# Congestion Control in VANET Using Threshold Based Distance Metric with Time Synchronization Approach

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**Abstract- The main objective of the proposed methodology is to minimize the congestion in the network based on the comparison among obtained distance value of the nodes with the defined threshold value and applying time synchronization approach to enhance the network performance. At first it calculates the distance value between the nodes and threshold value is predefined for each node in the network. It compare the value of threshold and distance value and after that it apply time synchronization method.**
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**Keywords –SCH, CCH, RSU, CA,V2V,V2I.**

## I. INTRODUCTION

Vehicular ad hoc networks (VANET) is used for communication among vehicles and between vehicles & roadside equipment. VANETs are composed of vehicles equipped with advanced wireless communication devices without any base stations. Each vehicle equipped with VANETs device will be a node in the ad-hoc network and can receive and relay other's messages through the wireless network. The networks with the absence of any centralized or pre-established infrastructure like access points in managed wireless networks or routers in wired networks are called Ad hoc networks. This type of networks can provide wide variety of services such as safety applications.

## II. PROPOSED WORK

In this scheme the type of messages supported and their formats are considered for discussion.

**Message Format:** The proposed scheme supports V2V communication of safe messages such as emergency message (Type_I message), warning message (Type_II message) and beacon message (Type_III message). It also supports V2V communication of unsafe message such as query for route to reach to a specific destination or query for nearest restaurant etc. (Type_IV message) and V2I communication of unsafe message such as query for traffic condition of a particular road (Type_V message).

The format of Type_I message is shown in Fig1 (i). Such message is generated by an abnormal vehicle (AV). AV is a vehicle which behaves abnormally like declaration exceeds a certain threshold, dramatic change of moving direction, major mechanical failure etc. Here it is assumed that the computation power of AV is not affected and its speed is almost zero. It sends emergency message to all its neighboring vehicles. AV can calculate which vehicles are moving towards its location and how much time they need to reach this location from the beacon messages of its neighboring vehicles.

The format of Type_II message is shown in Fig1 (ii). Such message is generated by a vehicle (Source_V) which detects traffic signal breakdown, jamming information etc. The Source_V sends this message to the vehicles behind it i.e. to the vehicles which are moving towards the jam location. It is required to prevent the other vehicles from entering into this road for improving its traffic condition .So, such message needs the communication up to the end of the road whose identification (Road_id) is specified in the message format.

The format of Type_III message is shown in Fig.1(iii).Such message is generated by all the vehicles periodically. The time out of such message is assumed as the reciprocal of beacon generation rate which is assumed as 5 to 10 Hz , otherwise the current beacon becomes obsolete by a freshly generated beacon.

The format of Type_IV message is shown in Fig1(iv). It is a query message which is generated by a vehicle (Source_V) to know the nearest restaurant (Destination_point) or the route to reach to a specific destination (Destination_point) etc. The Source_V sends this message to its neighboring vehicles and expecting its reply before reaching to the point (R_point) from where it has to enter into a new road so that the Source_V can move towards the Destination_point using proper route.
The format of Type_V message is shown in Fig1(v). It is a query message which is generated by a vehicle (Source_V) to know the traffic condition of a particular road (D_Road). The identification of D_Road is mentioned in the Road_id field of the message.

| Type | D_Sig | Message | Current location | Time out | Hop count |
|---|---|---|---|---|---|

| Type | D_Sig | Message | Current location | Time out | Road_id |
|---|---|---|---|---|---|

| Type | D_Sig | Current location | Direction | Number of high priority message | Number of low priority message | Speed | Vehicle priority |
|---|---|---|---|---|---|---|---|

| Type | D_Sig | Message | Current location | Time out |
|---|---|---|---|---|

| Type | D_Sig | Current location | Speed | Direction | Road_id |
|---|---|---|---|---|---|

Fig.1 Format of (i) Type_I message (ii)Type_II message (iii)Type_III message (iv) Type_IV message (v) Type_V message

*Algorithm:*

Distance value:
Input: nodes with coordinate values(x,y)
Output: Distance value, ds
Process:

1. Initialize the network.
2. For each node i, (i= 1 to n)
3. For each node j,(j=1 to n)
4. If (i not equal to j)
5. Proceed
6. Distance value, ds= $\text{sqrt}\{(x_2 - x_1)^2 + (y_2 - y_1)^2\}$
7. End

Comparison:
Input: Distance value & Threshold value
Output : Packet Transfer
Process:

1. Initialize the network
2. Define node i, (i=1 to n)
3. Define node j, (j=1 to n)
4. If (i not equal to j)
5. Proceed
6. If (ds is less than threshold value)
7. Proceed
8. Packet Transfer.
9. end

Input: Distance value & Threshold value
Output : Packet Transfer
Process:
1. Initialize the network
2. Define node i, (i=1 to n)
3. Define node j, (j=1 to n)
4. If (i not equal to j)
5. Proceed
6. If (ds is less than threshold value)
7. Proceed
8. Packet Transfer.
9. End

Time synchronization:
Input: nodes
Output: Time value for broadcasting of a packet
Process:
1. Initialize the network.
2. Call Comparison.
3. Now transferring packet:
4. Start time from node i to node j = time
5. End time from node i to node j=time
6. End

