Survey and Performance Analysis of Multipath Routing Protocol for Emergency Services in VANET: Design Approach

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Abstract- **With increasing demand of communication, it is of great necessity to maximize the utility of VANETs (Vehicular Ad-hoc Networks) especially in the context of high mobility network. The efficient routing protocol is required for reliable communication to be established between source to destination node in a network. In existing protocols like Adhoc on Demand Distance Vector (AODV) and Adhoc On Demand Multipath Distance Vector(AOMDV) it has been observed performance of the above protocol changes with the variation in high mobility network and parameters get affected accordingly. In such scenario congestion and load on each node keep increasing. In our work we identify how to control traffic load on populated network and to effectively provide alternate path in emergency rescue applications like Ambulance, Fire Brigade, Police vehicle etc.The multipath protocols (AOMDV) have a relatively greater ability to reduce the route discovery frequency than single path protocols (AODV).In this work multipath routing Protocol (AOMDV) separates the traffic among different paths to minimize congestion in terms of alternate paths through a network which can provide a variety of benefits such as minimize average delay, packet loss ratio , congestion and maximize packet delivery ratio and improved throughput. In this proposed work network simulate through all routing parameter to improved performance of the existing system.**

Keywords-VANET,AODV,AOMDV,Emergency Services.

I. INTRODUCTION

In recent research, vehicular communication networks are a promising and emerging technology to facilitate road safety, Safety of life, and traffic management in emergency rescue applications. Vehicular Network is one of the most growing types of wireless network. In such system lot work is being done. Traffic congestion is the most annoying thing that any driver in the world dreaming of avoiding it, a lot of mobile vehicles under network may undergo problems that must be reported to other vehicles or to near by base station (BS) to avoid traffic overcrowding. Today Routing is one of the core problems for data exchange between Vehicles in Vehicular Ad hoc Network (VANET). Many routing protocols have been proposed for wireless networks.

In [1], authors focuses on survey of various routing protocol for VANETs in city environment. This paper shows mobility model varies from highways to that of a city environment. Many routing protocols have been proposed for communication between vehicles in a city environment. Road based routing protocols have been classified into three types namely, Rural, Highway and Urban.

In wireless scenarios, routes are broken due to node movement. Also, the wireless links used for data transmission are inherently unreliable and error prone. Therefore, multipath routing protocols are used to overcome the disadvantages of shortest path routing protocols. Multipath routing protocols are used to increase the reliability (by sending the same packet on each path) and fault tolerance (by ensuring the availability of backup routes at all times). It can also be used to provide load balancing, which reduces the congestion on a single path caused by busty traffic [2].

In [4], authors propose an algorithm which excludes nodes with high mobility from constructing a path by collecting and managing the information of mobility. As the result, the proposed algorithm provides more stable paths. The performance of the proposed protocol is analyzed, and it is compared with the existing AOMDV by using the ns-2 simulator**.**

In our work new protocol is presented based on the existing protocols AODV and AOMDV which will be more reliable. In this article we are much more concerned about the existing system drawback and to overcome them in our network under design with the new routing protocol for emergency services. Here the network under design comprises of50 nodes randomly distributed over the network that communicates with them over a wireless channel with Wi-Fi network using NS2. The performance of AODV and AOMDV protocols decreases as the traffic increases due to increase in number of hops from source to destination node. This proposed protocol reduces the demerits of available protocols through the alternate path and increases the performance of different parameters routing to destination node.

II. MOTIVATION OF OUR WORK

Now a day's some vehicles on road are in need of special attention. Today the increased in traffic jam is not only the problem to be controlled but also some services which has to be overcome in such situations are in demand. In emergencies some vehicles on road are in need of immediate assistance from surrounding high speed network to make through the heavy traffic jam from source to destination. Such vehicles want to reach safely to the desired destination with minimum loss of time.

So to accomplish the requirement of special services we are going to design a network which will not take care of such services but also to make them reach safely on time. In proposed work we have a need of such a high speed reliable network with minimum chances of failure in emergency applications, that can send the packet from multiple paths by which if part of data is dropped at any path, it will never cause loss at the end when it being assembled since it will reach from other alternate path in network and provide congestion free communication.

