International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Hybrid Solution for Hidden Terminal Problem on VANETS

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Abstract: ***Hidden terminal problem is challenging task in the Vehicular adhoc networks (VANETs). In VANETSs nodes changes their position frequently. Since the nodes in VANETs are vehicles, which are not stable and changing their position frequently. To provide road safety we have to solve hidden terminal problem. Due to increase in density of vehicles on roads collisions of vehicles become challenging task. The population of vehicles on roads increases every year as compared to previous years. Therefore more challenging tasks takes place in VANETs. We need to improve road safety as well as comfort to both drivers and passengers. In the thesis, we have used Hybrid carrier sense multiple access(CSMA) and multiple access with collision avoidance(MACA) protocol for solve Hidden Terminal problem.***

Keywords: Hidden Terminal problem in VANETs, Solve Hidden Terminal Problem Using Carrier Sense Multiple Access (CSMA), Multiple Access With Collision Avoidance (MACA)

1. Introduction

VANET: A vehicular ad hoc network (VANET) uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns every participating car into a wireless router or node, allowing cars approximately 100 to 300 metres of each other to connect and, in turn, create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purposes. Automotive companies like General Motors, Toyota, Nissan, DaimlerChrysler, BMW and Ford promote this term. [14]

There are numerous research challenges that need to be addressed until a wide deployment of vehicular ad hoc networks (VANETs) becomes possible. The critical issues consists of the design of scalable routing algorithms that are robust to frequent path disruptions caused by vehicles' mobility. This paper argues the use of information on vehicles' movement information (e.g., position, direction, speed, and digital mapping of roads) to predict a possible link-breakage event prior to its occurrence. Vehicles are grouped according to their velocity vectors. This kind of grouping ensures that vehicles, belonging to the same group, are more likely to establish stable single and multihop paths as they are moving together. Setting up routes that involve only vehicles from the same group guarantees a high level of stable communication in VANETs. The scheme presented in this paper also reduces the overall traffic in highly mobile VANET networks. The frequency of flood requests is reduced by elongating the link duration of the selected paths. To prevent broadcast storms that may be intrigued during path discovery operation, another scheme is also introduced. The basic concept behind the proposed scheme is to broadcast only specific and well-defined packets, referred to as ldquobestpacketsrdquo in this paper. The performance of the scheme is evaluated through computer simulations. Simulation results indicate the benefits of the proposed routing strategy in terms of increasing link duration, reducing the number of link-breakage events and increasing the end-to-end throughput. [4]

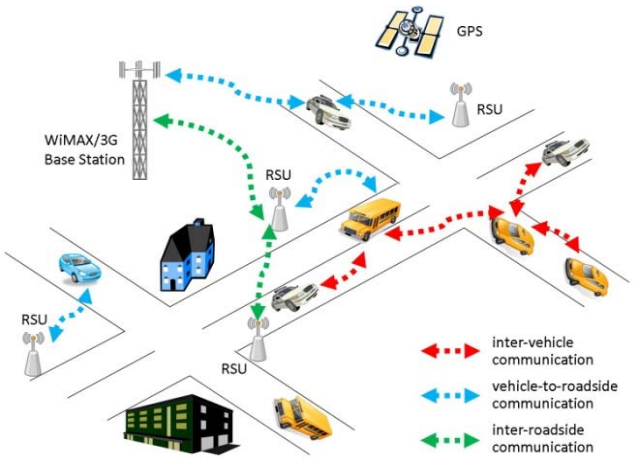


Figure 1: VANET

The technology which is used to move cars as joint in network to make a transportable network. Participating cars become a wireless connection or router through VANETs and it allow the cars almost to connect 100 to 300 meters to each other and in order to create a wide range network, other vehicles and cars are connected to each other so the mobile internet is made. It is supposed that the first networks that will incorporate this technology are fire and police mobiles to interact with one another for security reasons. [10]

2. Technology Used

Effective way to use Vehicular Networking is defined in VANET or Intelligent Vehicular Ad-Hoc Networking. Multiple ad-hoc networking technologies integrated in VANET such as, WiMAX IEEE, and WiFi IEEE for effective, simple and plain communication within automobiles on active mobility. The communication of media within automobiles can be allowed as well process to follow the automotive automobiles are also favoured. Security measures are defined in vehicles by VANET,

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flowing communication within automobiles, edutainment and telemetric.

