INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

(Volume2, Issue5)

Available online at: www.Ijariit.com

Vehicular ADHOC Network Routing Improved Throughput by Flower Pollination Optimization Algorithm

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Abstract— VANET (Vehicular Ad-hoc Network) is a new technology which has taken enormous attention in the recent years. Due to rapid topology changing and frequent disconnection makes it difficult to design an efficient routing protocol for routing data among vehicles, called V2V or vehicle to vehicle communication and vehicle to road side infrastructure, called V2I. It is autonomous & self-organizing wireless communication network, where nodes in VANET involve themselves as servers and/or clients for exchanging & sharing information.

Keywords*— *Vanet, opprunistic network, DTN, throughput.

I. INTRODUCTION

Recently, many works have provided in-depth studies of the VANET environment, including realistic mobility and propagation models. (VANETs) has grown over the last few years, particularly in the context of emerging intelligent transportation systems (ITS). However, efficient routing in VANETs remains challenging for many reasons, e.g., the varying vehicle density over time, the size of VANETs (hundreds or thousands of vehicles), and wireless channel fading due to high motion and natural obstructions in urban environments (e.g., buildings, trees, and other vehicles).

VANET (Vehicular Ad-hoc Network) is a new technology which has taken enormous attention in the recent years. Due to rapid topology changing and frequent disconnection makes it difficult to design an efficient routing protocol for routing data among vehicles, called V2V or vehicle to vehicle communication and vehicle to road side infrastructure, called V2I. It is autonomous & self-organizing wireless communication network, where nodes in VANET involve themselves as servers and/or clients for exchanging & sharing information.

Characteristics of VANET

VANET has some unique characteristics which make it different from MANET as well as challenging for designing VANET applications.

1. High dynamic topology: The topology of VANET changes because of the movement of vehicles at high speed. Suppose two vehicles are moving at the speed of 20m/sec and the radio range between them is 160 m. Then the link between the two vehicles will last 160/20 = 8 sec.

2. Frequent disconnected network: From the highly dynamic topology results we observe that frequent disconnection occur between two vehicles when they are exchanging information. This disconnection will occur most in sparse network.

3. Mobility modelling: The mobility pattern of vehicles depends on traffic environment, roads structure, the speed of vehicles, driver's driving behavior and so on.

4. Battery power and storage capacity: In modern vehicles battery power and storage is unlimited. Thus it has enough computing power which is unavailable in MANET. It is helpful for effective communication & making routing decisions.
5. Communication environment: The communication environment between vehicles is different in sparse network & dense network. In dense network building, trees & other objects behave as obstacles and in sparse network like high-way this things are absent. So the routing approach of sparse & dense network will be different.
6. Interaction with onboard sensors: The current position & the movement of nodes can easily be sensed by onboard sensors like GPS device. It helps for effective communication & routing decisions.

ROUTING PROTOCOLS

The characteristic of highly dynamic topology makes the design of efficient routing protocols for VANET is challenging. The routing protocol of VANET can be classified into two categories such as Topology based routing protocols & Position based routing protocols.
1. Topology based routing protocols: Topology based routing protocols use link's information within the network to send the data packets from source to destination. Topology based routing approach can be further categorized into proactive (table-driven) and reactive (on-demand) routing.
2. Position based routing protocols: Geographic or Position based routing is a routing that each node knows it's own & neighbor node geographic position by position determining services like GPS. It doesn't maintain any routing table or exchange any link state information with neighbor nodes. Information from GPS device is used for routing decision.

Advantages of VANET

Public Safety ,Traffic Management, Traffic Coordination and Assistance, Traveller Information Support, Comfort, Air pollution emission measurement and reduction.

Disadvantages of VANET

Flooding in route discovery initial phase, Wasted band width, Delay, Increasing network congestion, External source for destination location, Bad performances for long distance between source and destination.

