An Efficient data Transmission in VANETs using AODV Routing Protocol

[1]R. Jeevitha, [2]M. Chandra Kumar

Abstract

Recently the study of VANETs has become a popular research topic in the area of wireless networking. In today's affair the number of vehicles has been increased in the past few years. Traffic accidents and highway congestion are the serious problems considered world-wide. Recent technological advances in wireless communication led to the development of a decentralized communication system, the Vehicular Ad Hoc Networks (VANETs.) VANET was raised in the maintenance of road safety. VANET facilitates communication between vehicles to vehicles. In this paper, we prefer Manet routing protocol namely AODV in Vanet Applications for Efficient communication between the Vehicles. We evaluate various QOS metrics such as Throughput, and End to End Delay to ensure that AODV routing protocols can communicate effectively without higher rate of packet loss.

Keywords : VANET, Manet, Packet loss

I. Introduction

Wireless communication technologies are becoming increasingly available and inexpensive. Users are becoming connected nearly anytime and anywhere: at work, at home, and even on roads. In addition to the cellular networks and wireless local area networks (WLANs), vehicular ad hoc networks (VANETs) promise Intelligent Transportation Systems (ITS) new attractive and cost effective services that can definitely benefit users (drivers and passengers). In VANETs, vehicles or nodes, are equipped with wireless communication devices that create wireless links between these nodes [1].

A node (vehicle) can send data directly to another node (vehicle) which is located within its transmission range, without depending on an expensive fixed infrastructure. A node can also send data to another node that is not located within its transmission range with the help of intermediate nodes, forming a process of multihop message routing.

Message routing is a challenging problem in VANETs due to the inherent high degree of mobility of a large number of nodes. To enable message routing, the source node should be able to locate the destination node (node localization), and it can build a reliable route towards the destination node [2] [3].

VANETs can provide a viable alternative in situations where existing infrastructure communication systems become overloaded, fail (due for instance to natural disaster, or inconvenient to use. The way, messages are routed between sources and destinations is considered to be very important. Without an effective

[1]Research Scholar, Department of Computer Science, Bharathiar University, Coimbatore, India
[2]HOD, Department of Computer Applications, SNMV College of Arts and Science, Coimbatore, India

message routing strategy VANETs' success will continue to be limited. In order for messages to be routed to a destination effectively, the location of the destination must be determined. Since vehicles move in relatively fast and in a random manner, determining the location (hence the optimal message routing path of (to) the destination vehicle constitutes a major challenge.

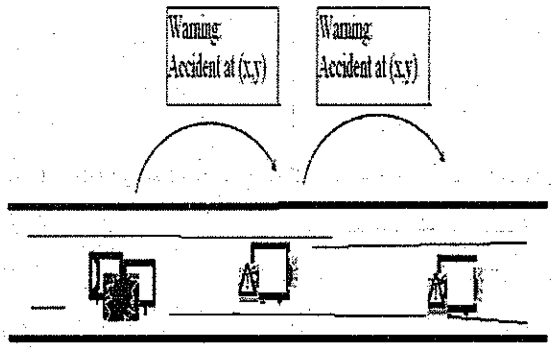

Figure. 1. (Explains the usefulness of VANET in real road scenario.)

If an accident warning can be sent to cars approaching the accident region, it would allow the drivers to take preventive measures and avoid disaster. This would surely decrease the number of accidents on the road.

II. Clustering of Nodes in Vanet

VANET is a subset of MANET. The technology and protocols for MANETs need to be evaluated carefully so that it can be used in VANET environment. MANET and VANET are mobile networks but they mainly differs in the mobility pattern of VANET nodes. In VANET the nodes are car having sufficient storage capacity and high processing power whereas MANET nodes lack in storage and processing power.

Cluster concept has successfully been applied in MANET for a better delivery ratio and to reduce broadcast storms. Cluster-based solutions provide less propagation delay and high delivery ratio. Clustering can simplify such essential functions as routing, bandwidth allocation, and channel access. The updates and the queries of nearby nodes are aggregated in one control message. Distinct groups of nodes called clusters are formed based on their geographical locations [9]. Each cluster will have a cluster head. The nodes in each cluster will communicate with the cluster head and the cluster head will transmit the message to base stations or road side units.