Selection of wireless technologies are required to implement in VANET as DSRC (Dedicated Short Range Communication) which is include in WiFi. Other entrant technologies of wireless are Satellite, WiMAX, and Cellular. Vehicular Ad-hoc Networks (VANET) can be considered as device of ITS (Intelligent Transportation Systems). ITS (Intelligent Transportation Systems) has conceived vehicular networks. IVC (Inter-Vehicle Communication) permits the automobile communicate to each other at the same time RVC (Roadside-to-Vehicle Communication) allows with the stations based wayside. [10]

3. MAC

The increasing demand of wireless communication and the needs of new wireless devices have tend to research on self organizing, self healing networks without the interference of centralized or pre established infrastructure/authority. The networks with the absence of any centralized or pre established infrastructure are called Ad hoc networks. Ad hoc Networks are collection of self governing mobile nodes. [12]

Vehicular Ad hoc Networks (VANET) is the subclass of Mobile Ad Hoc Networks (MANETs). VANET is one of the influencing areas for the improvement of Intelligent Transportation System(ITS)in order to provide safety and comfort to the road users. VANET assists vehicle drivers to communicate and to coordinate among themselves in order to avoid any critical situation through Vehicle to Vehicle communication e.g. roadside accidents, traffic jams, speed control, free passage of emergency vehicles and unseen obstacles etc. Besides safety applications VANET also provide comfort applications to the road users. For example, weather information, mobile ecommerce, internet access and other multimedia applications [9]. The most well known applications include Advance Driver Assistance Systems (ADASE2), Crash Avoidance Matrices Partnership (CAMP), CARTALK2000 and Fleet Net"that were developed under collaboration of various. Governments and major car manufacturers [9]. Figure 1 shows the overall working structure of VANET.

4. Characteristics of VPN

VANET has some unique characteristics which make it different from MANET as well as challenging for designing VANET applications.

a) High dynamic topology
The topology of VANET changes because of the movement of vehicles at high speed. Suppose two vehicles are moving at the speed of 20m/sec and the radio range between them is 160 m. Then the link between the two vehicles will last 160/20 = 8 sec.

b) Frequent disconnected network
From the highly dynamic topology results we observe that frequent disconnection occur between two vehicles when they are exchanging information. This disconnection will occur most in sparse network.

c) **Mobility modeling**
The mobility pattern of vehicles depends on traffic environment, roads structure, the speed of vehicles, driver's driving behavior and so on.

d) **Battery power and storage capacity**
In modern vehicles battery power and storage is unlimited. Thus it has enough computing power which is unavailable in MANET. It is helpful for effective communication & making routing decisions.

e) Communication environment
The communication environment between vehicles is different in sparse network & dense network. In dense network building, trees & other objects behave as obstacles and in sparse network like high-way this things are absent. So the routing approach of sparse & dense network will be different.

f) Interaction with onboard sensors
g) The current position & the movement of nodes can easily be sensed by onboard sensors like GPS device. It helps for effective communication & routing decisions

4.1 DSRC

The 802.11-p based dedicated short range communication (DSRC) is being seriously considered as a promising wireless technology for enhancing transportation safety and highway efficiency. However, to-date, there is very little research done in characterizing the reliability of DSRC communication based on real-world experimental data, and its effect on the reliability of vehicle safety applications. Our experimental set-up includes a fleet of three vehicles equipped with DSRC communication system, GPS receiver and a number of vehicle safety applications based on vehicle-to-vehicle communication.