II. LITERATURE REVIEW

In [1] Mohammad Al-Rabayah and Robert Malaney: In this paper, they propose a new hybrid location-based routing protocol that is particularly designed to address this issue. Our new protocol combines features of reactive routing with location-based geographic routing in a manner that efficiently uses all the location information available. The protocol is designed to gracefully exit to reactive routing as the location information degrades. They show through analysis and simulation that their protocol is scalable and has an optimal overhead, even in the presence of high location errors. Their protocol provides an enhanced yet pragmatic location-enabled solution that can be deployed in all VANET-type environments.
In [2] Bijan Paul et al: In this paper the author presents the pros and cons of VANET routing protocols for inter vehicle communication. The existing routing protocols for VANET are not efficient to meet every traffic scenarios. Thus design of an efficient routing protocol has taken significant attention. So, it is very necessary to identify the pros and cons of routing protocols which can be used for further improvement or development of any new routing protocol. Due to rapid topology changing and frequent disconnection makes it difficult to design an efficient routing protocol for routing data among vehicles, called V2V.
In [3] Mario De Felice et al: In this paper the authors introduces an application framework to handle multi-hop, multi-path, and dynamic environments and a routing protocol, the DBD (Distributed Beaconless Dissemination), that enhances the dissemination of live video flows on multimedia highway VANETs. DBD uses a backbone-based approach to create and maintain persistent and high quality routes during the video delivery in opportunistic Vehicle to Vehicle (V2V) scenarios. It also improves the performance of the IEEE 802.11p MAC layer, by solving the Spurious Forwarding (SF) problem, while increasing the packet delivery ratio and reducing the forwarding delay. Performance evaluation results show the benefits of DBD compared to existing works in forwarding videos over VANETs, where main objective and subjective QoE results are measured.
In [4] Neha Garg, Puneet Rani: In this paper, they have improved the performance of Ad-hoc on Demand Distance Vector (AODV) routing protocol by using some parameters i.e. Active route time outs and hello interval to choose the best path for routing and compared the proposed AODV protocol performance with Normal AODV in terms of different performance metrics i.e. average throughput, average delay and average network load. They have used a simulation tool "OPNET Simulator v14.5" for performance evaluation. Results show that proposed AODV routing protocol has better performance as compared to normal AODV.
In [5] K. Wang et al: In this paper the authors build redundant transmission trees, although the topology is highly dynamic. This proposal is difficult to implement in opportunistic and dynamic VANET environments: stability and availability of communication links over time are critical issues when dealing with real-time multimedia applications and they become much more challenging when coupled with vehicular mobility and frequent lane changes. Besides the overhead required for maintaining the overlay networks, the

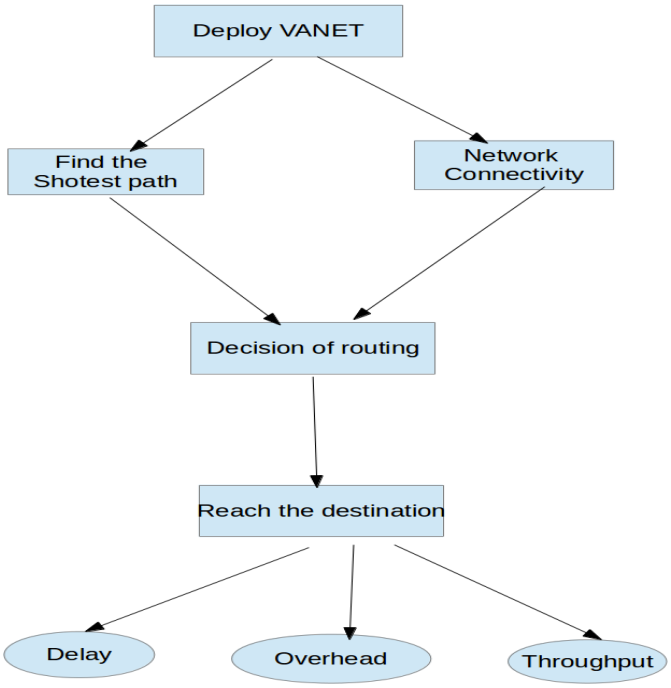
maximum bit rate considered is still somehow low for multimedia transmissions and the simulation study only takes into account a small amount of nodes (small-scale scenario).

In [6] F. Naeimipoor et al: The authors use several VANET approaches and compare them, like delay-based and network coding techniques, mixed with probability, trying to minimize the number of forwarding nodes and the final packet loss; still when the data rate increases, performance gets worst. Since the authors are discussing the performance evaluation of VANET protocols for video delivery they should have also included QoE results into the paper.

