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An Efficient Message Transmission Using Dsrc In Vanet

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Abstract**—** VANETs are receiving growing attention from the research community and from the transportation industry because of their great potential to improve traffic safety on roads. However, handling time-critical safety applications in these networks poses many challenges, particularly because such applications may have to share the communication channel with other applications. In existing system, using congestion control algorithm whether the node is active or inactive. If node is active the message is send otherwise placed in queue. The major problem in existing is there is no acknowledgement from receiver and also face time delay problem. To overcome this problem, Dedicated Short-Range Communication (DSRC) protocol is used. VANETs use Dedicated Short Range Communication (DSRC) due to its low latency and ability to transmission messages in multiple directions. The range of DSRC is 1000 meters which is suitable for both V2V and V2I. DSRC make use of bandwidth from 5.850 to 5.925 GHz to increase the safety and productivity of the transportation system.

Keywords**—** DSRC, Ad-hoc networks, multiple access techniques, quality of service assurance, systems and services, network architectures and protocols.

I. INTRODUCTION

VANET is the technology of building a robust Ad-Hoc network between mobile vehicles and each other, besides, between mobile vehicles and RSU. VANETs are start-of-the-art technology integrating ad hoc network, wireless LAN (WLAN) and cellular technology to achieve intelligent Inter-Vehicle Communications (IVC) and Roadside-to-Vehicle Communications (RVC). VANETs share some common characteristics with General MANET. Both VANET and MANET are characterized by the movement and self-organization of the nodes. But they are different in some ways. Because of the high nodes mobility and unreliable channel conditions [3], VANETs have individual characteristics which pose many challenging research issues, such as data dissemination, data security and sharing issues. VANETs have turned into an important research area over the last few years. VANETs are distinguished from Mobile Adhoc Networks by their hybrid network architecture, node movement characteristics, and application scenarios.

Vehicular Ad-Hoc Networks (VANETs) have attracted extensive attentions recently as a promising technology for revolutionizing the transportation systems and providing broadband communication services to vehicles. VANETs contain entities including On-Board Units (OBUs) and infrastructure Road-Side Units (RSUs). Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications are the two way basic communication modes.

II. RELATED WORKS

The two main components of the suggested sub-layer in this paper are safety message retransmission and the help of network coding for safety message broadcasting. In the following subsections, first review the prior work on safety message repetition, and then we discuss some of the prior works on the application of network coding in VANETs.

A. Message Rebroadcasting:

Repetitive broadcast of safety messages in VANETs were first proposed in [7].When a safety message is produced it should be delivered to neighbors within the message lifetime. The time is slotted and the message life-period is assumed to be time slot L. In IEEE 802.11p, safety messages are only broadcasting once during a time frame. This is due to the fact that in IEEE 802.11p broadcast mode, there is no acknowledgement. . In Synchronized Fixed Repetition (SFR), w time slots are randomly chosen (out of L) for rebroadcasting. In Synchronized Persistent Repetition (SPR) at each time slot a message is transferred with probability p. To less the number of collisions, Positive Orthogonal Codes (POC) is proposing [8].The retransmission pattern of each node is assigned based on predetermined binary codes.

B. Network coding:

In [9], authors have proved that random linear network coding could reach the multi-cast capacity in a lossy wireless network. The work in [12] has not been suggested for vehicular networks, but is the nearest, in terms of the techniques, to our work. This well-known outcome cannot be extended to the application of network coding in safety message transmitting in VANETs.

1) Vehicular Networks:

Most of the before work on the application of network coding in vehicular network deal with the content distribution from a Road Side Unit (RSU) to multiple On Board Units (OBUs) or refer only throughput performance[10].To the best of our knowledge, there are only a less works on network coding application in safety message broadcasting. In [11], *Symbol-Level Network Coding* (SLNC) is helpful for multimedia streaming from RSUs to vehicles. In [18], SLNC is helpful for content distribution, in order to maximize the

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download rate from the access points. SLNC is shown to reach good performance compared to packet level network coding in unicast transmissions. This is helpful for large packet sizes. For small safety messages, if each message is divided into smaller symbols, the network coding over-head can be compared to the size of symbol leading to network inefficiency. To address this drawback, our proposed system does not need any message decomposition.

2) Gossip Algorithms:

In the gossip algorithms, at each time slot, each node can transmit at most one neighbor node while a node can be contacted by multiple nodes. Our communication mechanism follows the reverse scenario: each node can potentially communicate with multiple nodes, but if a node is contacted by multiple nodes at the same time, there will be a collision occurs.

III. SAFETY MESSAGE RELIABILITY CONTROL

The existing reliability sub layer contains of two parts.

A. *Congestion Control Algorithm:*

In these algorithm verifies if a node should be active in a given CCH interval. If the node is not active the produced message will be dropped. If the node is active in CCH interval, it probabilistically transmits at each time slot during a CCH interval.

We undertake that the back off parameters of the IEEE 802.11p has been set to least and the physical carrier sensing is disabled. This can be done through the wireless card driver interface and ensures an instant communication when a message is sent to the lower layer.

