# A Literature Survey on Priority Based Scheduling With Reliable Content Delivery in VANET

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***Abstract* - Vehicular Ad-Hoc Network (VANET) is a subclass of Mobile Ad-Hoc Network (MANET). It communicates in two approaches Vehicle-To-Vehicle (V2V) and Vehicle-To-Infrastructure (V2I). By communicating with other vehicles and with Road Side Units (RSUs) VANET provides many lifesaving and commercial services. There are no fix infrastructures in VANET. Both Vehicle-To-Vehicle (V2V) and Vehicle-To-Infrastructure (V2I) take place with the help of On Board Unit (OBU) which is residing on the vehicle. Scheduling is a very important issue in VANET as messages are to be delivered to the recipient vehicle properly and accurately. It is important to send emergency, lifesaving and messages with critical information before general entertainment and commercial messages. It is also critical that any message which is sent to the vehicle is received by it in the time period for which the vehicle will be in range of the RSU.The objective of our work is to enhance the delivery of a message from RSU to vehicle. To achieve this we will develop a priority based scheduling protocol which will send the message from the RSU to the vehicle in the required time bound by broadcasting periodic messages which results into reduction in network traffic and without affecting the service ratio and without compromising reliability.**

***Keywords* - VANET, Scheduling, RSU, Priority Scheduling, Protocol**

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## I. INTRODUCTION

Vehicular Ad hoc NETworks (VANETs) belong to a subcategory of traditional Mobile Ad hoc NETworks (MANETs). The main feature of VANETs is that mobile nodes are vehicles endowed with sophisticated “on-board” equipments, traveling on constrained paths (i.e., roads and lanes), and communicating each other for message exchange via Vehicle-to-Vehicle (V2V) communication protocols, as well as between vehicles and fixed road-side Access Points (i.e., wireless and cellular network infrastructure), in case of Vehicle-to-Infrastructure (V2I) communications.[10] For Intelligent Transport System (ITS) VANETs are emerging as preferred network design.[3]

A Dedicated Short Range Communication (DSRC) IEEE 802.11 is used by VANET between vehicles for communication. Vehicles on the road can communicate with each other through vehicle -to-vehicle (V2V) communication and/or vehicle-to-infrastructure (V2I) communication. Vehicular Ad-hoc networks provide communication between nearby vehicles and nearby fixed equipment [9]. VANETs enable a new class of applications that require time critical response or very high data transfer rates. VANETs have unique characteristics as: very high mobility, theoretically infinite extension, absence of a centralized control and intermittent connectivity through the sparse infrastructure [3].

The core concern in vehicular ad-hoc networks (VANETs) is the reliable transfer of safety related messages to all vehicles which are in danger on the road. A severe challenge in the reliable safety message dissemination has occurred due to the presence of transmission holes in the VANET communication [7].

To effectively propagate data to a large number of recipients in the network under different system requirements, many dissemination techniques including some flooding protocols have been designed. The current basic data dissemination building blocks are not sufficient to effectively support many potential applications of VANET, which generally require disseminating data or ending quires to a fixed number of recipients in the interested area [1].

The objective here is to reliably prioritize and disseminate data periodically with small over head and little inaccuracy which will result in reduction of network traffic without affecting the service ratio [2].

VANETs share some characteristics with Mobile Ad Hoc Network (MANET). Both VANET and MANET are characterized by the movement and self-organization of the nodes. But they are different in some ways. The high nodes mobility and unreliable channel conditions [4] leads VANETs to have many challenging research issues, such as data dissemination, data sharing, and security issues.

VANET is a part of Intelligent Transport System (ITS) which provides many applications like global positioning system, traffic observation, management of traffic and many more.[4] Various protocols are used to establish communication between Vehicle-To-Vehicle (V2V) and Vehicle-To-Infrastructure (V2I) communication. These proto cols are defined as follow:

- Position Based Routing Protocol
- Topology Based Routing Protocol
- Broadcast Based Routing Protocol
- Cluster Based Routing Protocol
- Geo Cast Based Routing Protocol[3]

A new class of application that requires time-critical responses (less than 50 ms) or very high data transfer rates (6-54 Mbps) is enabled by VANET [8].

VANET routing is classified into Unicast: Vehicle to Vehicle communication, Multicast: Vehicle to multicast members through multi hop communication, Geocast: A subset of Multicast with communication targeted in a specific geographical location and Broadcast: Vehicle to all the vehicles in the coverage area.

