Performance Measure of Broadcasting Protocol for VANET's Safety Application

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***Abstract*— We study the wireless communication among highway vehicles in the 5.9 GHz Dedicated Short Range Communication (DSRC) spectrum. A vehicle to vehicle Location-Based Broadcast (LBB) communication protocol is one of the broadcasting protocols comes under the DSRC spectrum. An analytical model for the analysis of broadcast services in the LBB protocol is need to be proposed to have an effective communication. The analysis is done with reference to the parameters like jitter, throughput and delay to meet the highway safety applications. The network scenario is set for the simulation to obtained the better results. In this paper, the pre- analysis work is shown .**

***Index Terms*— DSRC, location based broadcasting, Reliability, VANET**

I. INTRODUCTION

A **vehicular ad hoc network** (**VANET**) uses cars as mobile nodes in a MANET to create a mobile mesh. A VANET turns every participating them into a wireless router or node, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide area. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a mobile Internet is created.

DSRC (Dedicated Short Range Communications) is a short to medium range communications service that affirms both public safety and private operations in roadside to vehicle and vehicle-vehicle communication environments. A spectrum of 75 MHz width at 5.9 GHz was newly assigned by Federal Communication Commission (FCC) to DSRC. Figure 1 shows the VANET network scenario.

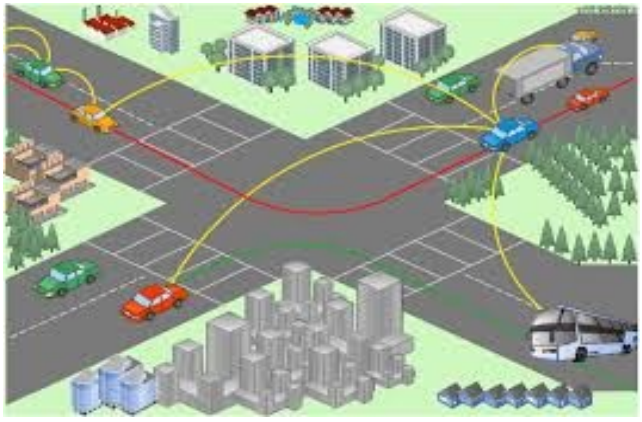

Figure 1

Location Based Broadcasting Protocol :-

In the most general sense, the vehicle to vehicle communication in DSRC could be categorized as Location-Based Broadcast LBB and unicast. This paper is focused on the analysis of LBB protocol. In Location Based Broadcast [4], sender broadcasts messages to all receivers in its communication range. It is the receiver's responsibility to find out the relevant message and the proper response. The decision is made on the basis of the relative position of the sender (e.g. in front, behind, left lane, distance, etc.), the purpose of the message(e.g. brake warning, lane change warning, accident reporting, congestion prediction, etc.), as well as the highway traffic environment.

To realize LBB, wireless communication techniques must be integrated with other techniques such as Global Positioning System, Inertial Navigation System, digital map and radar. The LBB is the enabling technique for wide range of highway safety applications such as cooperative collision warning and emergency vehicle warning.

II. PREVIOUS WORK

Authors had designed the LBB protocol to meet highway safety application communication requirements. mathematical expressions of the performance of the protocol in terms of probability of transmission failure channel occupancy were derived with commonly satisfied assumptions . Authors had used the following table for the analysis of the protocol.

Message generation interval (msec)	100
Packet size (bytes)	200
Channel bit rate (mbps)	10
Interference range (m)	100
Average distance between vehicles (m)	30

Table 1

III. PROPOSED WORK

An analytical model for the analysis of broadcast services in the location based broadcasting protocol is proposed to have an effective communication.
The parameters which are to be analyzed are :-

1) Delay
2) Throughput

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3) Jitter

IV. DESCRIPTION OF PARAMETERS

1) Delay –
In a network based on packet switching, transmission delay is the amount of time required to push all of the packet's bits into the wire. In other words, the delay caused by the data-rate of the link. End-to-end delay is known as the time required for a packet to transmit across a network from source to destination.
Delay can be calculated as –

Delay = Sent packet time – Received packet time

2) Throughput -
In general , throughput is the rate at which something can be processed. When used in the networking, such as Ethernet throughput is the rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical medium, or it can pass through a certain network node. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second.
Throughput can be calculated as-

$$\text{Throughput} = \frac{receive\ packet}{time\ (kbps\ or\ mbps)}$$

3) Jitter -
Jitter is an undesirable effect caused by the inherent tendencies of TCP/IP networks and components. Jitter is defined as a variation in the delay of received packets. The sending side transmits packets in a continuous stream and spaces them evenly apart. Because of network traffic, improper queuing, or configuration faults, the delay between packets may vary instead of remaining constant. This variation causes problems for audio playback at the receiving end.
Jitter can be calculated as –

Jitter = delay – mean delay

V. EXPERIMENTAL SETUP

The experiment is simulated in the network simulator (NS2). The simulation parameters are as given in the following table.