In [7] C. Rezende et al: The authors propose an opportunistic backbone-based geographic routing scheme for V2V video transmissions by using a Bayesian model for predicting where vehicles are going to be, so they can build the backbone by also considering such predictions. The relay node election is performed according to a delay-based fashion and, in order to tackle the broadcast storm problem, an additional safety delay is allowed. The idea is promising as a concept, but high data rates still results in a considerable degree of loss and decrease the video quality level.

In [8] M. Di Felice et al: The authors aim to build a backbone and they include several features in their design: the backbone is opportunistic, delay-based and it keeps into account the vehicles speed and direction in order to keep the backbone operative as long as possible. Also this approach uses beacons and ACKs. The authors provide several evaluation scenarios (traffic safety, video transmission, and audio streaming), so the study is interesting, but also in this case, the protocol requires beacons and general overhead messages to work. The main weakness of the current backbone-based routing protocols is that they do not consider the SF problem in their decision schemes, as well as they do not evaluate the quality level of the delivered videos based on QoE metrics.

III. METHODOLOGY

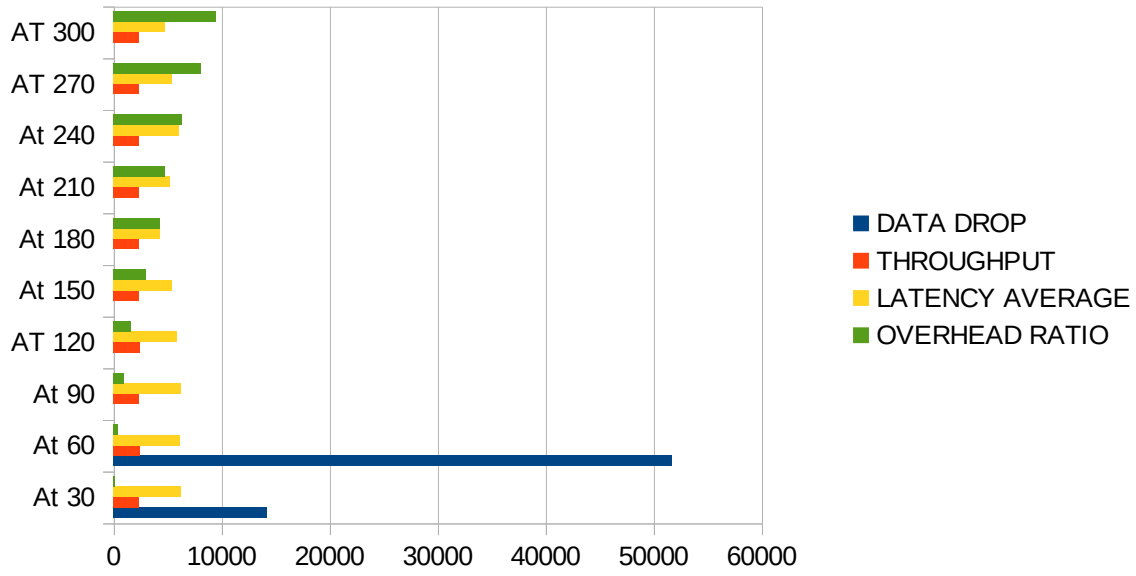


IV. RESULTS AND DISCUSSIONS

Values	Data Drop	Throughput	Latency Average	Overhead Ratio
At 30	14214	2361. 1868695652	6259.9513	131. 0261
At 60	51678	2423.1465484634	6135.7447	378.9929
At 90	117368	2381.5007563025	6291.1479	1013.5462
At 120	1889960	2429.4822033898	5923.9136	1636.5085
At 150	291872	2363.6067340067	5394.7899	3004.9091

At 180	**392234**	**2333.6151971326**	**4341.3269**	**4290.8817**
At 210	**512788**	**2336.3528440367**	**5210.2936**	**4773.8165**
At 240	**625544**	**2332.890833333**	**6107.09**	**6340.48**
At 270	**764122**	**2395.8575**	**5407.7604**	**8062.2083**
At 300	**899094**	**2405.168611111**	**4754.9188**	**94803958**