The link-level behaviour of DSRC vehicle-to-vehicle communication in a wide variety of traffic environments based on real-world experimental data. In addition, to characterize the application level reliability of DSRC for vehicle safety communication (VSC) system. Based the experiments, show that the reliability of DSRC vehicle-to-vehicle communication is adequate since packet drops do not occur in bursts most of the time. This that the application level reliability of VSC applications based on DSRC communication is quite satisfactory. Finally, develop an analytical model to relate application level reliability with communication reliability and VSC system parameter, laying out a clear way to improve reliability of VSC applications under harsh traffic environments. [13]

5. Scope

The most favourable target is the more useful, efficient and safer roads will built through vehicular networks by informing to basic authorities and drivers in time in the future.

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Another target is to discover the advancement of vehicular ad hoc networking (VANET) wireless technologies. The purpose is to secure and to make possible commercial requests through range of communication systems and/or other networks (VANET) which goes short to medium.

These technologies would support main concern for time secure communication and fulfill the QOS needs of other multimedia software. Next goal is to create high-presentation, extremely measurable and secured technologies of VANET for communication of vehicles. Specific restrictions normally assumed in ad hoc networks are alleviated in VANET yet. Such as, VANET might assemble comparatively huge means of computational. [10]

6. Applications of Vanet

Mostly interests to MANETS belong to the VANETS but the features are different. Vehicles are likely to move in structured way.

The connection with wayside equipment can similarly be indicated absolutely accurately. In the end, mostly automobiles are limited in their motion range, such as being controlled to pursue a paved way.

VANET suggests unlimited advantage to companies of any size. Vehicles access of fast speed internet which will change the automobiles' on-board system from an effective widget to necessary productivity equipment, making nearly any internet technology accessible in the car.

Thus this network does pretend specific security concerns as one problem is no one can type an email during driving safely. This is not a potential limit of VANET as productivity equipment.

It permits the time which has wasted for something in waiting called "dead time", has turned into the time which is used to achieve tasks called "live time".

If a traveler downloads his email, he can transform jam traffic into a productive task and read on-board system and read it himself if traffic stuck. One can browse the internet when someone is waiting in car for a relative or friend.

If GPS system is integrated it can give us a benefit about traffic related to reports to support the fastest way to work. Finally, it would permit for free, like Skype or Google Talk services within workers, reducing telecommunications charges.

7. Proposed Work

Flow of Work

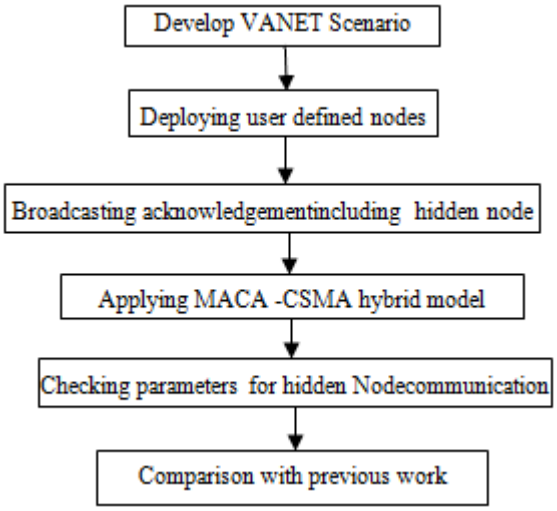


Figure 2: Flow of Work

8. Results

Simulation Table

Table 1: Simulation Table

Parameter Name	*Value*
Network Simulator	NS2.35
Channel	Wireless channel
Number of Nodes	10
Antenna	Omni Directional
Mac Version	802.11
Routing Protocol	AODV
Area	800*800
Interface Queue Type (If Queue)	Priority Queue
Propagation	Radio Two Ray Ground
Max Packets in If Queue	50
Node Range	120
Packet Size	512

Scenario

Using CSMA

Scenario 1
Scenario 1 is shown in figure 3In this scenario number of nodes deployed are 10. In this scenario source node broadcasts the message to all its neighbour nodes. Neighbour node receives the message and forwards to other nodes in its neighbour. All nodes receives message. The AODV is on demand routing protocol thus routing table is created. Circle represents range of the node up to which it can send the data. Range of node is mention in simulation table.