III. AIM AND OBJECTIVE

Our aim is to design an efficient network to control the congestion on various points to overcome the problem of over crowding which may affect the performance of the network. In our proposed work,

we are going to use vehicle to vehicle (V2V) communication and vehicle to infrastructure (V2I) or road side units (RSUs) communication in urban VANET as shown in Fig.1 and simulate our result in different traffic pattern. For V2V and V2I communication suitable routing protocols are needed. Routing is one of the most critical issues where, the established route should be the most reliable one among all other routes to the destination. Our aim is to design new multipath routing protocol to determine the effect of various traffic scenarios on modified routing protocol and compare the performance in metrics of packet delivery ratio, throughput, packet loss ratio, routing overhead and energy of original AOMDV protocol with new multipath routing protocol.
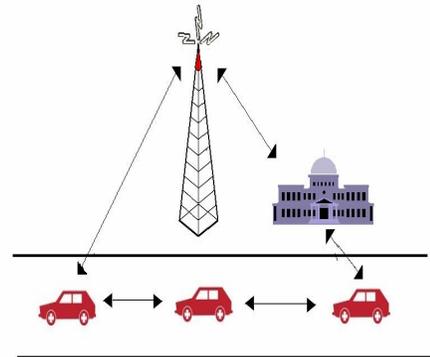

Fig.1: V2V and V2I communication.

IV. PROBLEM STATEMENT

In previous related work lots of changes has been done in regard of traffic control using AODV and AOMDV protocol but in our approach we are using it to modify and obtain the results comparatively better using multipath routing protocol in terms of minimum routing overhead and maximum traffic control in a situation of emergency services in VANET. This is very first time we are going to work on an application based protocol for VANET using network simulator (NS-2).

For this purpose our design protocol will find the shortest possible alternate path to destination and reduces end to end delay in network which will clear

the emergency vehicle to specified destination. To design and create a improvised AWK file like throughput, routing overhead, energy, packet delivery ration (PDR) and packet loss ratio (PLR) inbuilt onto the NS-2 after that we create TCL script for invocations of the internal module and analyze the behavior of our network through trace analysis file and network animator file.

V. PROPOSED METHODOLOY

Most of the protocols supports only single path to destination node like AODV. Such Protocols has poor performance in VANET. In our proposed design we are using AOMDV protocol to overcome the problem of AODV. This multipath protocol will find alternate path to destination when one of dedicated node to destination has failed. As the data transfer to destination node completed, then nodes in the network channel will free the node and ultimately it will reduce the traffic congestion. Therefore a protocol which utilizes the complete available resources of VANET for data transfer via multiple paths to destination node in minimum possible time is required to avoid the traffic congestion in a network.

The proposed protocol has the following features:

- The nodes in the network have been randomly distributed and the protocol will try to locate the shortest reliable path from source to destination. This feature will bypass the failure node and locate the node which will provide an alternate path to destination in emergency and make more stable routes.

- This protocol will utilize all the possible paths from source to destination node without fail in case of emergency. The active link remains available for a certain time interval.

- The proposed protocol minimizes average delay, packet loss ratio and congestion which in turns maximize throughput and packet delivery ratio.

The operation of proposed protocol is shown in Fig.2.

Fig. 2 shows the proposed network with randomly distributed nodes. In this there are source node, destination node, near node, far node, failure route and reliable route from source to destination node. Just like AODV protocol, this Protocol also floods the request to each neighboring node but selects only nodes which are in reliable range. A reliable route means the node at the range neither far nor near to source node. If the node is busy or route fails it opts for the alternate path without much wasting time and selects the available path to reach the destination without fail. Here we are trying to reach the destination through alternate path and focused to improve the throughput and reduces end to end delay with maximize packet delivery ratio. In above network we have shown the possible path selected by our node in case of emergency to avoid congestion at a particular point. This lead us to improved AOMDV protocol in all respect by
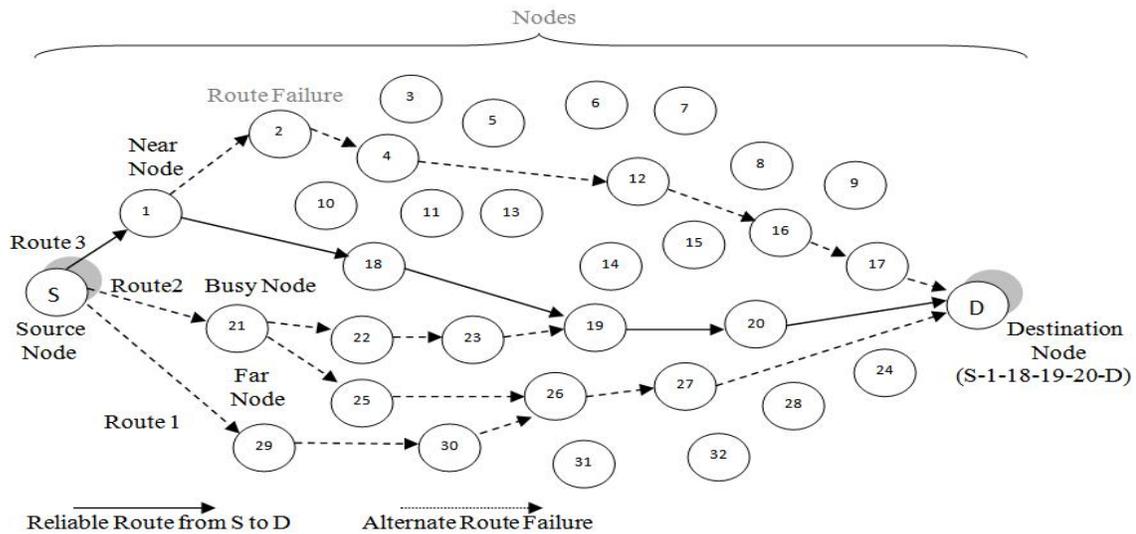

