IJCSE International Journal of Computer Sciences and Engineering Open Access
Review Paper Vol-6, Special Issue-3, Apr 2018 E-ISSN: 2347-2693

On Message Dissemiaton And Event Detection In Vanet

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Available online at: www.ijcseonline.org

***Abstract*—** The whole concept of message dissemination in Vehicular Ad hoc Networks relies on the inter-vehicle cooperation. This helpful nature of vehicles has empowered vehicles to gather and trade traffic related messages continuously. In this manner, it is conceivable to utilize Vehicular Ad-hoc Networks for event discovery on urban roadways. Due to the uneven topology of urban roadways comprising of both major and auxiliary roadways, different protocols are designed. These protocols are designed to detect traffic related events on roadways. Some protocols might be efficient for a particular road but may fail for some other types of roads. Besides, the current scattering strategies for occasions related data do not have the essential control system, so the message(information) might be dispersed to different geographical areas. This paper presents the review of existing message dissemination and event detection protocols in VANET. A tabular representation of various protocols of message dissemination and event detection on parameters like radio propagation model, transmission range, standard and simulator have been given. The comparative analysis of these existing protocols is also presented in the same section.

***Keywords*—**Vehicular ad-hoc networks, message dissemination, event detection, radio propagation model, transmission range

I. INTRODUCTION

The process of sending and receiving of kinematic information between vehicles over ad hoc networks is termed as Vehicular Ad hoc Network (VANET). Vehicular Ad-hoc Networks have been generally perceived by governments, business ventures and the scholarly community. VANETS have been regarded as one of the promising ideas for future of Intelligent Transport Systems (ITS). Thereby accomplishing security and productivity in our almost over crowded roads. The VANET is a sub-class of Mobile Ad hoc Networks (MANET) where the versatile nodes are vehicles. When Comparing VANET with other frameworks, Inter Vehicle Communication (IVC) has four noteworthy preferences: wide scope region, generally low message loss rate because of direct remote correspondence, practically no or less power issue and also no administration charges.[1]. Vehicular Ad Hoc Networks (VANETs) have become out of the need to help the developing number of remote items that would now be able to be utilized as a part of vehicles [2][3].
The basis of VANETs could be any wireless networking technology. The most widely used are short range radio technologies like WLAN (Wireless Local Area Network) either Wi-Fi or ZigBee. In addition, VANETs can also use cellular or LTE (Long Term Evolution) technologies.

The applications of VANETs are broadly categorized into two main categories:
Safety-Related VANET applications: These applications can be broken down further into three categories namely: driver assistance, alert information and warning alert. The vehicular safety communications consortium has listed eight main and potential safety-related applications: pre-crash sensing, curve speed, emergency electronic brake light, lane-change, traffic signal violation, collision alert, left turn assistant and stop sign movement.
Non-Safety-Related VANET Applications: These applications are likewise alluded to as solace or business applications. Normally, these applications plan to enhance movement effectiveness, traveller solace and business stages as far as advertisements and electronic toll accumulation [1].

Event Detection: An event is said to occur, when something happens. In case of VANET, event could be an accident or traffic jam. Event can be detected by monitoring higher variance in the speed and an unexpected increase of almost zero speedy vehicles. A protocol must

be designed in such a way that it should clearly identify the occurrence of an event i.e., it should clearly distinguish between an accident and a car parked along roadside.

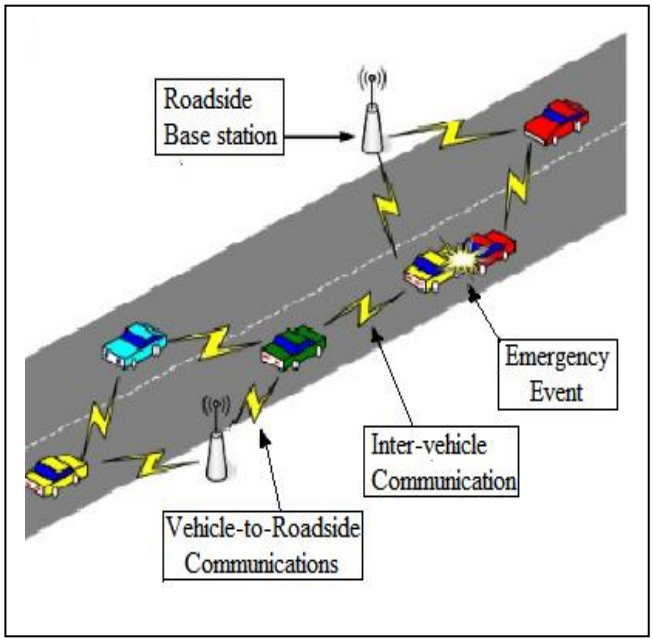

Figure 1: VANET Scenario.