## II. ARCHITECTURE OF VANET

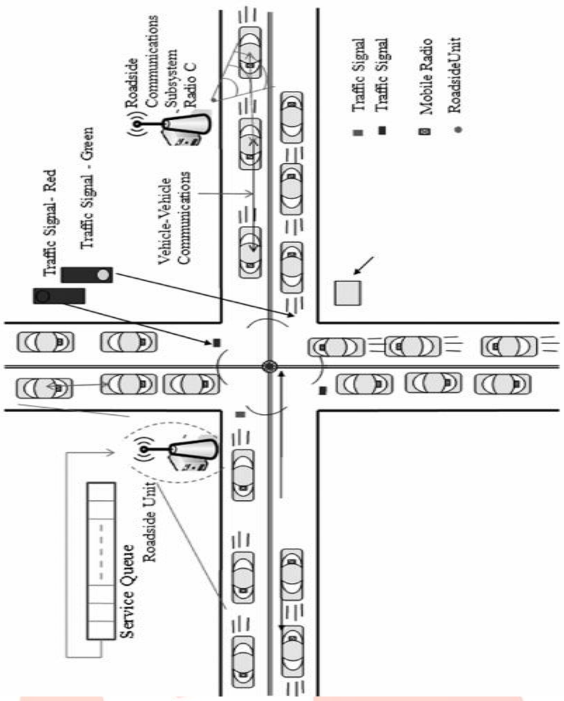



Fig 1 Architecture of VANET [7]

From the vehicular communication perspective, it can be categorized into:

– Road-vehicle communication (RVC, also called C2I)
– Inter-vehicle communication (IVC, also called C2C) [9]

V2V communications and transferring of safety data can be reliably carried out using IEEE 802.11p VANET. Vehicular wireless broadband can be accessed over IEEE 802.16 metropolitan networks [11].

Generally, Vehicular communication in VANET can be of two types:
1. Inter-vehicle communication. [V2V]
2. Intra-vehicle communication. [V2I]

The intra-vehicle communications is used to describe communications within a vehicle, whereas the term inter-vehicle communications represents communications between vehicles or vehicles and sensors placed in or on various locations, such as roadways, signs, parking areas, and even the home garage. Inter-vehicle communications can be considered to be more technically challenging because in this case the vehicle communications need to be supported both when vehicles are stationary and when they are moving [12].

## III. LITERATURE SURVEY

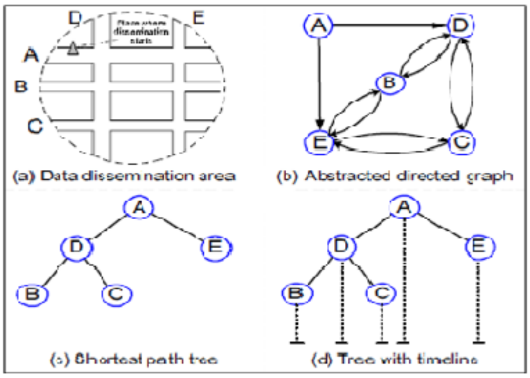
### 1. DOVE : Data Dissemination to A Fixed Number of Receivers in VANET

In [1] Tan Yan, Wensheng Zhang and Guilling Wang have emphesied on accurately control the number of receivers, achieve low dissemination delay and incur only small communication overhead. So, by implementing this protocol we can focus on sending the fixed number of desired message from the RSU to the targeted vehicles in the interested area. The high accuracy of sending the message can be achieved by a small overhead and low delay.

Many applications of VANET require disseminating data to a fixed number of recipients. This means that the message is to be sent to a particular fixed number of vehicles. This is achieved by implementing the technique of this paper with a small over head and little inaccuracy, e.g., 0.2% of inaccuracy, i.e., 1002 receivers actually gets the data though the desired number is 1000. [1]

The task of lowering the overhead and to speed up the dissemination process can be achieved by distributing the task to multiple nods on different roads. More copies will be sent to the recipients as the traffic will increase.

In the given diagram data structure of dissemination is given in which the data dissemination aera, abstract directed graph, shortest path tree and tree with timeline are shown.In figure (a) an abstrat road map is shown,fig.b represents a road,c and d are showing shortest path tree and work time line accordingly.




Data Structure In Disseminaton

Fig 2

The distributed scheme is devided into 3 parts :

- The workload delegation
- Relay the disssseminator role forward and share it backword
- Dynemic work reassignment

So, by implementing these techniques the DOVE will give an efficient data dissemination protocol to disseminate data to a fixed number of receivers in VANET.