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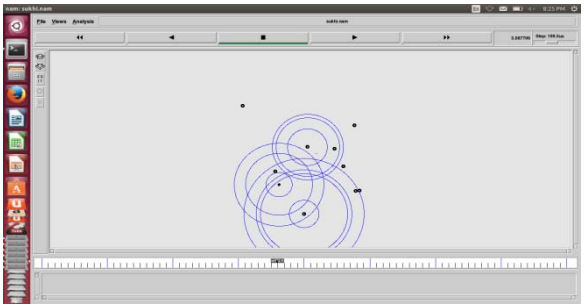


Figure 3: VANTE with 10 Nodes using CSMA

Scenario 2

Scenario 2 is shown in fig 4Once every node receives message data transfers starts between the nodes. The data transfers starts between the nodes using AODV routing table. As nodes are moving their position changes routing table is updated if some node moves out of range.

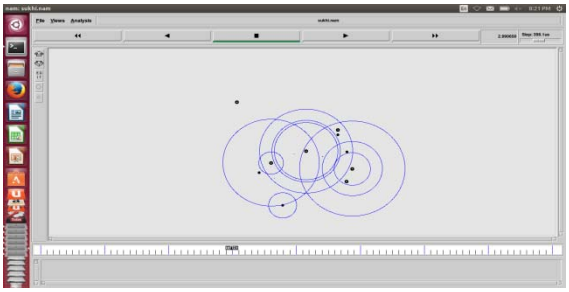


Figure 4: Data Transfer Between Nodes

Scenario 3

Scenario 3 is shown in fig 5 CSMA sense the channel when data exchanges between nodes. But it can not sense the node which is out of range due to this collision between nodes may occur. Due to re transmission policy of CSMA system collision may occur.

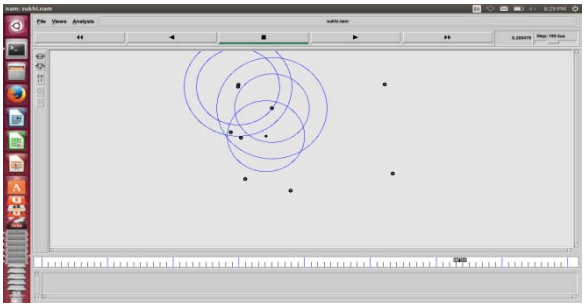


Figure 5: Collision of Nodes In VANET

Using CSMA and MACA

Scenario 1

Scenario 1 is shown in figure 6In this scenario number of nodes deployed are 10. In this scenario source node broadcasts the message to all its neighbour nodes. Neighbour node receives the message and forwards to other nodes in its neighbour. All nodes receives message. The AODV is on demand routing protocol thus routing table is created. Circle represents range of the node up to which it can send the data. Range of node is mention in simulation table.

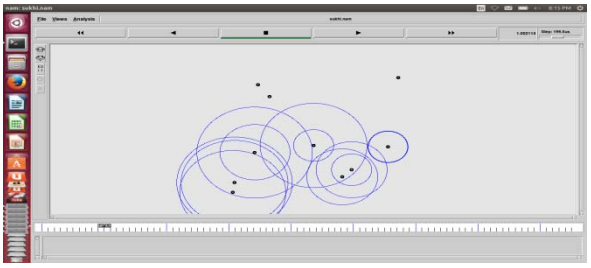


Figure 6: VANET with 10 Nodes using CSMA-MACA

Scenario 2

Scenario 2 is shown in fig 7Once every node receives message data transfers starts between the nodes. The data transfers starts between the nodes using AODV routing table. As nodes are moving their position changes routing table is updated if some node moves out of range.