III. Simulation Scenario

Ns-2 is extensively used by the networking research community. It provides substantial support for simulation of TCP, routing, multicast protocols over wired and wireless (local and satellite) networks, etc. The simulator is event-driven and runs in a non-real-time fashion. It consists of C++ core methods and uses Tcl and Object Tcl shell as interface allowing the input file (simulation script) to describe the model to simulate [4].

Table 1.0 Simulation parameters

Parameter	Values
Number of nodes (Vehicles)	30
Scenario	Urban, Highway
Traffic Type	TCP
Data Type	CBR
Speed of Vehicles	50 kmph for Urban & 40 Kmph for Rural Areas
Performance Metrics	Throughput ,End to End delay

A. Simulation Parameters:

To evaluate the performance of AODV routing protocol, the following metrics are considered.

1) Throughput:

The total amount of data a receiver R actually receives from the sender divided by the time it takes for R to get the last packet.

Throughput:T~ (1/RTT)*sqrt(3/2p)

Where, RTT= Round Trip Time (in seconds)
P= packet loss rate (fraction)

2) Average End-to-end delay:

End-to-end delay indicates how long it took for a packet to travel from the source to the application layer of the destination. So, Average End-to-end Delay is calculated as:

Avg. End-to-End Delay (e) =Td-Ts

Where, Td = Time when packet received at destination.
Ts=Time when packet created by source.

B. Simulation Result and Analysis

Scenario 1: Urban

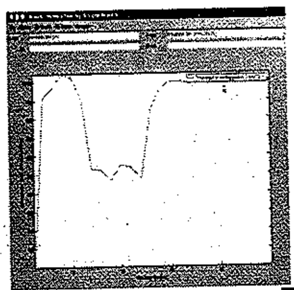

Figure. 2.
Throughput

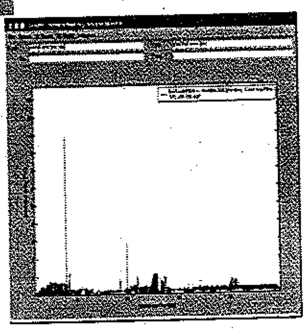

Figure 3.
End to End Delay

The Throughput for Urban Area Scenario is very high. In the graph, variations are seen in between because of node movement from one geographic area to other geographic area. Peak curve tells that the node clustering has occurred. The End to end delay is very less.

Scenario 2: Highway

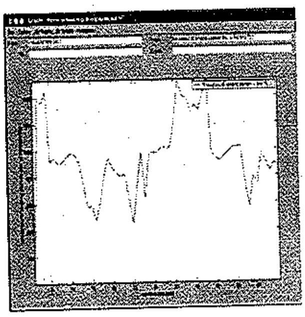

Figure. 4.
Throughput

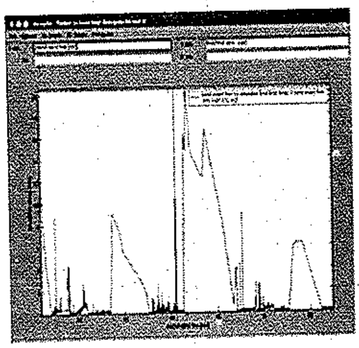

Figure 5.
End to End Delay

The Throughput for Highway Scenario is less. Throughput will be higher only if similar nodes enter a particular geographic area and cluster. End to end delay will be less due to mobility of large number of nodes.

IV. Conclusion And Future Works

In this paper we have evaluated the Manet Routing protocol (AODV) which reduces the Packet Loss in Vanet Environment. It is implemented both in rural and urban areas. The usage of AODV routing algorithm provides efficient means of communication among the vehicles during the transportation. Our

Future works can be extended of implementing Multicast routing in Vanet Environment.

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AUTHORS BIOGRAPHY

R. Jeevitha is currently pursuing her Master of Philosophy in Computer Science in Bharathiar University, Coimbatore, India. Her field of interests include Mobile Computing and Computer Networks. She has seven Publications in International Journals to her credit. She has also presented three papers in International Conference and five papers in National Conferences.

M. Chandra Kumar is currently working as the Head of Computer Applications Department in SNMV College of Arts and Science, Coimbatore, India. He has more than 14 years of Experience in Teaching. His field of interests include data mining. He has more number of Publications in International Journals to his credit. He has also presented papers in International and National Conferences. He is currently guiding 5 M.Phil Scholars.