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A Novel Delay Optimization Technique in VANET using Beacon Frame Range

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Abstract—*The mobile ad hoc network is the network in which mobile nodes are free to move in any direction without any central control. When these nodes combine they form a network. The VANET comes under the MANET as one of its type. The smart cars in VANET moves freely in the city area. There are two types of communication possible in VANET i.e. vehicle to vehicle and vehicle to infrastructure. The smart cars i.e. the intelligent vehicles are defined respective to their distance, direction and speed analysis. If there is any accident happened in that network then the node sends this information to its neighbour node and like this the information is spread in all over the network. Similarly at the time of handoff one RSU sends the information to next RSU, so that the required information of node's speed, directions, distance is known to the RSU in advance and hence help in reducing the delay at the time of handoff. In this there is a RSU which is attached to the main server. The vehicles communicate with radio waves and vehicle send the information of accident to the RSU which transfers it to the main server and the main server broadcast it to the other RSUs so that all the mobile nodes get this information. The servers replicate and send this information to all vehicles and the vehicles can change their direction and choose other path to reach their destination. In this paper, beacon frame range of RSU and threshold value has been discussed which helps in creating a synchronized relationship between road side unit which can help in reducing delay of packets and increasing throughput at the time of handoff of node from one road side unit to next road side unit.*

Keywords: *RSU, BEACON FRAME, VANET, MANET, CREDENTAIL*

1. INTRODUCTION

[10] Vehicular Ad Hoc network (VANET) is a wireless network in which mobile nodes are free to move in the city area. For drivers the concept of

VANET is best as it help in comfortable and safe driving experience. VANET is a subclass of MANET and it provides a distinguished approach of intelligent transport system. It is very necessary for the vehicles. It is a vehicle to vehicle roadside wireless communication network. It's a self organizing network in which all the nodes serve themselves as server or client when required therefore this is a decentralized network communication in which no central control is required. Wifi IEEE 802.11 is commonly used in today era for developing VANETs. The vehicles are installed with an on board unit which acts as a network interface for the vehicles. This network interface access the 802.11b or 802.11g which are two standard access media. But these standards are the general purpose standards which are not able to get fit properly in the highly dynamic environment like VANET. So in this scenario currently describes the DSRC (Dedicated Short-Range Communication) has been proposed as a standard for VANET for short distance communication services that offers low latency and high data rates. IEEE 802.11 standards are generally made for the vehicles which are in limited range while moving. This kind of network is very optimal in increasing optimal data exchange, reduce transmission time and network usage [8]. Now in VANET the vehicles are moving from one point to another and during this they maintain their connectivity with the RSUs. As we know that smart vehicles have on board units which act as interface for their communication in the network. As vehicle is moving it gets the coverage of more than one RSU. Thus the signal transfers from one RSU to the next vehicle as moving and this transfer of signal is known as handoff. The VANET has high dynamic network topology and due to which during handoff many packets lost because of delay and information is lost which may be very important for the driver at that time [11] [12].

The literature review is written in section 1. Beacon Frame Range and Credential values are discussed in section 2. New proposed technique in section 3. Simulation results are shown in section 4. Conclusion is illustrated in section 5.

2. LITERATURE REVIEW

M.S. kakkasageri represents a paper on mobile ad hoc network define the several challenges due to inherent characteristics of network like node mobility, reliability and their scarce resources etc. In this paper they define an agent based multicast routing scheme in the MANET. It can use the static and mobile agents. There are different schemes operates in the different sequence like first identifies the reliable nodes and

then made connection between them. A backbone is constructed with the reliable nodes and the intermediate nodes. Then there are different cluster members that join with the backbone network. Five types of agents which are used in the scheme are route manager agent, network initiation agent, network management agent, multicast initiation agent and multicast management agent [2].

Rakesh kumar and et al. represents a paper on (VANET) vehicular ad hoc network are upcoming wireless network in the intelligent transport system. In VANET applications build upon the data push communication model where information is disseminated to set of vehicles. There are many applications of VANET and the communication protocols which they used need a systematic literature survey. In this paper mainly define the VANET applications based on the various broadcasting data dissemination protocols are surveyed separately and their fundamental characteristics are revealed. At the end of this paper comparison of all the protocols are given [3].

Amiour med tahar and et al. represents a paper on VANET where vehicles like car, bus, truck are assumed ad a node in a network. The inter vehicle communication became a major topic for scientific research by considering the driver's comfort and the road safety. On VANETs routing protocol have a great consequence where AODV among the popular routing protocols dedicated to ad-hoc network it can use the flooding techniques for locating the destinations and possibly cause an overhead in the network. To overcome this problem used the multi point relay algorithm in the AODV protocol in order to decrease the number of messages that are broadcasted during the flooding technique [4].

Jason J. Haas and Yih-Chun Hu represents a paper based on the performance measurements obtained from simulations of the (VANETs) vehicular ad-hoc networks. These simulations take input traces of vehicle movements which have been generated by traffic simulators which are based on the traffic model theory. In this paper mainly work based on the actual large scale recordings of vehicle movements. Up to our knowledge, till now no one has published any work on actual large scale recording of vehicle movements. To enable analysis on large scale, a new VANET simulator is developed which handles more vehicle than ns2 [6].