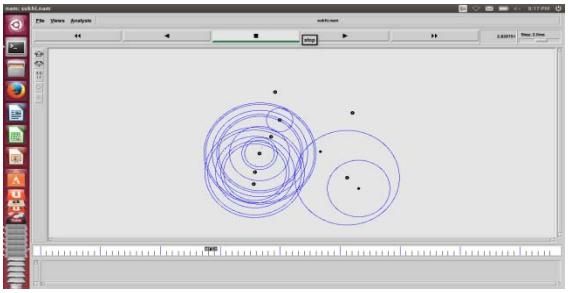


Figure 7: Data Transfer Between Nodes

Scenario 3

Scenario 3 is shown in fig 8 CSMA and MACA sense the channel and avoid collision by sending acknowledgement packet when data exchanges between nodes. It transmits Request to Send packet to anode and then receiving node transmits a Clear to Send packet to node. Due to re transmission policy of MACA system collision will avoid.

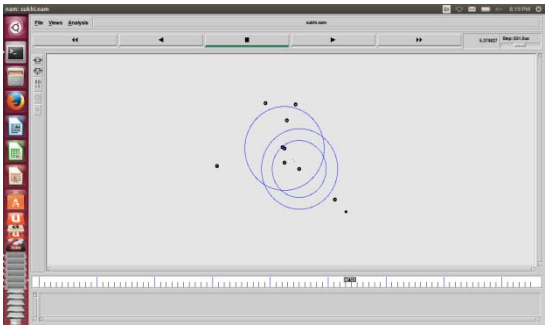


Figure 8: Collision Avoidance with the use of CTS Packet

Graphs

Throughput

Throughput is the rate of successful message delivery over a communication channel. This data may be delivered over a physical or logical link or pass certain network node. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second or data packet per time slot. The system throughput or aggregate throughput is the sum of the data rates that are delivered to all terminals in a network.

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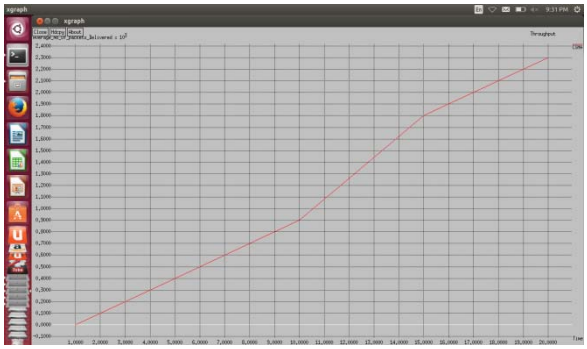


Figure 9: Throughput in CSMA

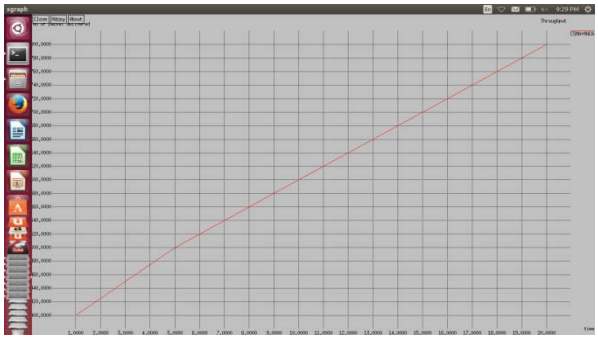


Figure 10: Throughput in CSMA-MACA

Table Shows Throughput Comparison

Table 2: Throughput Comparison

Average Time	*CSMA (Throughput)*	*CSMA-MACA (Throughput)*
1	0	0
5	40	50
10	90	100
15	180	200
20	230	240

Delay

It is defined as extra amount of time taken by packets to reach its destination.