## III. LITERATURE REVIEW

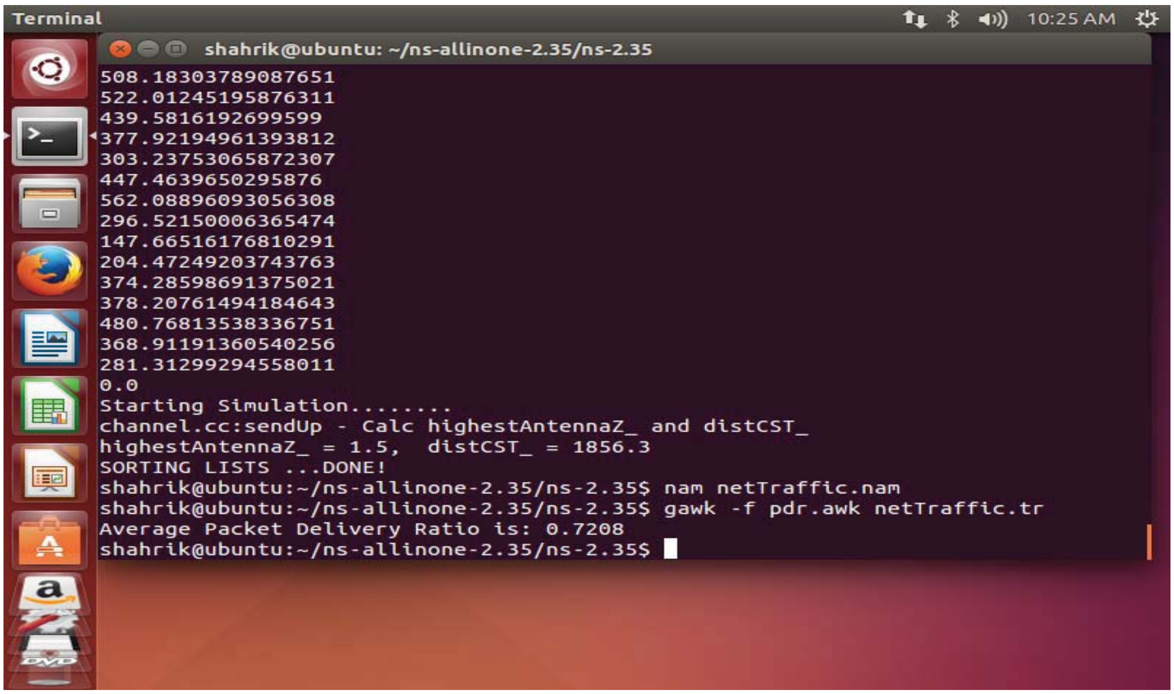
A cooperative congestion control approach in scheme [1], the priority of the messages is determined dynamically depending upon their types, network context and the neighboring vehicles configuration. Here the cooperation in message transmission is achieved by dynamically distributing the available bandwidth among vehicles. A vehicle having the high priority message can use the available bandwidth only. If the two vehicles have to send two messages with the same priority, the available bandwidth is given to the first vehicle who notifies the priority of its message. Each vehicle specifies the time of first notification in its beacon message. But in this proposal the available bandwidth at each vehicle is independent on the congestion level of vehicles.

A cooperative scheme [2] for service channel (SCH) reservation. According to Wireless Access Vehicular Environment standard, the safety messages are carried over a dedicated control channel (CCH) while non-safety messages are delivered over one of a set of available service channel (SCH). But in this proposal there is a possibility of bandwidth wastage when the SCH is overloaded and CCH is idle.

The objective of the proposed scheme is to minimize the channel congestion and to revoke misbehaving vehicles from VANET. The scheme in [3] aims for the reduction of channel congestion. The VANET in that proposed scheme is a hierarchy having certifying authority (CA) at the root level, road side units (RSUs) at the intermediate level and vehicles at the leaf level. Each vehicle has an electronic license plate (ELP) in which the encrypted vehicle identification number (VIN) of the vehicle is embedded by the vehicle manufacturer. Each vehicle is equipped with global positioning system to know its current location. This scheme supports V2V communication of safe and unsafe messages among authentic vehicles. It also supports vehicle to infrastructure (V2I) communication of unsafe message among authentic vehicles and RSU. The priority of safe messages is assumed as higher than the priority of unsafe messages to disseminate the safe messages among vehicles without delay. The ELP of a vehicle broadcasts (as per IEEE P1609 and IEEE 802.11p) the encrypted VIN after entering into the coverage area of a new RSU. The new RSU verifies the authentication of the vehicle. It assigns a digital signature to the vehicle as a valid key if the vehicle is authentic. Each authentic vehicle includes its digital signature in the message format which helps to prevent the unauthentic vehicle from participating in V2V and V2I communication. Each RSU revokes the misbehaving vehicles from its coverage area without which antisocial and criminal behavior jeopardizes the benefit of the system deployment. A control queue (CQ) is maintained for keeping safe messages and a service queue (SQ) is maintained for keeping unsafe messages at each vehicle. The length of CQ and SQ at each vehicle is assumed as variable and it depends upon the number of safe and unsafe messages. The duplicate messages are discarded from CQ to minimize channel congestion.

## IV. EXPERIMENT AND RESULT

After the simulation of the proposed scheme in ns-2.35 network simulator, average PDR value or Packet Delivery Ratio has been obtained. Thus, from avg. PDR value we are able to extract the network efficiency value. The network efficiency is 72.08% which is deliberately high compared to real life scenario. Thus, through network efficiency it is been verified that this above approach is possible in real life scenario for controlling the congestion in the VANET




## V.CONCLUSION

The proposed work is a congestion control mechanism in VANET. It considers both V2V and V2I communication of safe and unsafe messages among nodes. Each node has a message manager module to manage the sending and receiving messages, a congestion control module to schedule the waiting messages in queue and a bandwidth manager module to calculate its effective bandwidth dynamically. The present work can be extended by evaluating the dynamic priority of a message as a function of network condition in terms of vehicle density, congestion level of the network etc.

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