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Reliable Multicast AODV Protocol for VANET Using Network Coding

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ABSTRACT

VANET is a major challenge now a days due to the high speed mobility, reliability and fast communication time are also major challenge in vehicular communication then our work proposed to the network coding. Random linear network coding is a particularly decentralized approach to the multicast problem. Use of random network codes introduces a non-zero probability however that some sinks will not be able to successfully decode the required sources. One of the main theoretical motivations for random network codes stems from the lower bound on the probability of successful decoding. So in Network coding instead of directly forwarding packet, here packets will be mixed and encoded over finite field like GALOIS field.

1.INTRODUCTION

Using network coding we can increase the reliability our network, In our technique we using Group Id, LAN ID, Node id, for identify node & the related area, when any car enter in the network then the main RSU allocates it's unique group id & that group id is not permanent when it will be pass through the another RSU, then another group id allocate it. Between two main RSU ,there are also small RSU are available & these RSU containing the message from car & buffer in it, and when it got the signal it will be transmit to another car for assigning group id , it's works same as a well as like a DHCP.

We transmit the message like infotainment & emergency, the infotainment message, store in RSU & when any car passing through that RSU range, then it will be multicast. That means this msg. multicast all nearest car which are comes to that's range. In this technique, we can also multicast our message, to opposite side LAN through this & we can also to decrease the load of RSU. & which msg. we multicast then it's contain to id, group id. If group id & ID match then Using network coding we can directly to decrypt the packet node.

If group id not match then that node or car will carry that msg. up to that id will not match that car also this msg. transmit to RSU using this. In multicasting there is no intermediate node comes for transmission msg. so, every packet contain the information of encryption & decryption, for this technique we finally using the random liner network coding.

1.1 PROBLEM DEFINITION

To develop a reliability aware network coding based protocol to deliver information in VANET. Also to reliable content from others in VANET. DTN which connectivity is prime issue, so this problem will network coding then packet needs to the guarantee reliability. Finally the works for using network coding where the sending encrypted packets to other finite field to provide Reliability.

1.2 PROPOSED SYSTEM

In this Existing system there is no work done that investigates the throughput, reliability and other quality-of-service (Quos) parameters in multicasting so for that make a protocol for VANET using network coding that increase the reliability of multicasting and also increase throughput of network. In this techniques using Group ID, LAN ID, Node ID.

Then Network Coding for Reliability, techniques for vehicle to vehicle and vehicle to Infrastructure to getting the maximum enhanced throughput using Network coding. And end to end fast reliable message transfer. In this scheme multicast the message to opposite side LAN vehicle & infrastructure & decrease the load of RSU. If group id match then using network coding we can directly to decrypt the packet node. & not match then node will be carry that message transmit to RSU. In multicasting there is no intermediate node comes for transmission message so, every packet contain that information of encryption and decryption for this techniques we finally using the random linier network coding.

2.LITERATURE SURVEY

The vehicular wireless networks are significantly different from the wireless *ad-hoc* networks that are implemented and deployed for the infrastructure-less environments. Firstly, the vehicles have far greater energy/power supply than normal mobile devices, as often energy can be derived from the vehicle itself. Secondly, given the size of the vehicle, a large number of sensors can be fitted onto the vehicles. This is particularly significant in case of having an intelligent transportation system with safety, security, communication, infotainment and other services deployed. Thirdly, the vehicles usually travel at high speeds and thereby have great difficulty in consistently maintaining vehicle-to-vehicle connectivity. Finally, unless there is a heavy investment in upgrading the current infrastructure, the vehicles are most often few hops away from BS or access points (AP). However, in order to have fixed access points to cover all roads at short distance one from another, huge and expensive investment is required, which is practically impossible. Hence, there is a need to design and develop novel methods to enable vehicular wireless network support for the above requirements.

2.1 NETWORK CODING-BASED RELIABLE MULTICAST [12]

Based on the above observations, we aim to design an efficient coding-based reliable multicast scheme which performs the packet coding with the general coding operations and can effectively exploit the packet overhearing between different local groups. Below we discuss the details of our network coding-based reliable multicast scheme.