Message Dissemination: The process of sending information or alert message to nearby vehicles after an event has been detected. There are several protocols that are being used depending upon the problems they are designed to address. The efficient message dissemination protocol must be designed in such a manner such that it has fast delivery, high reliability, minimum message loss rate etc.

This paper has been organized as follows: Section 2 presents the literature survey of various protocols of message dissemination and event detection. The tabular representation of various protocols in literature has been given in section 3. Section 4 concludes the paper.

II. LITERATURE SURVEY

Message forwarding can help warning message reach vehicles beyond the radio transmission range. In [3], the authors presented a multi-hop based broadcast protocol on MAC slot reservation. We must also take into account the scenario that it is hard to find that all will be vehicles equipped with transceivers. Warning or emergency message dissemination in sparsely connected ad-hoc network consisting of highly mobile vehicles is studied in [4]. The movable functionality of vehicles is essential to help us with message transmission.

In [5] authors presented several context-aware packet forwarding protocols for intra-platoon scenarios. Also in [6] some other algorithms have been proposed which can help vehicles to limit the effects of broadcast storm problem.

Tseng et al. [7], proposed various techniques such as "Counter-based, Distance-based and Location-based" schemes. These were threshold-based techniques. Depending on the scheme used, when a node receives a broadcast packet, it then compares the pre-set threshold with value of the broadcast data packet.

"Vehicular Collision Warning Communication (VCWC)" protocol was given by Yang et al.in paper [21]. VCWC protocol can satisfy emergency warning delivery requirements irrespective of the presence of abnormal vehicles.

Fogue et al. [8], presented the "enhanced Message Dissemination based on Roadmaps scheme (eMDR)". This protocol also considers the effect of buildings over the signal transmission. This improves the message dissemination in real scenarios.

Parikh et al. [9], presented p-persistence in order to reduce the number of nodes required to re-transmit the data broadcast packets. Given p be re-forwarding probability, the number of packets received at each node will be reduced by a factor of 1 – p.

Suriyapaiboonwattana and Pornavalai [10], proposed "TLO (The Last One)". TLO is a rebroadcast technique, that uses GPS (Global Positioning System) provided information to enhance the performance of safety alert applications in VANET. In [11] Suriyapaiboonwattana and Pornavalai again presented "Adaptive Probability Alert Protocol (APAL)", which showed much less collisions than previous TLO protocol. As the number of collisions increase, the message delay also increases.

Slavik and Mahgoub [12] proposed SBS, which is Stochastic Broadcast Scheme for message dissemination. It requires that all nodes determine a probability with which they will retransmit received messages.

Bi et al. [13], proposed "Cross Layer Broadcast Protocol (CLBP)" protocol, which is an Inter-vehicle protocol (IVC). CLBP shortens the emergency message transmission delay and also delivers emergency messages reliably with less resource consumption.

Considering the mobile nature of VANET, Sormani et al. gave "Function Driven Probabilistic Diffusion (FDPD)" protocol in [14]. FDPD was designed to take decisions in a receiver-based manner, which eliminated the need to collect the neighbourhood related information.

Sanguesa et al.[15], proposed "Nearest Junction Located(NJL)" Algorithm in 2013. NJL was particularly designed for high vehicular densities scenarios or simple topologies, where broadcast storms are prone to occur.

Tonguz, Wisitpongphan and Bai[16], presented a "Distributed Vehicular Broadcast (DV-CAST)" protocol. DV-CAST implements the "Dedicated Shortrange Communication" (DSRC) approach to deal with low market penetration rates. Viriyasitavat, Tonguz and Bai [17], presented UV-CAST "Urban Vehicular Broadcast). UV-CAST is another version of DV-CAST designed specifically for urban highways.

