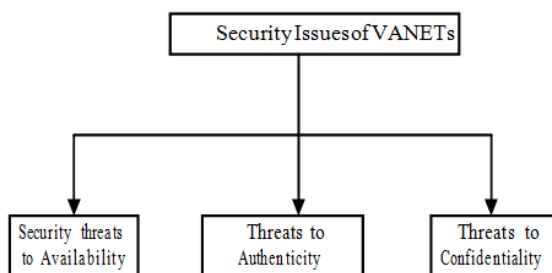


Fig. 2 Types of Security issues in the VANETs

A. SECURITY THREATS TO AVAILABILITY

The security challenges that are always there for vehicle-to-roadside and vehicle –to-vehicle are given by various types. They are given by various types [11].

- Denial of Service Attack
- Broadcast Tampering
- Malware
- Spamming
- Black Hole Attack

B. THREATS TO AUTHENTICITY

The Threats to Authenticity security issues is also important in the VANET which has been including the defending of nodes from insider’s attackers. The following are the types of threats [12].

- Masquerading
- Message Suppression/Fabrication/Alteration
- Global Positioning System (GPS) Spoofing
- Message Tampering
- Tunneling

- Position Faking

C. THREATS TO CONFIDENTIALITY

The following are the types of security issues comes under confidentiality [14].

- Analysis of Traffic
- Dropping Eaves
- Social
- Man-middle.

IV. SECURITY CHALLENGES IN VANET

They are three types of security challenges in VANET is there which is shown in Fig 3.

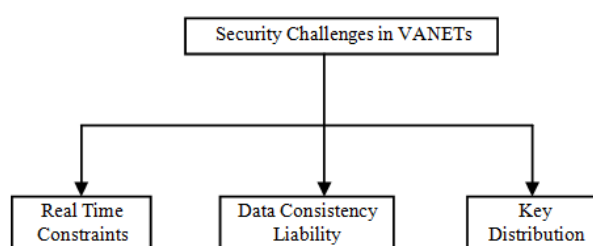


Fig. 3 Security Challenges in VANETs

A. REAL TIME CONSTRAINTS

Very high speed cryptographic algorithm is used in the VAETS to deliver real time constraints such as sending messages in a specific time.

B. DATA CONSISTENCY LIABILITY

To avoid the unnecessary information due to authenticate node the data consistency is preferred which is an important tool in the VANETs.

C. KEY DISTRIBUTION

VANET Key Distribution has taken care of send and receives the messages to complete the whole procedure in the VANETs Applications.

V. VANET APPLICATIONS

The main applications of VANET is divided into two types one is comport applications and second one is safety applications.

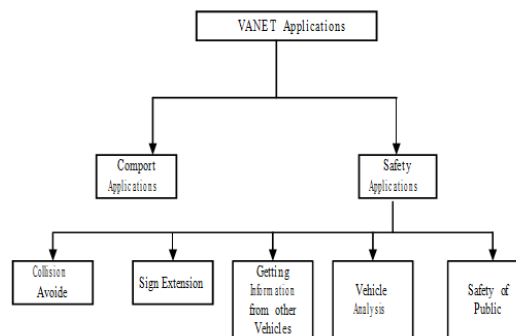


Fig. 4 Classification of VANET Applications

The safety applications are further divided into many types according to the various applications. The Fig.4 shows classifications for the VANET applications.

A. COMFORT APPLICATIONS

The comfort applications gives the comfortless of the passengers like internet availability, climatic information needed, communication exchange between vehicles, parking area location, hotels location etc.

B. SAFETY APPLICATIONS

Safety applications of VANET are mostly favorable for the protection of the users and vehicles by provide safety information, lane change information traffic information and exchange of vehicular information between the systems etc. In the public safety applications the VANET gives information

about Emergency Vehicle warning, signal preemption and post cash warning.

The Sign Extension applications gives data about the Turning speed warning, Low-Bridge Warning, low parking warning etc. .

Information from other vehicles applications in VANETs gives the information about pre-crash sensing, road condition warning and also it gives collision warning etc.

Vehicle Analysis application in VANET gives the information about safety call notice, just in time repair notification [13].

Finally to understand the types of Ad hoc networks like Mobile Ad Hoc networks (MANET) with VANETs. we have tabulate the comparison table with various parameters between mobile and vehicular Ad hoc Networks. The comparison is shown in Table.1

TABLE I Comparison of different Network Systems

Various Parameters	MANET system	VANET system
Localization	GPS	AGPS, GPS
Mobility	LOW	HIGH
Change Topology	Slow	Very Fast
Nodal Density	LOW	HIGH
Sight Light	Not Available	Rarely available

VI. SIMULATION TOOLS FORVANET

Privacy and Security problems are considered seriously in the VANETS, when is used for the different Applications. The security issues will occur in the VANETS due its network structure, its mobility and decentralization. So to get the optimal solution of VANETs it is so important to develop proper algorithms in network and also to use suitable simulation tools. There are two types of simulation tools are imposed one is mobility simulator and second one is network simulator. The mobility simulator is used for vehicle mobility [14]. The application of network simulator is for the evaluation of VANETs and network issues.

A. MOBILITY SIMULATOR

The METACOR [15] is the tool used for determine the vehicle attitude with utilizing of traffic at high scale.

Vanet Mobisim [16] is used to share the original moments of Vehicles [17].

Simulation of urban mobility (SUMO) [18] is an open source is simulator for generate traffic information and vehicle parameters.

A. MOBILITY SIMULATOR

The NS-2 simulator is designed for doing research work in network communication systems [18]. The global mobile information system (GlomoSim) is

another type of network after NS2 which is used for wireless network systems [19]. The OMNeT++ is the discrete simulation library to do research on network communication, configuration of system and distributed systems [20].

VII.CONCLUSION

The various applications in the present situations to improve the quality advance to avoid the accidents, traffics in transport systems. The VANET component system is the core value of many applications to servers the users. In this paper the authors discuss about information of VANETs system components, characteristics of VANETs, security issues system and last authors discuss the applications of VANETs. The paper also tabulated the basic parameters difference between VANETs and MANETs.

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