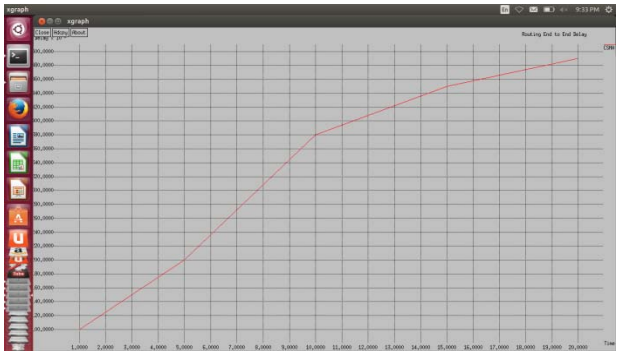


Figure 11: Delay in CSMA

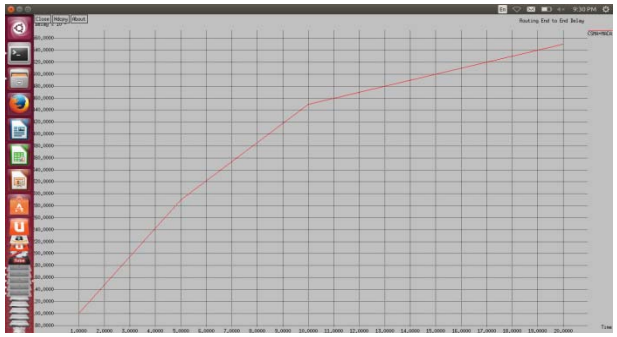


Figure 12: Delay in CSMA- MACA

Table Shows Comparison of Delay

Time	*CSMA(Delay)*	*CSMA+MACA(Delay)*
1	0.1	0.1
5	0.29	0.20
10	0.45	0.38
15	0.50	0.45
20	0.55	0.49

Figure 3: Delay Comparison

Packet Delivery Ratio

Packet delivery ratio is the number of successful packets deliver from total number of packets sent or ratio of number of delivered data packets to the destination.

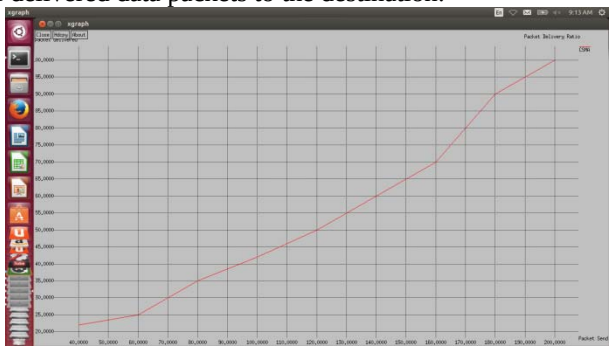


Figure 14: Packet Delivery Ratio in CSMA

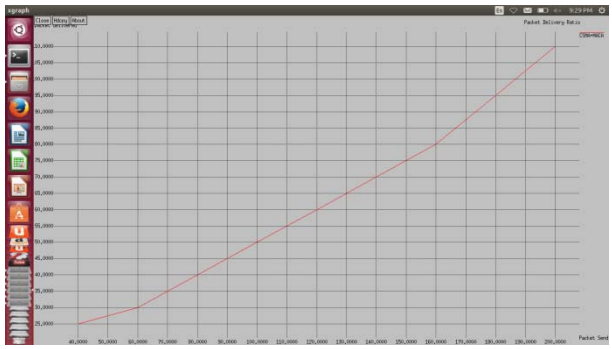


Figure 15: Packet Delivery Ratio in CSMA-MACA

Table Shows Packet Delivery Comparison

Total Packet Send	*CSMA (Delivered)*	*CSMA+MACA (Delivered)*
40	22	25
80	35	40
120	50	60
160	70	80
200	100	110

Figure 4: Packet Delivery Ratio Comparison

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9. Conclusion

In this work, scenario of vehicular networks is created. Basically focusing on solution of hidden terminal problemin VANETs. Route is established by using AODV routing table. CSMA and MACA hybrid algorithm used to avoid collision between nodes in VANETs. This protocol uses two additional signalling packets Request to Send Packet(RTS) and Clear to Send Packet(CTS). When a node wants to transmit data packet, it first transmits a RTS packet. The receiver node receive RTS packet if it is ready it receive data packet it transmit a CTS packet. Once sender receive CTS packet without any error, it starts transmitting data packets. In this way it avoids the collision between nodes and successfully sends data and improves road safety as well as comfort to both driver and passenger. The various conclusions are given are given below:

- Increase Throughput.
- Decrease End to End Delay.
- Packet Delivery Increases.

10. Future Work

Feature Work includes developing more methods to avoid collision between vehicles to provide on road safety. It will provide comfort to both driver and passangers.

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