A.NODE OPERATION

The broadcast nature in wireless medium creates many opportunities for nodes to overhear packets when they are equipped with Omni-directional antennae. In our scheme, the net work nodes are set in the promiscuous mode and snoop all communications over the wireless medium, such that the node of one local group can overhear the packets transmitted from the source of another local group.

2.2 NETWORK CODING [16]

Consider a system that acts as information relay, such as a router, a node in an ad-hoc network, or a node in a peer Ties are broken arbitrarily. The algorithm results in the client requesting all of the blocks of the file from the servers such that the cost is minimized. As mentioned earlier, in this paper the cost function is hop distance. Therefore, the closest server is contacted first and as many blocks as are available are downloaded from it. If more blocks are required, the next closest server is contacted, and so on. This is illustrated fig 2.4. In the figure, Node *A* is attempting to download a file which consists of 60 blocks. Node *B*, within 1 hop, is contacted first and 20 blocks are requested from it, since those are all the blocks *B* has. Node *C*, 2 hops away, is then contacted, and 30 blocks are requested from it. Finally, node *D*, which is 3 hops distant, is contacted. Only 10 blocks remain, and so 10 blocks are requested from *D* instead of the 20 it has available. The unlabeled nodes do not have any blocks of the file. It may happen that due to client, server, or intermediate node mobility, or the receipt of too many non–innovative blocks, a client may not be able to download the entire file as expected. In this event, the client repeats the search query to get an updated list of servers and costs, and then re-runs the algorithm, but leaves the counter, *b*, as is. This allows the client to obtain the remaining number of blocks required.

2.3 WHAT ARE THE BENEFITS OF NETWORK CODING?[17]

Theoretically proven results about network coding mainly concern performance improvements in static settings. We review these first and then discuss random distributed settings.

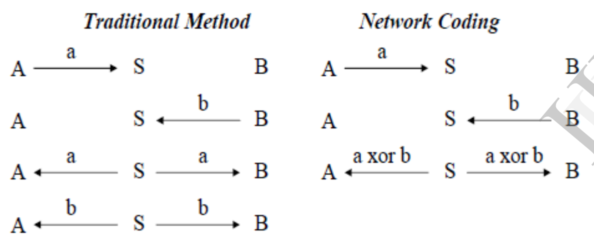

Figure 2.1 A simple network coding example. [16]

A.THROUGHPUT GAIN IN STATIC ENVIRONMENT

A primary result that sparked the interest in network coding is that it can increase the capacity of a network for multicast flows. More specifically, consider a network that can be represented as a directed graph (typically, this is a wired network). The vertices of the graph correspond to terminals, and the edges of the graph correspond to channels. Assume that we have *M* sources, each sending information at some given rate, and *N* receivers. All receivers are interested in receiving all sources. Theorem 1. [21, 22] Assume that the source rates are such that, without network coding, the network can support each receiver in isolation (i.e. each receiver can decode all sources when it is the only receiver in the network). With an appropriate choice of linear coding coefficients, the network can support all receivers simultaneously. In other words, when the *N* receivers share the network resources, each of them can receive the maximum rate could hope to receive, even if it were using all the network resources by itself. Thus, network coding can help to better share the available network resources (Figure 2.4). Network coding may offer throughput benefits not only for multicast flows, but also for other traffic patterns, such as unicast.

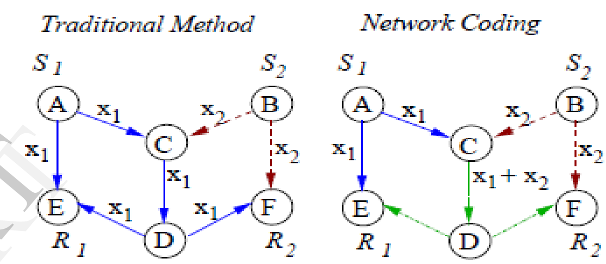

Figure 2.2 (Butterfly Network) *S*1 and *S*2 multicast to both *R*1 and *R*2. [17]

source *S*1 transmits to destination *R*2 and *S*2 to *R*1. With network coding we can send rate 1 to each receiver, while without, we can only send rate 1⁄2 to each receiver. There exist directed graphs where the throughput gains of network coding for multicasting can be very significant [21, 6]. However, in undirected graphs (e.g., a wired network where all links are half-duplex) the throughput gain is at most a factor of two [17]. Experimental results in [20] over the network graphs of six Internet service providers showed a small throughput gain in this case. "Multicommodity flow problem"). An interesting point is that network coding allows to achieve the optimal throughput when multicasting using polynomial time algorithms. In contrast, achieving the optimal throughput with routing is NP-complete: this is the problem of packing Steiner trees in CS theory. Thus, even

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when the expected throughput benefits of network coding are not large, we expect to be able to achieve them using "simpler" algorithms. We expand on this point in the following.