Sanguesa et al. [18], again proposed "Neighbour Store and Forward (NSF)" protocol. It was specifically tailored for low vehicle density roads.

In 2015, Sanguesa et al., [19] presented "Real-time Adaptive Dissemination (RTAD)" protocol. RTAD is an adaptive warning message dissemination protocol that selects the optimal broadcast scheme in a VANET environment.

Hu et al.[20] presented "Lifetime-aware Beacon-less Routing Protocol (LBRP)". Its main focus was the dissemination of large data content in VANET. A particular vehicle forwards data packet based on the decision made by checking the message header and its current state information. Radio propagation model used by LBRP is Source Vehicle (SOV).

III. COMPARATIVE ANALYSIS

The following table: Table 1, presents the various protocols mentioned in the literature survey with their corresponding Transmission Range, Standards upon which they are built, Mobility Model used and finally the Simulator upon which they were implemented and tested.

The mainly used simulators for VANET are SUMO (Simulator for Urban Mobility) integrated with NS-2 or NetSim and OPNET.

Table 1: Various message dissemination protocols.

Protocols	Transmission Range	Standard	Mobility Model	Simulator
VCWC[21]	300m	802.11b	—	NS-2
eMDR[8]	400m	802.11p		NS-2
p-persistence[9]	1000 m	802.11a	—	OPNET
RTAD[19]	400m	802.11p	—	NS-2
UV-CAST[17]	140–250m	802.11p	—	NS-2
SBS[12]	10 m	—	—	Java simulator
CLBP[13]	250m	802.11e	—	NS-2
NSF[18]	200-400m	802.11p	—	SUMO and NS-2
NJL[15]	400m	802.11p	—	NS-2
RTAD[19]	400m	802.11p	—	NS-2
UV-CAST[17]	140–250m	802.11p	—	NS-2
LBRP[20]	558m	802.11p	Krauss	NS-2

Counter scheme was originally designed for mobile ad hoc networks. Counter scheme has easy operation with a high percentage of informed vehicle but it blocks the channel by flooding abundant messages. While Distance scheme has also easy operation with low number of emergency messages, but the main drawback is its low performance in urban roadways.

VCWC: It works quite well for small number of vehicles(nodes). But retransmission delay factor increases as number of vehicles start increasing.

eMDR: Its was made as an improvement over eSBR. It minimized the number of messages, but it requires high precision GPS and was purposely implemented for urban environments.

NJL: It was quite effective in urban environments with reduced number of messages and aggressive broadcast storm reduction technique, but high precision GPS was required, which makes it useless in highway scenarios.

RTAD: It's is an adaptive dissemination scheme with high efficiency in different scenarios, but it has complex implementation and also requires GPS.

FDPD: It's is recommended for highway scenarios. It takes direction of vehicles into consideration but it also requires GPS and showed low performance in urban environments.

UV-CAST: It is an adaptive dissemination protocol that may connect unconnected subnetworks. Though it minimized the number of messages used but showed low performance in urban environments.

DV-CAST: It is an adaptive dissemination protocol with nice accomplishments in terms of well-versed vehicles. But requires GPS and has slow decrease of messages.

JSF: It has a good percentage of known vehicles and was specially made for basic and simple maps. The drawback of JSF is that it uses high number of messages and uses GPS. It also faces overhead when put in high density conditions.

LBRP: It is first beacon-less routing protocol designed for huge amount of data delivery. The main focus of LBRP is to consider the effect of routing paths on data delivery, because mainly the delay occurs due to the instability of routing paths

IV. CONCLUSION

In our work, we studied various message dissemination and event detection protocols in VANET. These protocols were analysed based upon the results presented in their research work respectively. Since in case of message dissemination, the main source of delay is due the unstable link. The cause of instability is the make and break of routing paths continuously. Considering this instability as a main factor, greatly favours the desired results i.e., message dissemination. We conclude that LBRP protocol is efficient among these mentioned protocols in terms of reliability of message dissemination. However, there most certainly is the need for further improvement in reliability of message dissemination and event detection in VANET because there

are other factors that affect the reliability. Which is a novel and unique open research challenge.

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