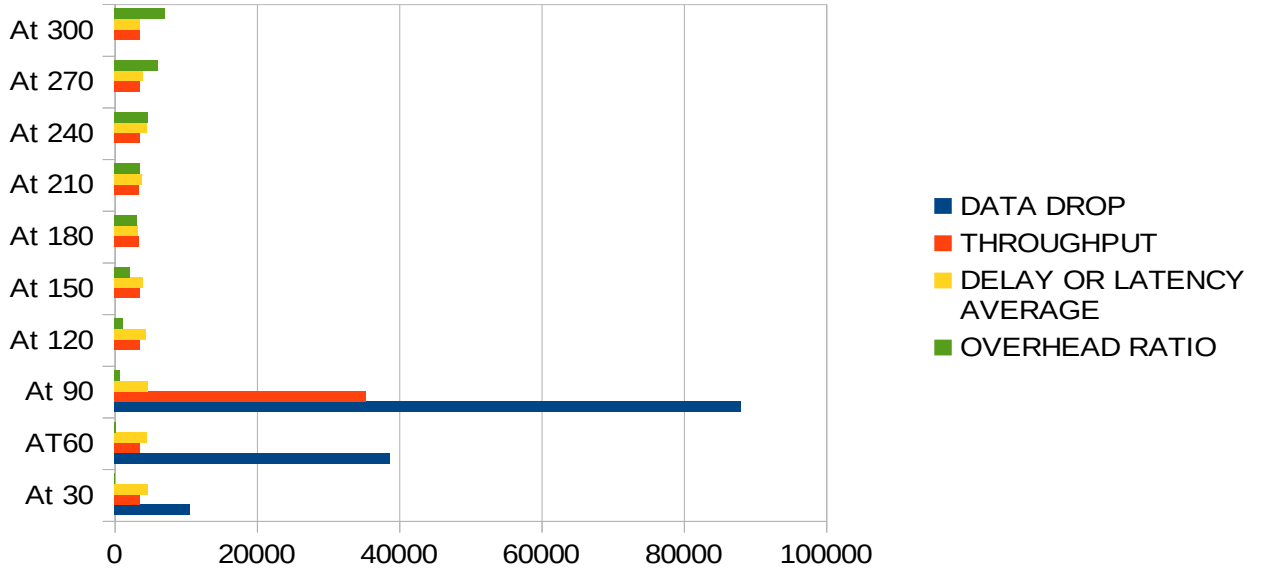
Table 4.1: OlD Metho



Graph 1

Nodes	Data Drop	Throughput	Latency Average	Overhead Ratio
At 30	**10660.5**	**3541.7803043478**	**4694.9635**	**98.2696**
At 60	**38758.5**	**3634.719822695**	**4601.8085**	**284.2447**
At 90	**88026**	**35372.251124537**	**4718.3609**	**760.1597**
At 120	**141747**	**3644.2233050847**	**4442.9352**	**1227.3814**
At 150	**255298**	**3545.41010101010**	**4046.0924**	**2253.6818**
At 180	**392234**	**3500.42795969889**	**3255.9952**	**3218.1613**
At 210	**384591**	**3504.529266055**	**3907.7202**	**3580.3624**
At 240	**469158**	**3529.33635**	**4580.3175**	**4755.36**
At 270	**573091**	**3593.78625**	**4055.8203**	**6046.6563**
At 300	**674320.5**	**3607.7529.166667**	**3566.1891**	**7110.2969**

Table 4.2: FPA Method



V. CONCLUSION

VANET (Vehicular Ad-hoc Network) is a new technology which has taken enormous attention in the recent years. Due to rapid topology changing and frequent disconnection makes it difficult to design an efficient routing protocol for routing data among vehicles, called V2V or vehicle to vehicle communication and vehicle to road side infrastructure, called V2I. It is autonomous & self-organizing wireless communication network, where nodes in VANET involve themselves as servers and/or clients for exchanging & sharing information. VANET routing protocols for inter vehicle communication. The existing routing protocols for VANET are not efficient to meet every traffic scenarios. Thus design of an efficient routing protocol has taken significant attention. So, it is very necessary to identify the pros and cons of routing protocols which can be used for further improvement or development of any new routing protocol.

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