

Efficient and Secure Communication In Vehicular AD HOC Network

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Abstract - Vehicular Ad hoc Networks (VANET) is a collection of vehicles and each vehicle acts as wireless node or router. These vehicles can communicate within 300 to 1000 meters of each other and create a wider range of network. Vehicles in a particular coverage area, it can exchange information between them using radio communication. When a vehicle falls out of coverage in one area can join in another vehicle's coverage area. VANET allows a driver in one vehicle to communicate with the drivers in the other vehicles within the range of radio communication.

The characteristics of highly dynamic topology make the design of the routing protocol a challenging one. On highways, each vehicle moves at different speeds. In practice, the path can be changed very often due to the change of the vehicle's speed, which leads to additional time and overhead in discovering new routes. To solve this problem this research proposed a Cluster based reliable routing (CRR) protocol. The vehicles are clustered based on their velocity. A Cluster Controller (CC) is elected based on transmitter heights and its position. CC manages the request from all the members.

Key Words: Cluster based reliable routing, Cluster Controller, RSU.

1. INTRODUCTION

Computer and communication has rapidly grown over the past decade, making technology advanced in computer networking. A computer network is a system of communication between computers using connectors. These connectors may be fixed or temporary and visible or invisible. In the early days, communication between calculation machines and computers was done by human users. In 1940, teletype machine used to send instructions between two systems located in different locations. In 1964, a time sharing system was used for distributed users of large computer systems. In mid of 1970s, wireless networks have become popular in the computing industry. There are presently two variations of wireless networks available, that is infrastructure networks and mobile wireless network. Those networks with fixed and wired gateways is called infrastructure. The bridges for these networks are known as base stations. Applications of this type of network are called as Wireless Local Area Networks (WLANs). The second type of mobile wireless network is the infrastructure less mobile network, commonly known as an ad-hoc network. This network has no fixed routers, all nodes are capable of movement and can be connected dynamically in an arbitrary manner. Nodes of ad-hoc networks function as routers which discover and maintain routes to other node in the network. In 2004, Mobile Ad-hoc Networks (MANET) can turn into the

dream of getting connected while in driving a vehicle. Such a network is called VANET. VANET is a collection of vehicles and each vehicle acts as a wireless vehicle or router. These vehicles can communicate within 300 to 1000 meters of each other vehicle and create a wider range of network. Vehicles in one particular coverage area can exchange information between them using radio communication. A vehicle that falls out of coverage in one area can join in another vehicle's coverage area. An Intelligent Transportation System (ITS) provides an efficient communication between the vehicles. VANET is also called Inter-Vehicle Communication (IVC) or Vehicle to Vehicle communication (V2V). VANET allows a driver in one vehicle to communicate to drivers in other vehicles within the range of radio communication. If the vehicles are out of range, they can communicate with each other through multihop networking. Compared to mobile vehicles, VANET has advantages in broader coverage, low latency and no service charges. Many different applications have already developed in the field of smart car, for an accurate automatic control and at easy environment for drivers. These applications are based primarily on the exchange of information, which ensures the communication between the vehicles. Currently many automobile manufacturers, researchers are more interested in this V2V communication, and are investigated in various research projects.

2. Literature Survey

Dhanush yadav M et al. [1], in this day and age the quantity of vehicles is expanding step by step as a result of which there is parcel of blockage on streets. And additionally number of bundles coursing through a VANET systems are expanding. There are part of calculations in the writing in particular Shortest Path Tree and Minimum Spanning Tree which gives a progression of steps which can enhance the parcel conveyance proportion. However, algorithm suffers from hops, delay and complexity. Hand-off hub is in charge of correspondence between vehicles on 2 distinct areas/streets. The choice of relay node will make utilization of Expected Transmission which is a tedious procedure. Consequently a calculation is required which can convey the bundles speedier towards the goal before the vehicles changes to an alternate area.

