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Queue Management For Congestion Control In VANET

Neha Yawale[1], Prof. C.M Raut[2]
1(Computer Department, Datta Meghe College Of Engineering
Airoli, University Of Mumbai, Maharashtra,India
Email: nehayawale@gmail.com)
2 (Computer Department, Datta Meghe College Of Engineering
Airoli, University Of Mumbai, Maharashtra,India)

Abstract:

Urban areas around the world are populating the streets with Vehicular Ad Hoc Network (VANET) in order to feed incipient smart city IT systems with metropolitan data.VANET i.e Vehicular ad-hoc network is the way for the vehicles to communicate with each other, and to share the information between them. In next few years the VANET will have massive impact in the smart cities, and the municipal operations will be mostly depends on the data gathered by the VANET. From the information security point of view, the VANET may face failures and can be the target of different types of attacks. The main requirement in the VANET is to forward the packet to the nest node. The main issue in the VANET which observed is when the large number of packets come to the node suddenly the node need to forward it towards the destination. The forwarding node may have its own packets to deliver. There may be buffer overflow when the node have the outgoing packets and the transitory packets to send, because of this the buffer overflow situation may occur and packets may get dropped which will degrade the network performance.Congestion control schemes are essential in such situations to increase network performance and ensure a fair use of the resources. This work proposes the congestion control technique which can deploy at the transition, network and MAC layer.It provides priority based traffic scheduling with a dual queue scheduler which favours transit queue packets.When congestion is detected based on the buffer occupancy, source sending rate is updated by the sink periodically with the help of dual queues and route the packets through less congested paths.

***Keywords* — VANET, Scheduling Schemes, Intelligent Transport Systems, Generated Queue, Transit Queue,Efficient Energy aware routing protocol(EEAR),Cut Generation in VANET (CG).**

I. INTRODUCTION

Vehicular Ad Hoc Networks (VANETs) are special types of networks having high mobility rate of the nodes. Its ultimate goal is to provide various services to the users to make their journey an unforgettable experience. These networks support various services such as access of internet, Intelligent Transport Systems (ITS), online video streaming applications to the users. Users access these services by sitting in the vehicles with the help of internet connectivity. But as the numbers of users increases rapidly, it becomes a challenging task to detect the activities of those in VANETs. The problem becomes more complex due to large variation of mobility and density of the nodes. Nodes pass the information about a particular area to other nodes while moving and exchange the valuable information such as speed of the nodes, position of the nodes, direction of motion of the nodes, data exchange or any other relevant information. This information is exchanged among the vehicles periodic all so that neighbouring vehicles can take precautionary measures in case of some emergency on the road.

Security always remains a challenging task in VANETs due to the high mobility of the nodes. While nodes share the information with other nodes, there are chances of leakage of information sent by one node to other. In such a case, we say that nodes are compromised, i.e., the nodes that access the information of the other nodes in an unauthorized manner to breach the confidentiality, integrity and availability are called as intrusions in the network. In view of the above, efficient mechanisms are required for detection of all malicious activities by various nodes in the network. Once nodes are identified which may act as intrusions then several precautionary measures (such as the use of asymmetric key cryptographic solutions can be taken to mitigate the effect of those in VANETs.

As discussed above, most of the existing solutions in literature have used asymmetric key mechanisms for secure communication among the vehicles. The authentication mechanisms provided in these proposals have considered various phases for authentication such as key generation, maintenance and update which generates considerable delay and overhead. Such generated delays degrade the performance of the applications such as video streaming, alert generation in case of emergency or mission critical applications. Hence a novel intelligent mechanism is required which not only detects intrusion in the network but also provides the way to overcome the same. The mechanism should detect the intrusion without causing much overhead in VANETs.