Network size (meters)	300×300
Routing protocol	AODV
Number of mobile nodes (no. of vehicles)	30
Packet size (bytes)	1000
Packet interval(sec)	0.07

With the help of above parameters the LBB scenario is created and simulated. Following are some simulation scenario for location based broadcasting.

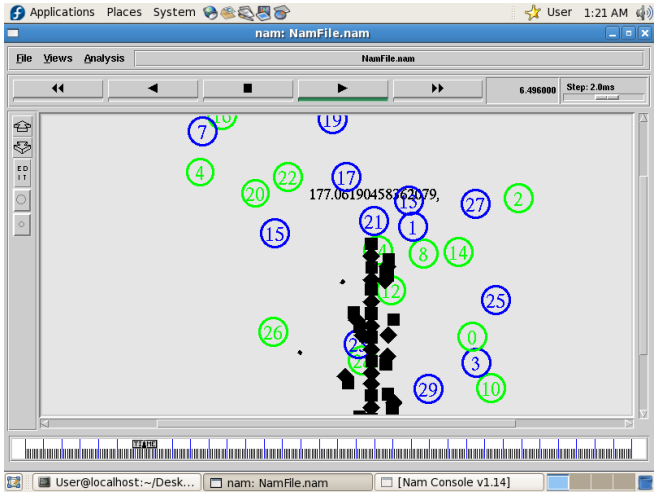

Figure 2

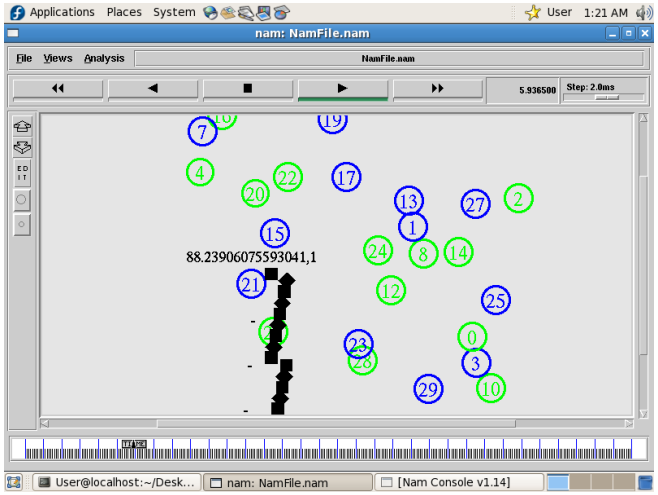

Figure 3

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Not Broadcasting at location 211.26602124947402,248.01913991012572
Location based broadcast between 20->26 started at location 102.87859598308737,1
80.56268774930513
Location based broadcast between 20->22 started at location 82.094215872741415,5
7.486173164791509
Location based broadcast between 20->17 started at location 78.781599308728048,1
82.33958179240096
Location based broadcast between 20->8 started at location 169.36432610701971,10
6.22888068027277
Not Broadcasting at location 221.15133890004427,190.55289304375319
Not Broadcasting at location 110.20454615829723,7.8072825017419092
Not Broadcasting at location 168.6928888637074,221.38313232985473
Location based broadcast between 20->19 started at location 129.27565939225053,1
36.0074055548792
Not Broadcasting at location 49.958479520845451,252.16530684948216
Location based broadcast between 20->4 started at location 141.46887485006306,16
7.37960500986296
Location based broadcast between 20->5 started at location 102.68268967172256,18
7.96531264109785
Location based broadcast between 20->13 started at location 191.65696110187889,7
8.545239278369223
Location based broadcast between 20->11 started at location 122.92192826183602,1
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Figure 4

Above figures 2 & 3 shows the nodes (vehicles) are having communication . One of the nodes is broadcasting and the location of the that node is also shown. The location of other nodes can also be shown. When the node (vehicle) reaches at a particular location the it starts broadcasting.
Figure 4 shows the record of location based broadcast between vehicles at different locations.

VI. CONCLUSION

The Location Based Broadcast(LBB) protocol and its parameters on which the analysis can be done is discussed in this paper. The system reliability can be increased by the

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mathematical analysis of the protocol. It is important to increase the reliability of system to enhance the broadcast services of the LBB protocol to meet the highway safety application.

VII. FUTURE WORK

The parameters delay, throughput and jitter will be analyzed with the help of graphs.

VIII. REFERENCES

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