In this work we make utilization of DHSP calculation which plays out the course revelation in view of directional mapping of goal hub which builds the exactness and diminishes the deferral. MATLAB recreations of proposed steering calculation have been performed to get the reenactment comes about. The reproduction comes about demonstrate that our proposed convention diminishes Parameters, for

example, End to End Delay, Number of Hops, Energy Consumption, and Routing Overhead builds the throughput are estimated for most limited way tree (SPT), Minimum traversing tree (MST) and it is demonstrated that proposed calculation is the best.

Dogan Yildiz et al. [2], Crossing point of hyperbolic bends characterized when Time Difference of Arrival (TDOA) is frequently utilized as a part of Wireless Sensor Networks (WSNs) to evaluate the area of sensors. This paper proposes another calculation of this compose. The hyperbolic parametric condition and the pivot grid are utilized to appraise the area of the objective hub and turn, interpretation and crossing point activities are connected. MATLAB reenactments on Uniform, Beta, Weibull and Gamma appropriated systems demonstrated the ideal mixes of circulation, steady range and grapple rate.

Alexandros Ladas et al. [3], upgrade version of ChaMeLeon (CML) routing protocol is proposed in this paper i.e. Multipath ChaMeLeon (M-CML). To support emergency communication, ChaMeLeon protocol is used which is a Hybrid and adaptive protocol specially design for MANETs. Multipath ChaMeLeon adopts the attributes of the proactive Optimized Link State Protocol (OLSR) and extends it so as to implement a multipath routing approach based on the Expected Transmission Count (ETX). We use NS-3 simulator tool to verify the efficiency of proposed protocol. To decrease the consequence of link unstabilities and to improve the network performance with respect to scalability and resiliency, the obtained results shows that Multipath ChaMeLeon routing approach merged with intelligent link metric such as the expected transmission count.

P. Fazio et al. [4], in a years ago, remote systems administration is winding up extremely prominent in light of the fact that it can fulfill client asks for regarding Quality of Service (QoS); when portability is available, maybe, hand-over issues are pertinent when has change scope territories amid their dynamic sessions. It is essential to relieve portability impacts, utilizing a proper data transmission administration approach. In our work, we propose two coordinated plans: the first depends on Markov hypothesis and is gone for the expectation of versatile hosts developments (regarding future cells), while the second one depends on measurable hypothesis and is gone for the minimization of the squandered transfer speed utilized for detached reservations. In this way, the proposed Pattern Prediction and Passive Bandwidth Management Algorithm (3P-BMA) is the aftereffect of the combination of the Markov indicator and the factual transfer speed administration conspire. 3P-BMA is totally autonomous on the thought about innovation, versatility display and vehicular condition. We couldn't care less if the scope is made by UMTS or WLAN innovations, if has are people on foot or portable clients, and so forth.

F. De Rango et al. [5], this papers exhibits a 2D reservation conspire in WLAN condition. A two-dimensional remote versatility display called smooth random mobility model (SRMM) has been considered, on the grounds that it makes the development of clients smoother and more practical than surely understood in writing irregular portability models. A general expectation strategy construct both with respect to the examination of cell stay time and on the course probabilities of deliver and pass out occasions of portable hubs from remote cells is delineated.

F. De Rango et al. [6], this paper introduces a novel call admission control (CAC) calculation in view of the measurable multiplexing of VBR activity. The proposed calculation is called measurable multiplexing in view of discrete transmission capacity levels of GOP rate (SMDB) on the grounds that the arrangement depends on the discretisation of the GOP rate in an arrangement of transfer speed levels and on the time attributes of discrete data transmission levels of MPEG sources. SMDB is contrasted and another factual CAC in view of the ordinary/lognormal circulation of the GOP rate (SMND).

Park S. Y. et al. [7], Least Cost Forwarding Algorithm (MCFA) is another steering convention for Wireless Sensor Network that adventures the way that the heading of directing is constantly known and it is towards the settled outside Base Station. The sensor hubs require not have a special ID or they don't have to keep up steering tables. Every sensor hub keeps up the minimum cost gauge from itself so as to achieve the Base Station. At whatever point a sensor hub has parcels to forward to the Base Station, it communicates to its neighbors. After a hub gets the bundle, it checks on the off chance that it is on the minimum cost course between the source sensor hub and the Base Station. On the off chance that it is in this way, the accepting hub rebroadcasts the bundle to its neighbors.