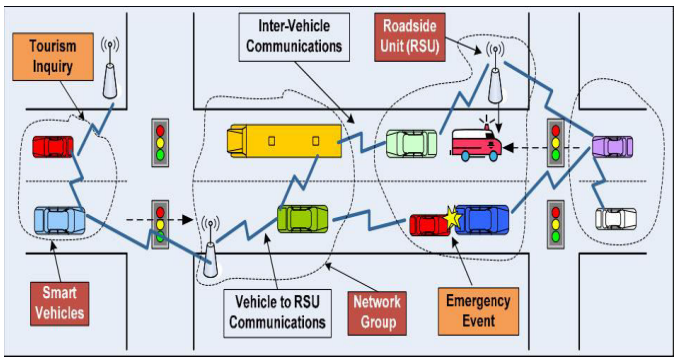

Fig 1.A basic structure of VANETs

1.1 Working Procedure Of VANET

VANET security is an important issue. Periodically exchanged safety packets might have prominent consequences on VANET applications such as preventing collisions of vehicles. In Sybil attack, a single attacker node plays the role of multiple nodes of VANET by impersonating their identities (IDs) or claiming fake IDs. In this way, a Sybil attacker creates an illusion of existence of multiple nodes in the network. Legitimate nodes are deceived in believing that they have many neighboring nodes around. In Sybil attack, an attacker can take over the control of whole VANET system and inject false information in the network, forcing other vehicles and vehicular authorities to take incorrect decisions. Attacker can impact the data consistency of the system. It comprises of a gathering of self-ruling nodes that are spatially differentiated and are integrated with sensors that helpfully monitor physical and natural conditions. Such systems find expanding utilization in assorted territories like over-taking, speed control and so forth. A local VANET may comprise of tens or hundreds of nodes scattered in an area. When an event is detected, there is a sudden outburst of data. The data generated by the nodes increases and the offered load exceeds available capacity and the network becomes congested. Congestion in the network can be transitory (link level congestion) or persistent (node level congestion). Transitory congestion is mainly due to over flow of a link , as a result of the burst of packets arriving at the switch or router buffer. It occurs as a result of link variations. Persistent or sustained congestion happens when the long term arrival rate at a link exceeds its capacity. This happens when data sending rate from the source increases and the buffer over flows whereas, transient congestion solely introduces a delay in data transmission, and persistent congestion leads to data loss. Congestion ends up in packet dropping, delays, exaggerated throughput, and wastage of communication resources, power, and eventually decreases the life span of the network. Congestion control involves several strategies for monitoring and regulating the quantity of data entering the network to keep traffic levels at a suitable level.

In VANET, congestion control has an affluent history of algorithm development and theoretical study. Varied schemes for congestion control have been projected and enforced over the years. The existing works differ in the algorithms they use for adjusting the sending rate from source and techniques to deal with transient congestion like dropping packets or using backpressure mechanism that mitigates the rate of links feeding the congested buffer. They are classified based on whether to follow a traditional stratified approach or cross layer approach.

II. LITERATURE SURVEY

There are different big design issues in the VANET such as the data aggregation, routing protocols but among them the most important is Scheduling of the different types of packets through the network. Because of the delivery of the packet is notified through this. So here we are focusing on

the packet scheduling with different schemes and priorities for different packets.

VANET have been used to enable better data collection in scientific studies, create more effective strategic military defences, pinpoint the origin of a gunshot, and monitor factory machinery [Culler, 2004]. All of these uses depend on the ability to collect data such as light, vibration, moisture, temperature, and more, as well as the ability to communicate with each other. This last ability is what makes a collection of nodes so much more powerful than any node in particular.

G. Wang and N. Ansari [19] have proved that the scheduling matrix optimization is an NP Complete problem. They also proposed an approximation method, mean field anneal (MFA) to optimize the schedule matrix. The matrix optimization is divided into two phases: minimize frame length and maximize throughput. More recently approximation methods have been proposed.

A. Congestion Control Approach By Reducing The Number Of Messages In VANET

In [21] Prabhakar Kumar, Hardip Singh Kataria&TrishitaGhoshproposed method for the control of congestion in VANET is exploiting the already existing resources of the network and at the same time preventing the unnecessary overheads of nodes as well as links of a network.

The proposed scheme allows one vehicle to communicate to another vehicle (V2V communication) by means of threetypes of messages namely beacon message, emergency message and query message. The beacon messages aretransmitted periodically in order to let other vehicles nearby know about the present state of the approaching vehicle. This message contains the information about the speed, position as well as the direction of the approaching vehicle. The information thus obtained from these beacon messages help the nearby vehicles to become aware of their neighbouring vehicles. Now, the second types of messages are the emergency messages. The emergency message comes into role at abnormal conditions. The abnormal condition can be a road accident, dead end whenever any other potential danger. These messages ought to have high priority because any loss or delay in these messages can cause threat to one's life. Query messages are generated when there is a query. Query will be related to the local area information and result in a reply from infrastructure. It supports discarding of similar types of messages. Here each node consists of a neighbour table for comparing the incoming messages with the previous messages. The information from the message is extracted and the values are compared with the values of neighbour table. If a match is found then the corresponding message field in the table is updated else a new entry is added in the table and the message is transferred to CQ or SQ. After being processed the entry is deleted from the queue as well as table. Average delayof messages vs. mean message size is responsible to specify the performance of the proposed algorithm.