The congestion control algorithm filters the produced messages in order to minimize the number of active nodes in CCH interval. The Synchronized Persistent Coded Repetition (SPCR) algorithm explains the main functionality of the transmission. At each time slot a random linear combination of all the queue messages can be transmitted by an active node.

B. Message Coding:

In this section, we existing algorithm that uses Random linear network coding in combination with message rebroadcasting. Based on the introduced repetition-based scheme in the prior section, all nodes potentially have multiple communication opportunities in a subframe.

The random linear coding algorithm is simple: each node queues all the received message and when it has a broadcasting opportunity based on its rebroadcasting pattern, it broadcasts a random linear combination of all the already received message in own queue with the coefficients Next, all nodes empty their queue and start a new communication for the next time slot.

IV. DEDICATED SHORT RANGE COMMUNICATION

Dedicated Short-Range Communication (DSRC) is a standard that aims to bring vehicular networks to North America. Traffic mortality has been a long standing problem in the United States, as in the rest of the world. In proposed system developed a novel analytical model to determine the main performance measures of VANETs with two traffic priority classes. Unlike other studies, the modeling took a multi hop perspective rather than the generalization of single-hop results, which captures the dynamics of the system such as the hidden-terminal activity better.

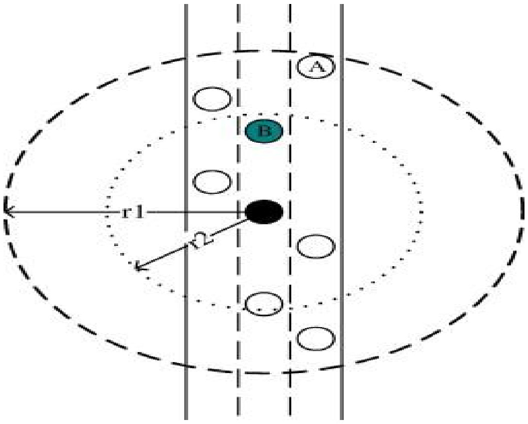

Fig 1: DSRC Architecture

The latter work, however, assumes that the arrival time of a message to the channel corresponds to the moment that its back off counter reaches zero, after which the message is transmitted. Therefore, the medium access control (MAC) back off time was considered part of the message inter arrival time, and the effect of the messages in a back off process was neglected due to mathematical complexities.Analytical model for the communication of low-priority traffic.

According to the IEEE 802.11 MAC broadcast mode which is a CSMA/CA based protocol, when a message is generated in an idle node, it will be transmitted immediately if that node finds the medium free for a distributed interface space (DIFS) time period.

Otherwise, it randomizes a one-time back off counter and decrements it whenever the medium is sensed free. As such, any message arrival to the idle nodes that are located within an activity region results in back off initiation, whereas messages that arrive at the idle nodes located within a nonactivity region will immediately be transmitted. Furthermore, nodes that are in a back off process and located in activity regions cannot decrement their counters. An example of transmission activities within Δt (in seconds) in a segment of the network. Nodes 1, 3, and 7 are transmitting, whereas nodes 2, 4, 6, and 8 are receiving. Nodes 4, 6, and 8 have received a message at the MAC layer for transmission; however, because they are within an activity region, they have scheduled their back off timers, which are frozen. We note that idle node 2 is located within an interference area. The evolution of the network after Δt (in seconds), where nodes 3 and 7 finished their transmissions, whereas node 1 is still transmitting. Node 5 has received a message after node 7's transmission has terminated and immediately started its transmission. Furthermore, nodes 4 and 8 sensed the medium free and started to decrement their back off counter, whereas node 6 still senses the medium busy and continues freezing its back off counter. Let w and α denote the back off contention window size and the duration of the back off time slot, respectively. We assume that the back off times are sampled from an exponential distribution, with its mean for a single back off broadcasting network given by $1/\beta = \alpha w/2$ [15, p. 1498]. First, we let the following conditions hold.

A new message arrives at the MAC layer of an idle node in an activity region and changes the state of the network from (n, k) to (n, k + 1). The number of idle nodes per meter in activity regions is given by φ − n/_ (n) − k/R, Where _(n) denotes the average lengths of the activity regions. Thus, the number of idle nodes within activity Regions can be written as (φ − n/_ (n) − k/R) _ (n). We note that no message buffering is considered in this paper and new messages that were generated in transmitting nodes or nodes in a back off process are dropped. As a result, the rate of the messages that arrive at the MAC layer of the idle nodes in activity regions is given by λ0 (φ − n/_ (n) − k/R)_(n) messages per second.

A new message arrives at the MAC layer of a node in a nonactivity region and changes the state of the network from (n, k) to (n + 1, k). We note that there cannot be transmitting nodes in nonactivity regions. Thus, the number of idle nodes per meter in nonactivity regions can be written as φ − k/R. Because the average lengths of nonactivity regions in the network are given by R − _ (n), the number of idle nodes in nonactivity regions will be (φ − k/R)(R − _(n)). As a result, the rate of messages that are generated by the nodes in nonactivity regions is given by λ0 (φ − k/R)(R − _(n)).