Cristina Rico Garcia, Andreas Lehner represents a paper on efficient design and reliable broadcast MAC layers for wireless MANET especially high user speeds are allowed is a very challenging. As there is absence of infrastructure in this, still it would permit channel allocation, awareness techniques that allow a certain channel assignment. In this paper design a protocol on MAC layer for broadcast MANETs called cell based orientation- aware MANET Broadcast and can be abbreviated as COMB. In the technique of COMB allow the realization of transmission which is collision free, supported high speed and no handshake (authentication) is required. COMB is based on the localization aware cross layer dimensioned CDMA cell and it uses the SOTDMA protocol as intra cell scheme [7].

Jaiwan kang and et al. represents a paper on vertical handoff in VANET using optimal stopping approach. In this paper they first discuss the overview of the optimal stopping approach and then do simulation using different scenarios i.e. with WLAN, 3G and optimal stopping approach. the output is better than in case of using optimal stopping approach than WLAN and 3G [14].

3. BEACON FRAME RANGE AND CREDENTIAL VALUES

Beacon Frame is a management frames which is based on WLANs. It comes under standard IEEE 802.11. This frame has all the information about its network. These frames are transmitted periodically so that the nearby devices get the presence of wireless network in their surroundings. As shown in Fig. 1 the router sending the beacon signals which are received by the laptop.

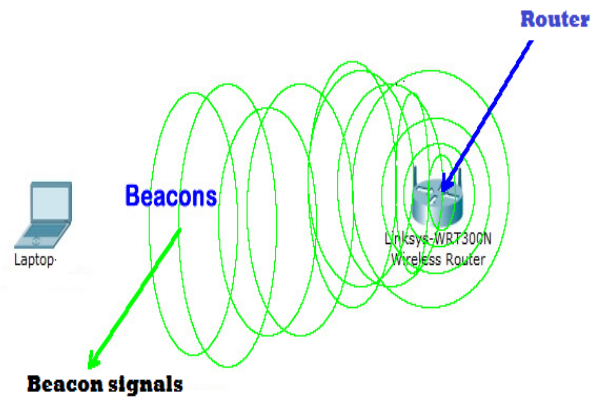

Fig. 1: Beacon Frames

The time interval between two consecutive beacon frames is called beacon interval and it is expressed in Time Unit (TU). The time interval of the beacon frames can be configured according to the requirement.

Beacon Frame Range is the range of the device up to which the beacon frames covers the distance. It means the distance between device which transmits the beacon frames and range of its signal at maximum far location is known as beacon frame range. For Wifi beacon frame range is 100 mt.

In Fig. 2, the car remote shows the beacon frame range through which it can operate its car. When we press the button given on the remote, it sends the signal to the car which is the beacon frames and has the information regarding open lock or closes the lock of the car. And the maximum distance up to which we can use that remote to operate the car through remote is the beacon frame range of the remote.

Fig. 2: Car Remote showing its beacon frame range

Generally credential means an attestation of qualification or authority which is issued to an individual by third party or may be assumed. Here in wireless network, the credential value is the value which is assigned to the node when it enters in its coverage area [13].

In VANET each RSU has a beacon frame range up to which it can transmit its information signals to the mobile vehicle. When the mobile node comes under the area of RSU, it starts receiving the signals from RSU through on board unit and also transmits its own information signals to the RSU. When node enters in beacon frame range, it gets a credential value which helps the node in making a proper connection with RSUs even when it is to leave the range. This is technique which is applied in my paper and shows in the new proposed technique section.

4. NEW PROPOSED TECHNIQUE

This work is about the Ad hoc network and to enhance the reliable data transmission in the VANET at the time of handoff. For the reliable data transmission during hand off we use the concept of beacon frame range.