B. Velocity Monotonic Scheduling In Sensor Networks

Velocity Monotonic Scheduling (VMS) policy suggested by C. Lu et al [13], in RAP for packet scheduling in sensor networks. It is based on a different concept of packet requested velocity. It is expected that each packet meets its end-to-end deadline if it can move toward the destination at its requested velocity, which reflects its local urgency. In comparison with non- prioritized packet scheduling, VMS improves the dead- line miss ratios of sensor networks by giving higher priority to packets with higher requested velocities. Local urgency of a packet is more accurately reflected by requested velocity when packets with the same deadline have different distances to their destinations and hence VMS is better than deadline-based packet scheduling. In this scheme it is assumed that each sensor knows its own location (using GPS or other location services), from which it determines the requested velocity locally. This property helps VMS to scale well in large-scale sensor networks.

C. Multi-Queue Scheduler

E. M. Lee et al[7]. suggested a method in to reduce the amount of exceeded deadline packet by changing delivery order among packets in the ready queue of intermediate nodes and thus reduce the packet miss ratio. They proposed a Multi-Level-

Queue scheduler scheme which use different number of queue according to location of node in the network. They consider two methods to change the packet delivery order in intermediate nodes: (1) SP (Simple Priority), and (2) Multi-FIFO-Queue. In the first method, when a node inserts a packet to the queue, the node finds the packet's location in a ready queue according to priority. Thismethod forms a basic solution but suffers the problem of starvation. It can be solved by checking deadline and sorting packets according to remaining time to deadline. But, this greatly increases computation. In the second method, Multi-FIFO-Queue each sensor node consists of two or three queue according to location of node in network. Each queue has different priority such as low, high or mid. When a node gets a packet, the priority of the packet is decided by the node according to hop count data field of packet. As leaf nodes have only its own data to send, they have only a single queue.

D. Dynamic Multilevel Priority Packet Scheduling Scheme

Dynamic Multilevel Priority (DMP) Scheme proposed by Nidal Nasser et al. in [18] is a multi-queue packet scheduling scheme which uses of zone based topology of WSNs. Nodes have separate queues for real-time data packets, non-real time remote data packets received from other nodes and non-real time local data packets generated at the node itself. All the intermediate nodes have three queues whereas leaf nodes have only two queues, one each for real time and non-real-time data packets. In this scheme, nodes are virtually organized into a hierarchical structure based on hop distance from the base station. Nodes at different levels send their data packets using a TDMA scheme in which timeslots are allocated according to the level. Real-time data packets are given highest priority, followed by non-real time remote data packets and then by non-real time local data packets. Real time packets can pre-empt data packets in other queues, thus enabling emergency data to reach base station with minimum delay. Giving more priority to remote data reduces the waiting time of data from nodes far away from base station. Non real-time data packets with the same priority are scheduled using shortest job first (SJF) scheduling scheme. All these techniques help DMP to reduce average waiting time and end to-end delay.

E. CARAVAN: Providing Location Privacy for VANET

Krishna Sampigethaya and RadhaPoovendran[2] study the problem of providing location privacy in VANET by allowing vehicles to prevent tracking of their broadcast communications. They first, identify the unique characteristics of VANET that must be considered when designing suitable location privacy solutions. Based on these observations, They propose a location privacy scheme called CARAVAN, and evaluate the privacy enhancement achieved under some existing standard constraints of VANET applications, and in the presence of a global adversary.

III. PROBLEM STATEMENT

This work proposes a congestion control scheme distributed across the transport, network and MAC layers thatcan detect and avoid congestion in the network. It provides priority based traffic scheduling with a dual queue scheduler which favours transit queue packets. Priority is assigned to each message and according to the priority the message will be transmitted in the transitory and generated packet queue.

3.1 Existing System

The main focus of existing system is to reduce the congestion in vehicular network by using dual queue scheduler. Here the system uses two fixed length queues to differentiate the messages based on its type i.e Generated Queue and Transit Queue.

1. ***Generated Queue :***
   Generated queue will hold all the generated packets i.e the packets which are generated by the same node.
2. ***Transit Queue :***
   Transit queue will hold all the transit packets i.e the packets which are forwarded by other nodes and need to forward to next node.