**2. SCORE : Data Scheduling at Roadside Units in Vehicle Ad hoc Networks [2]**

In [2] Khaleel Mershad and Hassan Artail have focused on the RSU that provides a scheduling technique which bulids a schedule that is devided in time-solts in which all uasers are expected to connected to VANET.

In this paper the user’s data will be cached and stored during the free time slop of the RSU and by doing this RSU will estimate the time on which user connectes to the VANET.RSU’s cache can store any kind of data which is ready to be delivered to users and from the data and service provider it can also obtain on-demand data as well.

To aquire this facility of the RSU the uer has to register with RSUs online website and he specified his personal detail for authetication purpose.The uer can also choose a default RSU by which he will connect regulaerly.Default dtabase will save his account in the database.A secret key of 12 charaters is provided to the user to connect to the RSU database.

The RSU,by building their own schedule which contains the time at which the user will connect, RSU prepares the data which is cached during the free time slot RSU will be allowed to balance its load and enable to user to obtain data much faster after they connect.

The RSU will start a training perioid to upadate the user’s profile.The defalut RSU will of the user will be assigned with a probanility value which will be intialized to 1. The RSU then starts a training period for the user, during which the RSU increases or decreases the probability (i.e., priority) of each period according to whether the user connects during this period or not.

To build the RSU’s schedule data can be classified into three parts :

- Data that change frequently and are fetched every session.
- Data that doesn’t change frequently and are fetched only when they change.
- Data that are sent to the user only once.[2]

By using all the techniques the load on the Road Side Unit will be reduced and the complexity will be hidden for getting the data in a secure way.

**3. VANET Routing Protocols: Issues And Challenges [3]**

In [3] Surmukh Singh and Sunil Agrawal have focused on major Issues and challenges of VANET routing protocols is illustrated. Various applications like comfort applications, collision avoidance, cooperative driving traffic improvement, payment services and location based services are described.

In the routing section of VANET the main difference between MANET and VANET is illustrated which is the mobility pattern and suddenly changing topologies. The typical ad hoc routing protocols are inappropriate to handle problem of VANET like configuration, number of vehicles at varied times of the day, demographics, mobility patterns, random change in vehicles incoming and outgoing the network and also the indisputable reason is that the dimensions of the road are usually lesser than the transmission coverage.

Routing protocols are classified in the following manner:

- Position Based Routing Protocol
- Topology Based Routing Protocol
- Broadcast Based Routing Protocol
- Cluster Based Routing Protocol
- Geo Cast Based Routing Protocol[3]

**4. A Survey of Routing Protocols for VANET in Urban Scenarios [4]**

In [4] P.S Nithya Darsini and N. Santhiya Kumari have focused on various routing protocols which can be used in urban environment and issues related to implanting routing in urban areas are illustrated.

Routing protocols have been classified in to Urban, Rural and highway these three parts.

Node direction is bidirectional in urban environment. Any angles described in a street map are followed. This reduces the correlation of the destination to a suitable next hop. Performance is hampered due to obstacles in between line of sight of the two nodes. High traffic density also blocks the signals especially at the intersections.

Even though this kind of situation provides good ad hoc connectivity, efficient flooding mechanism is required to propagate data. Due to high density mobility of the nodes is also very low. These are some of the problem which can occur in urban environment.

To counter the challenges of urban routing given protocols have been proposed.

**ASTAR -** Anchor Based Street and Traffic Aware Routing protocol follows street awareness for efficient routing. Based on traffic information dynamic monitoring is a must.
**CAR -** Connectivity Aware Routing: destination location, path discovery, data forwarding and path maintenance. This protocol works on anchor mechanism. This means it will forward the packet to the neighbour.
**RBVT -** Road Based using vehicular traffic information protocol works with flooding mechanism.
**BRAVE** - Beacon less routing algorithm for vehicular environment deals with Change in the route which may occure at any point not only at junction so at every hop trajectory of the packet is computed
**CLWPR** - In Corss layer weighted postion based routing ,Each node broadcasts periodicaaly minimal weight.
**MAR-DYMO** - Mobility aware ant colony optimization routing uses an ant colony optimization in the existing dynamic MANET On demand (DYMO) protocol which is a reactive protocol.

### 5. A Stable Routing Protocol Using Segment-by-Segment Way in VANET [5]

In [5] Yun Ge, Xin Fan and Xing Wang have proposed a stable routing protocol for highway scenarios using a segment-by-segment method. When the source and destination nodes are in the same vicinity this protocol adopts the proactive routing protocol. When a node is in near by surrounding it maintains a k-hop count.