Osama Ennasr et al. [8], LEACH is one of the principal various leveled group based directing methodology for remote sensor connect with static sensor hubs and static Base Station. The whole sensor field is intelligently isolated into groups and roughly 5% of the aggregate conveyed sensor hubs go about as the bunch head. The bunch head hubs are chosen with a likelihood in view of the measure of vitality left in the hubs. The group head does information endless supply of information from its bunch individuals and evacuates excess in the detected information lastly advances the amassed information towards the Base Station. This spares part of vitality by limiting the volume of information to be transmitted.

3. Survey Report

| Author | Title | University | Objective |
|---|---|---|--|
| MDhanush yadav M and Flory Francis | Delay and Hop sensitive routing protocol for VANET's. | Ramaiah institute of technology, Banglore | They proposed DHSP algorithm which conduct the route discovery which can improve the accuracy and reduce the delay. |
| D. Yildiz, S. Karagol and O. Ozgonenel | A Hyperbolic Location Algorithm for Various Distributions of a Wireless Sensor Networks, Smart Grid and Cities Congress and Fair (ICSG) | Ondokus Mayus University, Turkey | In this paper, rotation matrix and hyperbolic parametric equation are used to evaluate the location of node. |
| Nikolaous P, W. Nuwan, P. Christos and L. Alexander | Multipath Routing Approach to Enhance Resiliency and Scalability in Ad-hoc Networks, Ad-hoc and Sensor Networking Symposium. | Kingstone University London, UK | This paper mainly covers M-CML protocol. It also provide the description of optimized link state protocol. |
| F. Peppino, T. Mauro, M. Salvatore | A distributed handover management and pattern prediction algorithm for wireless networks with mobile hosts | University of Calabria, Italy | Pattern prediction and passive bandwidth management algorithm is proposed in this paper to decrease the call dropping/blocking probabilities and system utilization. |
| Rango De F., F. Peppino, M. Salvatore | Mobility Prediction and Resource Reservation in WLAN Networks under a 2D Mobility Models | University of Calabria, Italy | This paper mainly focus on comparing the MIP, SRMM and MSRVP. |
| Rango De F., F. Peppino, M. Salvatore | Call admission control with statistical multiplexing for aggregate MPEG traffic in a DVB-RCS satellite network | University of Calabria, Italy | This paper introduced call admission control (CAC) algorithm for MPEG traffic sources. |
| Ghaboosi, N., & Haghghat, A. T. | Tabu search based algorithms for bandwidth-delay-constrained least-cost multicast routing | Islamic Azad University, Iran | On novel move, bandwidth delay constraints minimum cost multicast tree which is based on TS algorithm. |

Table 1. Survey Report

4. CLUSTER BASED RELIABLE ROUTING

VANET is an autonomous and self-sorting wireless communication network, where vehicles include themselves as a server and additionally a client for sharing data. VANET is highly dynamic in nature. One of the basic issues in the designing of the scalable routing algorithm is frequent path interruptions caused by vehicles portability. Existing routing protocol, generally intended for MANET isn't appropriate for the unique attributes of VANET. Numerous intriguing enhancements can be gotten by modifying these routing conventions to mirror the powerfully changing topology of VANET. Protocols in VANET are ordered into the accompanying classes, topology based directing conventions, position based steering conventions, broadcasting conventions and bunch based directing conventions. Topology based steering conventions utilize the connection data for directing the bundles. Position based directing conventions utilize the geographic situating data to choose the course from the sender to goal. Broadcasting is used to share information like traffic details, weather condition and emergency information to all the vehicles. New broadcasting protocols are proposed and discussed in the previous two chapters. Figure 1 shows the normal view while figure 2 shows cluster in graph view. Cluster based routing is grouping the vehicle using criteria like location, speed and direction of the vehicles. In this thesis speed based clustering is done and reliable routing is then identified. Cluster is a group of vehicles that identifies themselves to be a part of cluster and one of the vehicles acts as a head of the group. The vehicle which called Cluster Controller (CC) will control all the communication among the members. Clustering provides stable connection among the vehicles in the VANET.