In this system the high priority is given to the transit queue packets and once all the packets in the transit queue is forwarded then after that the generated queue packets will be forwarded. If new transit packet come to the node and there is no space in transit queue to store then all the packets in

the generated queue will be dropped to make space for transit packet.

The problem with this system is that waiting time for generated packets are larger than the transit packets. If some priority packet is in generated queue then also the packet need to wait until all the packets in the transit queue is forwarded. Another problem is the generated packets will be dropped if there is no space for transit packets.

3.2 Issues In Existing System

There are some issues in this system which needs to rectify, they are as follows.

1. The length of the generated and transit queue is fixed, so if large number of packets come then the system will fail.
2. Priority is always given to the transit queue packets, so if some packet in generated queue need to deliver early then it is not possible in this system.
3. If transit queue is getting full all the packets in the generated queue will be dropped, so there is loss of generated packets.

3.3Objective of the project

The objective of this project is :

- To design and implement a system using network simulation in vehicular ad hoc network.
- To implement proposed scheduling protocol according to message type of vehicles.
- To eliminate network congestion during the vehicle movement in transport network.
- To evaluate the proposed system performance analysis with existing approaches.

IV. PROPOSED SYSTEM

VANET as comfort communication can be made by two means: Periodic Safety Message (we refer them as Beacon) and Event Driven Message (refereed as Emergency Message here), both messages share only one control channel.The Beacon messages are messages about status of sender vehicle. Status information includes position, speed, heading towards.etc about sender. Beacons provide resent or latest information of the sender vehicle to the all present vehicles in the network which will help them to know the position of the current network and anticipate the movement of vehicles. Emergency Messages are messages sent by a vehicle who detect a potential dangerous situation on the road, this information should be disseminated to alarm or worn other vehicles about a feasible danger that could affect the incoming vehicles. VANET is a high mobile or volatile network where the nodes are keep changing their position and they are moving in speeds, which means that this vehicles may be get influence, even if these vehicles are very far from the danger, they will reach near to danger very soon, in this case fraction of seconds will be very important to avoid the danger. In VANET Emergency messages are delivered in broadcasting way. Purpose behind this is all the vehicle within the communication range of the sender should receive the message. Message is hardly reaches a 1000m (which is the DSRC communication range) which is coverage area of sender and it is not enough as due to attenuation and fading effects. Critical information should receive by vehicles which are out of senders range. By using this information they can avoid the danger. In short distances the prospect of message reception i.e. percentage of message reception can reach 99% and as we move forward it decreases up to 20% at half of the communication range. Therefore, there is requirement of a technique to increase the emergency message reception with high reliability and availability. Due to the high mobility of vehicles, the distribution of nodes within the network changes swiftly, and unexpectedly that wireless links initialize and break down customarily and randomly. Therefore, broadcasting of messages in VANETs plays a pivotal rule in almost every application and requires novel solutions that are different from any other form of Ad-Hoc networks. Broadcasting of messages in VANETs is still an open research challenge and needs some efforts to reach an optimum solution .

System proposes a congestion control scheme distributed across the transport, network and MAC layers that can detect and avoid congestion in the network. It provides priority based traffic scheduling with a dual queue scheduler which favours transitory packets. When congestion is

detected based on the buffer occupancy, source sending rate is updated by the sink periodically with the help of dual queues and route the packets through less congested paths.

List of Modules and Functionality

1. ***Network Initialization***

The proposed work first initialized the network with 89 nodes which contains some relay nodes, some vehicles and some are RSU's. Each vehicle moving on whole topography network during the execution. The vehicle send some packet as request to RSU for release the vehicle from this region.

2. ***Process of assigning priorities***

Each vehicle generates the request packets queue by vehicle called as incoming packets which is first received by router. This queue consist the some generated packets, low priority transitory packet, high priority transitory packets. After RSU classify those packets based on this function there are two types of data namely locally generated data and transit data. The data generated from any source node is called locally generated data.

3. ***Persistent Congestion Control***

The system also focuses to eliminate the congestion during the multiple packet transmission using multi queue scheduler. Using scheduling approach it will set the vehicle scheduling according to message type like emergency, normal, low priority etc.

4. ***Delivery ratio and performance***

Finally after running the simulation we have to measure the delivery ratio as well performance ratio of system. with the help of confusion matrix of system evaluate the performance analysis like packet drop ratio, error rate, accuracy etc.

Algorithms Used

The steps followed in the proposed algorithm are as follows.