Fig.2.Multipath Routing Protocol operation for our proposed Network.

considering all the above discuss performance parameters of network in an application.

Some comparative result studied and observed from the routing protocol is listed in Table I in terms of various features associated with it.

Features	Routing Protocol	
	AODV	AOMDV
Multipath	No	Yes
End to End delay	High	Low
Reliability	Low	High
Functionality	Unicast	Unicast Multipath
Performance	Decreases with traffic	More than AODV
Mobility Support	Low	Comparatively High

Table I: Comparison of routing Protocol in VANET

Our research work is important for following purpose

➢ Our proposal design network with dynamic nature that causes to control congestion and provide best data delivery.
➢ In our proposed work under the multipath routing protocol provides fast and congestion free communication with load balance node.
➢ It's provides reliable as well as low overhead and increases throughput of the network.
➢ Our proposed network also minimizes the end-to-end delay because multipath routing protocol provides data delivery through more than one path in a network.

VI. IMPLEMENTATION STRATEGY AND PERFORMANCE EVALUATION

For implementation we will use Network Simulator 2 (NS-2). The description and Key features of Network Simulator toolbox are as follows:
The simulator is written in object oriented C++ and a script language called OTcl. NS uses an OTcl interpreter towards the user.C++ is fast to run but

slower to change, making it suitable for detail protocol implementation. This means that the user writes an OTcl script that defines the Network (number of nodes, links), the traffic in the network (sources, destinations, type of traffic) and which protocols it will use. This script is then used by ns during the simulations. The result of the simulations is an output trace file that can be used to do data processing (calculate delay, throughput etc.) It provide support for simulation TCP, routing and multicast protocol over all networks (Wired and Wireless). A simulator typically comes with a set of predefined modules and user-friendly GUI. Results of simulations can be visualized using the Network Animator nam. It provides a virtual environment for an assortment of desirable features such as modeling a network based on a specific criteria and analyzing its performance under different scenarios. According to below table II we simulate our network.

1.	Number of nodes	50
2.	Dimension of simulated area	1000×1000
3.	Routing Protocol	AOMDV
4.	Simulation time (seconds)	100
5.	Transport Layer	TCP ,UDP
6.	Traffic type	CBR , FTP
7.	Packet size (bytes)	1000
8.	Maximum Speed (m/s)	Random
9.	Initial Energy(Joule)	100
10.	MAC Layer	802.11

Table II: Simulation parameters

Performance Measure:

Packet Delivery Ratio: The ratio between the number of packets originated by the application layer CBR sources and the number of packets received by the CBR sink at the final destination.

End-to-end Delay (e2e delay): The average time of the data packet to be successfully transmitted across

the network from source to destination. This includes all the possible delays caused by buffering during route discovery, queuing at the interface queue, retransmission delays, and propagation and transfer times.

Network Load: The number of data packets transferred per second through the network .The total number of packets transmitted during the simulation. For packets sent over multiple hops, each transmission of the packet or each hop counts.

Average Throughput: Average TP is the number of bytes received successfully and the number of bytes successfully transferred to the destination during a specified amount of time(s).

Energy Consumption: It is estimated from the ratio of the number of nodes in the network versus the average consumed battery power by each node.

VII. CONCLUSION

In this paper work presented focuses on improvised AOMDV existing protocol and to relate the same with some specific application like emergency services. In our work we tried to analyze the major problem with AODV and to overcome that with AOMDV protocol. Here we have chose to improve the existing protocol with some of the parameters which have been taken into consideration while selecting desired path from source to destination. Unlike the referred protocols it will be faster and more reliable multipath protocol in case of any emergency with minimize delay, packet loss ratio and maximize throughput. Also this greatly reduces the routing overhead and energy caused by the route failure and discovery processes thus increases the network capacity.

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