A message transmission is completed, and the state of the network is changed from (n, k) to (n − 1, k). For n messages in transmission, this rate can be written as nμ.

A message back off is completed within the nonactivity regions, and the state of the network is changed from (n, k) to (n + 1, k − 1). The corresponding flow rate out of state (n, k) can be written as kβ/R(R − _ (n)). Example, for GF (2^8), if there are 200 vehicles in a cluster, the maximum coding overhead will be 200 Bytes, which is comparable to the message size of 200-500 Bytes.

Finally, the DSRC protocol is implemented in ns-2 which provides a more realistic simulation framework.

V. SIMULATION RESULT

In this section, we present realistic simulation results based on the introduced Nakagami channel model in the earlier section. The simulator is implemented using Mat lab based on the assumed channel and system model. Unlike the earlier sections, it is assumed that the erasure probability changes with distance. We assume 20 nodes are spaced horizontally with a spacing of 25m in a 500m road segment. Nodes are indexed from 1 to 20, in order, from left to right. A Nakagami channel model with the same parameter as previous section is utilized. All nodes broadcast with a channel rate of 12Mbps. The message size is 200 Bytes. The transmission power is assumed to be 20dBm for each node. The simulation results are averaged over 10000 runs. The loss probability $(1 - P_s(n))$ versus the node index can be seen in Fig. 4. It is observed that the SPCR loss probability of all nodes is almost the same.

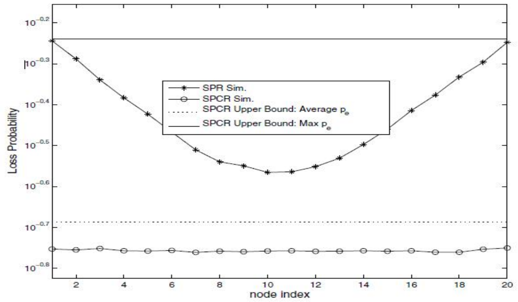

Fig. 2 Loss probability for all nodes: n = 20.

For SPR, the less probability is dependent on the location and is higher for all nodes. The location independent performance of SPCR is due to the cooperative nature of network coding.

To further evaluate the performance under a more realistic network model, SPCR and SPR have been implemented in the ns-2 simulator. Unlike the assumed channel model for our analysis in ns-2 some of the collisions can be resolved due to capture. The transmission power for every node is set to 760mw (Class D in the IEEE 802.11p standard) and the transmitter and receiver antenna gain is 2. The message size is 200 Bytes. The radio frequency, reception and carrier threshold have been set according to the IEEE 802.11p standard. A 4-lane road segment of length 500m and 1km is assumed. In each lane a vehicle is placed uniformly every d meters. Four traffic densities of 10, 15, 20 and 25 nodes per lane are assumed. is observed that SPCR can significantly benefit from the rate increase.

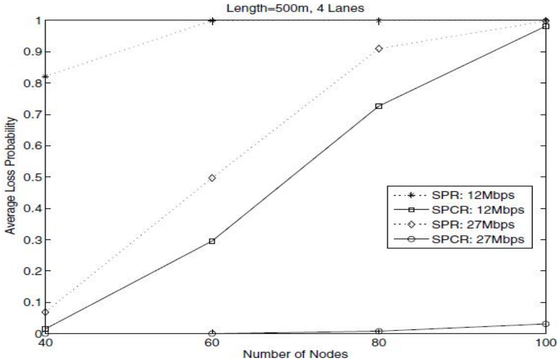

Fig.3.Expected loss probability vs. number of nodes

For example, for $n = 100$, in SPCR, by increasing the rate from 12Mbps to 27Mbps the average loss probability drops one order of magnitude in less than 0.05, while for SPR the average loss probability remains Unlike the SPR in which the additional transmission chance are not necessarily helpful for all the receivers, in SPCR, most of the receivers can advantage from the received coded message by expanding their sub space of receiving coded vectors.

The simulation results for the 1km road segment topology can be observed. Due to longer transmission ranges, channel quality is worse compared to the earlier topology. It can be seen that SPCR performance is robust.

It can be seen that SPCR performance is robust. To channel error and does not change significantly compared to the earlier topology. However, the SPR performance suffers from lower channel quality. For example, for 40 nodes and 27Mbps rate, the average loss probability increases to more than 0.56 from 0.08. This shows that network coding not only is effective in dense topologies, but also is robust to channel errors.

VI. CONCLUSION

The results provided within this paper are very promising and encouraging. We plan to continue working on ABSM in the vehicular context. We will address the degree of compatibility of the protocol with developing standards like DSRC. On the other hand, we are currently investigating how to further reduce the protocol overhead when there are multiple simultaneous broadcasting tasks, by means of probabilistic data structures to limit the size of the acknowledgment list in beacon messages.

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