B. ROBUSTNESS & ADAPTIBILITY

The most compelling benefits of network coding might be in terms of robustness and adaptability. Intuitively, we can think that network coding, similarly to traditional coding, takes information packets and produces encoded packets, where each encoded packet is "equally important". Provided we receive a sufficient number of encoded packets, no matter which, we are able to decode. The new twist that network coding brings, is that the linear combining is performed opportunistically over the network, not only at the source node, and thus it is well suited for the (typical) cases where nodes only have incomplete information about the global network state. Consider again Figure 2.5 and assume that *A* and *B* may go into sleep mode (or may move out of range) at random and without notifying the base station *S*. If the base station *S* broadcasts *a* (or *b*), the transmission might be completely wasted, since the intended destination might not be able to receive. However, if the base station broadcasts *a* xor *b*, or more generally, random linear combinations of the information packets, the transmission will bring new information to all active nodes.

3.SYSTEM DESIGN

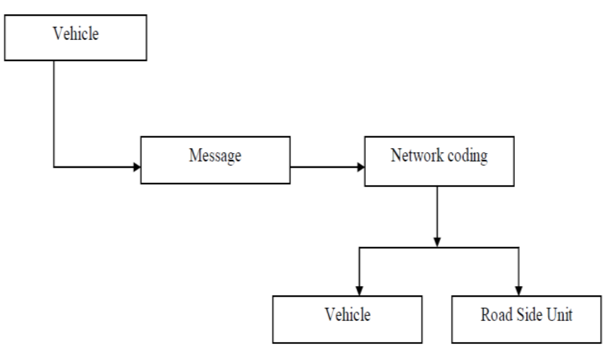

Fig. 3.1 System Design

3.1 PROPOSED ALGORITHM

Procedure ()
Enter in WAVE network
Allocate dynamic group_id for zone wise
Allocate dynamic lane_id for particular lane

1. If node_id = source_id
    group_id ← RSU_id
    Send_Procedure ()
    {
        Creates N Packets
        Call_Network Coding (N)
        Set Destination_id ← Destination Group_id;
        Send ()
    }

2. If node_id = intermediate node
    {
        Call_Network Coding (N)
        Forward ()
    }

3. If node_id = Destination_Node
    {
        Call_Network Decoding ()
    }

End Procedure

3.2 IMPLEMENTATION THEORY

In this research work there are three modules are there

1)Vehicle generator
2)Network coding
3)Simulate NC in existing AODV protocol

Using network coding we can increase the reliability our network , In our technique we using Group Id , LAN ID , Node id , for identify node & the related area , when any car enter in the network then the main RSU allocates it's unique group id , & that group id is not permanent when it will be pass through the another RSU , then another group id allocate it. Between two main RSU , there are also small RSU are available & these RSU containing the message from car & buffer in it, and when it got the signal it will be transmit to another car for assigning group id , it's works same as well as like a DHCP. We transmit the message like infotainment & emergency, the infotainment message, store in RSU & when any car passing through that RSU range, then it will be multicast. That means this msg. multicast all nearest car which are comes to that's range. In this technique, we can also multicast our message, to opposite side LAN through this & we can also to decrease the load of RSU. & which msg. we multicast then it's contain to id , group id. If group id & ID match then Using network coding we can directly to decrypt the packet node. If group id not match then that node or car will carry that msg. up to that id will not match that car also this msg. transmit to RSU using this. In multicasting there is no intermediate node comes for transmission msg. so, every packet contain the information of encryption & decryption, for this technique we finally using the linier network coding.