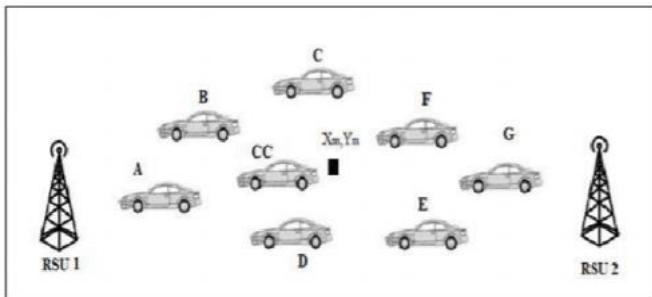


Fig -1: Cluster in Normal View

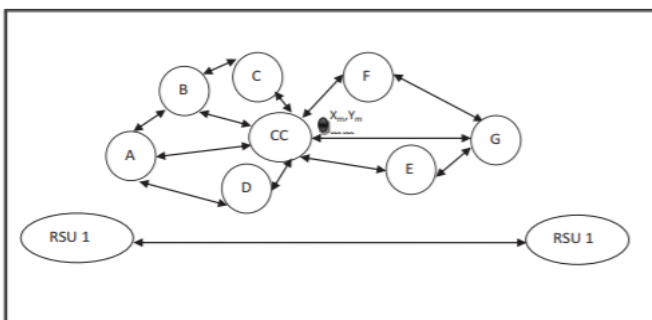


Fig-2: Cluster in Graph View

5. METHODOLOGY

VANET is a class of temporary networks, where the connection between the vehicles is very shortly disconnected. The vehicle movements and density of the network causes frequent changes in the network topology. Hence, security issues in VANET become very challengeable. Vehicles should have the ability to ensure that messages are not corrupted by other vehicles and the malicious vehicles and false messages must be detected and removed from VANET. Each vehicle can broadcast and authenticate whether the incoming message is from a valid entity. RSU are regularly collecting the information about the vehicle in their transmission range. There are two types of attackers in VANET like Selfish Vehicle and Malicious Vehicle. Selfish vehicle may give false information for selfish reasons. They wish to use their lanes with maximum comfort and they do not want to share with other vehicles. They can send message like "there is a traffic jam" to vehicles behind it. The vehicles that trust this message will choose another route, so that the selfish driver can have the clear lane to reach its destination. The drivers in malicious vehicle are more harmful and could bring more danger to other drivers. They may change the message and purposely give the wrong information and cheat the system to obtain more resources like bandwidth. In the worst case, malicious attackers attempt to damage the network by cheating the RSU. These attackers can damage the network in the following ways.

5.1 Message Integrity

If the attacker modifies the safety-related messages with incorrect information against the original event, leads the driver to take wrong decision and consequently cause serious accidents.

5.2 False Position Information

A position plays a vital role in VANET. Routing and broadcasting techniques identifies the next hop sender based on its position. If the attacker transmits false information about their position will decrease the performance of transmission techniques.

5.3 Denial Of Service

Network availability is most important requirement in VANET for the reliable communication. Denial of Services is the dangerous attacks in vehicular network. When the malicious attacker tries to jamming the communication medium, network is no more available to other neighbor vehicles. The aim of this attacker is to prevent the authenticate user to access the network.

6. CONCLUSION

Broadcasting road safety information among vehicles avoid accidents and improve road safety is the main motivation in the development of VANET. It is a promising technology to allow the vehicles to communicate among them. VANET has unique characteristics like change in topology due to vehicle's fast movements, network disconnections and limited bandwidth. Also to achieve secure communication is difficult due to the movement of different kinds of travellers on the road. The main objective of this research is to develop efficient protocol in VANET for secure and efficient message broadcasting. VANET consists of collection of vehicles moving on the road. Each vehicle is connected through ad-hoc infrastructure with smaller coverage area. Every emergency message is broadcast to all the vehicles through multi-hop broadcasting. This research proposed a multi-hop broadcasting protocol. It also cluster the vehicles based on velocity and find out reliable routes between them. It also extends to provide security by identifying false position and false information attacks.

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