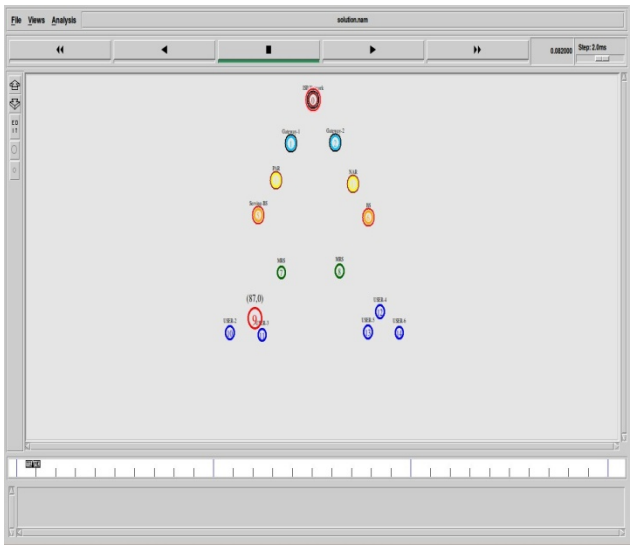

Fig. 3: Hand off schema

Here the data loss is done during the time of hand off because at the time when a device is near to move in next cell the home base station send some credentials to next base station and the problem faced over there is the device moves to next cell before the home base station is done with credential exchange process and this caused for packet loss. And to solve this problem in this paper we use the concept of beacon frame range. Here we see the range of device in vicinity of base station and set a threshold value. When a node cross this threshold value then home base station starts sending credentials to next base station. So the nodes and base stations are properly synchronized and the device can smoothly hand off to next cell. In this, we work to strongly synchronize the base stations .If the base stations are strongly synchronized then various types of packet loss problems are prevented. In our simulation we set the RSU range 100 as the RSUs uses Wifi signals and the range of Wifi are up to 100 mt and the threshold value is 15. As the node moves towards the next base station, its value changes. It starts reducing value from 100 to 0. When the value becomes 15, base station send the credentials to the next base station and due to these they get synchronised before handoff process and when handoff occurs, the packet delay reduces and throughput increases. Fig. 3 shows the schema which is used in simulation in NS2 tool.

5. SIMULATION RESULTS

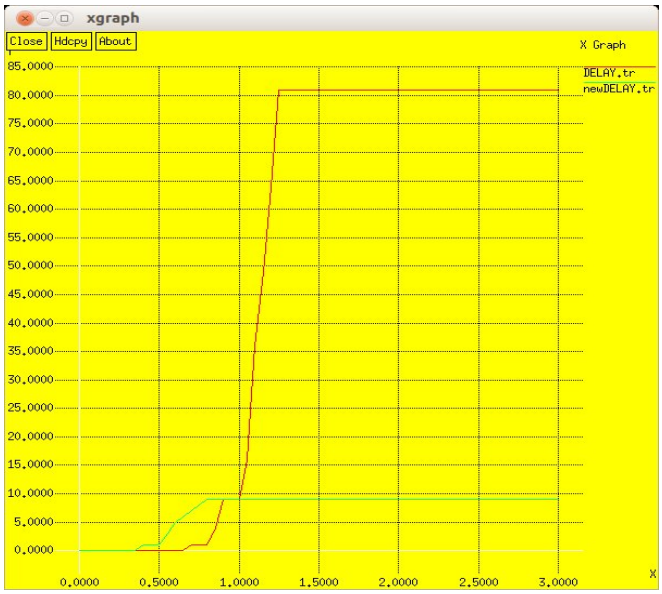

Fig. 4: Comparison Graph of DELAY

Delay: Here the delay between two scenarios is shown. In this graph red line shows delay curve for old scenario and green line show delay curve for purposed scenario. In case of old scenario the RSUs are not synchronised so the delay is more and in proposed scenario the RSUs are synchronised thus reduces the delay.

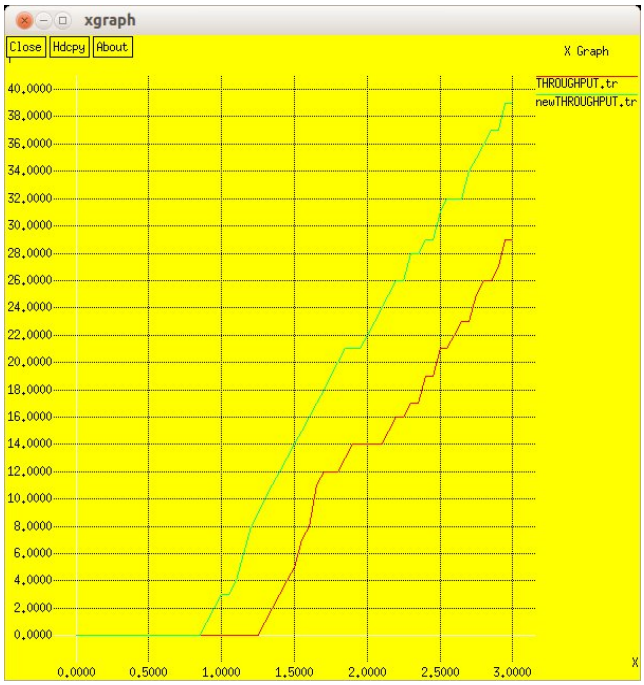

Fig. 5: Comparison Graph of THROUGHPUT

THROUGHPUT: In this graph throughput comparison between two scenarios is shown. Here red curve shows throughput for old case and green curve shows throughput for new case. Because of packet loss in old case when RSU are not synchronised, throughput is very less and because of synchronization in new case throughput is high.

6. CONCLUSION

VANET is a very vast area of research in which researchers are taking more and more interest these days. Road safety and driving comfort is the main focus for management. Thus while driving getting proper information about the road and the nearby nodes is very necessary. In this paper we concluded that using beacon frame range and setting the threshold value for sending the credentials is an efficient approach in VANET to reduce the delay at the time of handoff. When one node is near to leave first RSU then at that time first RSU sends credential information to next RSU regarding the node's speed, distance, direction. Thus like this it's easy for the node to have a proper connection with the next RSU and hence decreases the delay and increases the throughput.

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