3.3 PACKET STRUCTURE

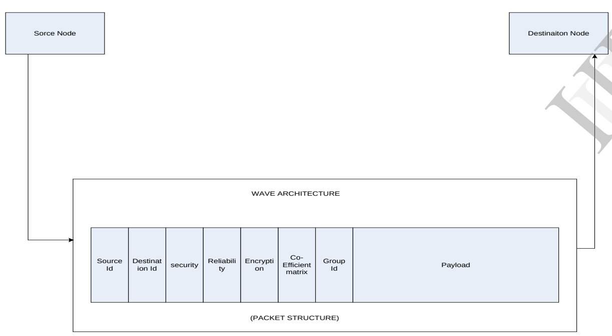

Fig.3.2 Packet Structure

Above the system Architecture there are two nodes first one is the source node and the second is the Destination node, When Source node are send any Information or messages to the destination that will be process into WAVE (Wireless Access Vehicular Environment) architecture there will be define as the packet structure and this contain Source ID, Destination ID, Security, Reliability, Encryption, Co-efficient Matrix, Group Id and Payload.
When Destination node Receive the message, according to packet structure it performs the decoding and getting the reliable message.

4.SIMULATION RESULT:

To analyze the effect of mobility, pause time was varied from 0 seconds (high mobility) to 100 seconds (low mobility). The number of nodes is taken as 50 and the maximum number of connection as 20. Graphs shown in Fig. 3.4 show the effect of Mobility for DSDV, DSR and AODV protocols with respect to various performance metrics.

4.1 PACKET DROPPED

Pause time (sec)	Packets Dropped		
	DSR	DSDV	AODV
0	2804	4318	2327
10	2269	4223	1883
20	719	2205	691
30	147	1897	583
40	768	2565	782
100	385	735	884

Table- 1 Time Vs Packets Dropped

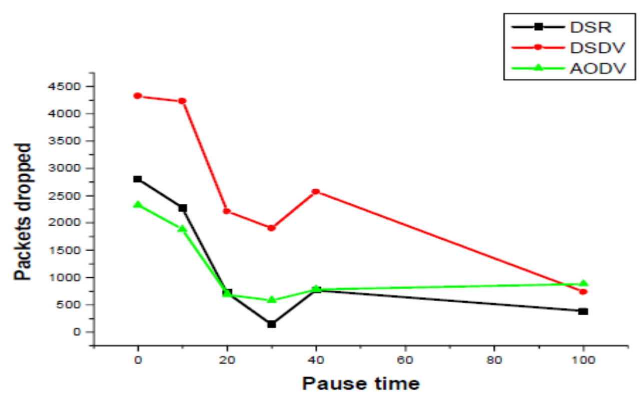

Fig. 3.3 Pause Time Vs Packets Dropped

DSDV performs poorly as it is dropping more number of packets at high mobility. Each packet that the MAC layer is unable to deliver is dropped since there are no alternate routes. Both DSR and AODV allow packets to stay in the send buffer for 30 seconds for route discovery and once the route is discovered, data packets are sent on that route to be delivered at the destination. If route fails, both DSR and AODV find new path within 30 seconds there by minimizing the possibility of packet drop.

4.2 IMPLEMENTATION OF NETWORK CODING

```
Enter 1 for encoding
Enter 2 for decoding
Enter your choise:1
Enter how many packets you want to encode:7

Generated Information:
2,4,6,8,10,12,14,
Encoded packets are:[119,49,217,46,104,147,76,]
Vectors are:
41 35 190 132 225 108 214
174 82 144 73 241 241 187
233 235 179 166 219 60 135
12 62 153 36 94 13 28
6 183 71 222 179 18 77
200 67 187 139 166 31 3
90 125 9 56 37 31 93

Continue(Y/N):y
```

Here we choose which function we have to do according to that the randomly packet will be generated that packet will be multiply by same as the size of packet with random [n*n] matrix.

5.CONCLUSION

As VANET is an Emerging Area in which prime focus on Reliability so, that can be resolve by Network coding which can maximize bandwidth. Hence it can be simulated in AODV. Up to this related papers studied & find out the problem definition for this optimize multicasting based routing protocol use AODV protocol and as per our proposed algorithm, then changes in AODV protocol & stimulate this result for checks Reliability and throughput of multicasting.

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