A full use of topology based routing and location based routing is done by stable routing protocol. Information is maintined and updated periodically with short end-to-end delay in proctive routing [5].

In case of route discovery proactive routing is used when the destination is within the k-hop vicinity. Source phase, source to ancher phase and ancher to destination phase,these are the three phase type if the routing is not proactive.

Path length is ensured as short as possible by selecting an anchor which is the node nearest to the destination and with in the k-hop vicinity.

There are two types of route maintaence in stble routing protocol :

- Global Route Maintanence
- Local Route Maintanence

The source record its next anchor and next-to-next anchor, and the destination records its previous anchor and previous-to-previous anchor in local route maintanence.

The path length may be incresed, if the stable routing protocol (SRP) uses local route maintanence for a long time. To resolve this problem global route maintanence is used. SRP protocol achieves higher data packet delivery ration and shorter average path length[5].

### 6. IDVR-PFM: A Connectivity oriented VANET Routing Protocol in Urban Scenarios [6]

In [6] Huijing Shi, Chong Ma, Liang Chen and Zhizhong Ding have proposed a protocol system which delivers a message with a higher efficiency and lower latency of packets using parked vehicles.

Frequent disconnection is a major challenge in the VANET scenario. The disadvantage of the greedy algorithms for transmission is that there may not be enough vehicles on the road. To avoid this scenario this paper proposes to use parked vehicles as path forwarding mechanism and also to ue buses to trasmitt the desired data more efficiently [6].

Gerrdy alogorithms use the shortest path strategy whose performance depends on correct determination of forwarding direction node at the intersections. Greedy Parameter Stateless Routing (GPSR) is not a very dependable protocol in this scenario. GPCR (Greedy Parameter Coordinator Routing) utilizes restricted greedy mode at the intersection of streets. That makes it very high dependent on intersection node [6].

Table 1. Hello packet format

| | | | | | |
|---|---|---|---|---|---|
| ID | T | (X,Y) | V | RID | NODETYPE |

Table 2. Format of neighboring node list

| | | | | | | |
|---|---|---|---|---|---|---|
| ID | T' | (X',Y') | V | RID | NODETYPE | N |

Table 3. Format of data packet

| | | | |
|---|---|---|---|
| SID | (Xd,Yd) | Last-hop | DATA |

Fig 3 Diagram of a control packet format design

Each vehicle broadcasts hello messages (Table 1) periodically to obtain the information of the neighboring vehicles. Every vehicle can use beacon messages to maintain one-hop neighbor list table (Table 2). Packet formats and data structures needed in this algorithm are shown through (Table 3) [6].

**7. Data Scheduling in VANETs: A Review**

In [7] Vishal Kumar and Narottam Chand have studied various scheduling techniques It is stated that data broad is a good solution for large scale data dissemination.

Two broadcast techniques PUSH and PULL are given.

In Push Based broadcast the roadside unit (RSU) broadcasts the whole or part of the database periodically according to a static broadcast program.

Pull Based broadcast is commonly known as demand broadcast. In Pull Based broadcast RSU only sends data items in request to explicit requests sent by vehicles [6].

A routing protocol plays a vital role in scheduling of data in communication. Since each node has a limited transmission range, messages often have to be forwarded by other nodes in a VANET [6].

The service-ratio of a RSU is very limited. Service Ratio will specify for how much time the vehicle will be in the range of the RSU. This is generally very short and RSU has to deliver the desired message to the vehicle. In this scenario scheduling is very important to deliver the message from RSU to the vehicle.

Following are few scheduling algorithms:

- First Come First Serve (FCFS):
- Longest Wait Time (LWT)
- Most Requests First (MRF):
- Longest Total Stretch First (LTSF)
- First Deadline First (FDF)
- Smallest Data Size First (SDF)
- MQIF-Maximum Quality Increment First
- LSF-Least Selected First
- D*S Scheduling Algorithm

These are some of the scheduling techniques by which we can make sure that the desired message is sent to the recipient in the desired time.

## IV. CONCLUSION

The present survey illustrates the current scheduling techniques and importance of scheduling in VANET systems. This survey illustrates methods for enhancing the scheduling techniques in VANET. We will focus on implementing a priority base scheduling technique to deliver the desired message ahead of other messages. In our work we will focus to enhance the delivery of the message from RSU to vehicle. We can enhance the scheduling using proper scheduling algorithms and combining them with other elements like service ratio, data access and reliability. So, In our proposed system we will train the RSU and set the priority of the messages stored in the RSU buffer and send the message from the RSU to the vehicle according to the deadline calculation of the vehicle without compromising reliability.

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