- A packet reaches the router.
- Generated and Transit Queue usage is calculated.
- Header is identified from the packet to get the source and time to live for classification.
- if (Generated) then
- if(High Priority Packet) then
- Route the packet into the transit packet queue.
- else Route the packet into the Generated packet queue.
- else if (Transitory) then
- if(High Priority Packet) then
- Routethepacketintothetransitpacketqueue.
- elseRoutethepacket into the Generated packet queue.
- Allow the vehicles in the transit queue topass.
- Allow the vehicles in the Generated queue to pass.
- Update Generated and Transit queue usage.

RESULTS AND DISCUSSIONS

After describing our experimental setup, we quantitatively evaluate the analysis with respect to the different parameter used such as throughput, packet drop ratio and average end to end delay. We run our experiments in NS2 simulator version 2.35 that has shown to produce realistic results. NS simulator runs TCL code, but here use both TCL and C++ code for header input. In our simulations, we use Infrastructure based network environment for communication. For providing access to the wireless network at anytime used for the network selection. WMN simulate in NS2 .TCL file show the simulation of all over architecture which proposed. For run .TCL use EvalVid Framework in NS2 simulator it also help to store running connection information message using connection pattern file us1. NS2 trace file .tr can help to analyze results. It supports filtering, processing and displaying vector and scalar data. The results directory in the project folder contains us.tr file which is the files that store the performance results of the simulation. Based on the us.tr file using xgraph tool we execute graph of result parameters with respect to x and y axis parameters. Graphs files are of .awk extensions and are executable in xgarph tool to plot the graph.

A. Delay versus Simulation Time

The end-to-end delay in EEAR, CG and EAACK increases with increase in Simulation time. However, increasing treads in CG and EEAR is much higher than Proposed as shown in Table 1. The smallest amount value of end-to-end delay states superior performance of the protocol. Figure 1 shows, proposed system gives superior perform than other three protocols.

Table 1: Delay of 100 Nodes

Delay in seconds(per kbps)				
Simulation Time(Sec)	**Proposed System (QMCC)**	**EEAR**	**CG**	**EAACK**
20	0.00572	0.00742	0.00632	0.00813
40	0.00588	0.00792	0.00663	0.00911

B. Throughput versus Simulation Time

Figure 2 shows the throughput under different networks scale in CG, EEAR, EAACK and proposed system. The throughput in proposed, EEAR, EAACK and CG increases with increase in Simulation Time. The greater value ofthroughput states superior performance of the protocol as shown in Table2.

Table 2: Throughput of 100 Nodes

Throughput in %				
Simulation Time	**Proposed System (QMCC)**	**EEAR**	**CG**	**EAACK**
20	**93**	**86**	**78**	**80**
40	**92**	**84**	**79**	**81**

Advantages:

- System can easily identify the emergency scenario using different message type.
- Provide easy communication to remote vehicles which is not in RSU's range.
- It also provide priority to the generated packets .
- Packets in generated queue will not be dropped because of the dynamic length queue.

CONCLUSION

A cross-layered congestion control algorithm for VANET is proposed. It enables joint optimization of different layers and is more advantageous compared to the traditional layered approach. Concentration is majorly on congestion control. Here congestion can be detected using the buffer occupancy in dual queue. During congestion more priority is given to the transit packet than generated packet. One of the common situations where this approach would make a difference is in the vehicular overtaking scenarios.

When a speeding vehicular node is overtaking another node, the vehicles further ahead also need to be made aware of the overtaking. One of the common situations where this approach would make a difference is in the vehicular overtaking scenarios. When a speeding vehicular node is overtaking another node, the vehicles further ahead also need to be made aware of theovertaking. Such communication would prevent accidents from taking place because, the speed of the vehicle can be overwhelming and time taken for the generated packets to reach the appropriate nodes may be large. Another compellingscenario is when vehicles are forced to enable sudden brakes. In such a case informing the vehicles following behind the given vehicle will help these vehicles to not engage in series of heartoverhead collisions.Hence, the VANET can be enhanced byprioritizing transitory packets over the generated packets. Such communication would prevent accidents from taking place because, the speed of the vehicle can be overwhelming and time taken for the generated packets to reach the appropriate nodes may be large. Another compelling scenario is when vehicles are forced to enable sudden brakes. In such a case informing the vehicles following behind the given vehicle will help these vehicles to not engage in series of reartohead collisions. The propose work has done with NS2 environment with given packet scheduling approaches, provides the accepted results. To defence some unknown type of network, active and passive attack detection is the future work for this system.

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