Optimization Framework to Obtain OLSR Parameter Configuration

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ABSTRACT

Performance evaluation of optimized OLSR is the main goal for Mobile Adhoc NETworks (MANETs), but later it is used for Vehicular Adhoc NETworks (VANETs) and Wireless Sensor Networks (WSNs) also. The performance of the routing protocol is depends on significance of parameter in VANET. OLSR standard configuration is insufficient for VANETs (vehicular ad-hoc networks). The OLSR tuning parameter can enhance the performance. In this paper we propose various algorithms (PSO, GA, SA) to optimize the constraint framework in OLSR. When they are improve the PDR, throughput and E2E delay. Using NS2 simulation tool, the optimization problem is solved by optimization techniques.

Keyword : *VANET, MANET, QOS, OLSR, PSO.*

I. Introduction

Vehicular ad-hoc networks have become visible successful application of mobile ad-hoc network. VANET providing inter-vehicle and vehicle to infrastructure communication can rather improve transportation safety and facility of driving and traveling. VANET hold the increasing of wireless product that can be used in vehicles. VANET has developed into a part of explore, consistency, and progress since it have large prospective to progress mechanism and road safety, transfer efficiency and relieve to drivers and passengers. As mobile wireless device and networks turn increase essential, the demand for inter-vehicle and vehicle-to-infrastructure or communication will continue to grow. The Concept of the vehicular ad-hoc network has been expanded to contain a various application which can be proceeding from wireless communication between vehicles. Transports are not only communicated between each other, but are also receiving data from transfer data to infrastructure unit. VANET application consist onboard active safety system which are used for service drivers in desist collision and to co-ordinate with them at cutting point acting as intersection and high way entries. Security organization may responsible declare data, equally incident, real time transportation overcrowding, high speed rating or plane state to vehicle in the locality of run side. This helps to skip unit of vehicles and enhance road capacity with the safety systems the number of car accidents and related damage are proposed to be less. The main objective of this paper is to optimize the OLSR protocol by selecting proper multipoint relay and effective tuning of OLSR parameter. It is generally to calculate these new protocols value perfectly before using them to redeploy VANETS and through simulation is doing it. VANET is used GPS navigation system. VANET are refill analyzing and compares other type of existing routing protocol in VANET.

ROUTING PROTOCOLS:

The protocol determine how routers are communicates with all varient, circulate information that facilitate them to decide on routes between any two nodes on a computer networks. Transmission of packet from one end to other end through optimal and efficient path in VANET environment is achieved with the help of different routing protocols. Routing occurs at the network layer of the OSI Model.

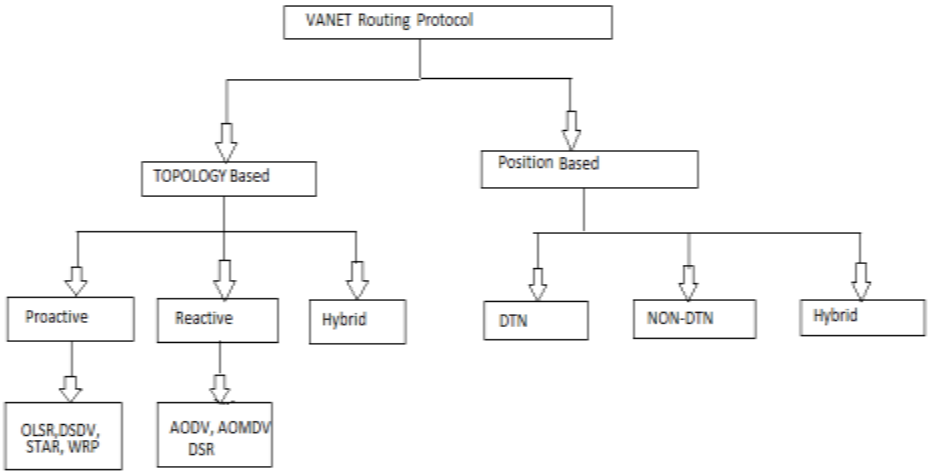

Figure 3: Classification of Routing Protocol [16]

Topology Based Routing:

In this protocol, all nodes inside the network sustain one or more routing tables that are reorganized frequently. Every node circulates a message throughout network if in network topology changed. Topology requires all the nodes participating in VANET for routing resolution. Before the transmission of data begins, these protocols determine and preserve the route in the routing table. Routing protocols use data link which exists inside the network to do package premature.

- **Proactive Routing Protocol:**

Proactive protocols are table driven protocols that accumulate routing information of each node participating in network. The node continues changing its position every second so it is needed to update the information offered in routing table. Two type of update are use in routing tables, Triggered update and Periodic update .There are many proactive routing protocols are OLSR, WRP, DSDV and STAR.

- **Wireless routing protocol:**

WRP is a distance vector routing protocol. Every node in the network keeps a Distance Table, a Routing Table, a Link Cost Table and a Message Retransmission Table. It is used superior version of the distance vector routing protocol that uses the Bellman Ford algorithm to compute path and reduces route loop and count the infinity problem. It is at times change routing tables information through its neighbors through renew message or every time there is a change in the link state table.

- **Destination sequenced distance vector routing:**

DSDV uses the direct pathway to find the route to the objective and updated information should be stored in the routing table. Every node from instance to instance broadcast the information of routing table to its neighbors. It keeps only the optimal path to the destination rather than keeping multi path to the same destination. This protocol also guarantee loop free node, reduce count the infinity problem and reduces the message control overhead.

- **Source Tree Adaptive Routing:**

This routing protocol is based upon link state protocol and it applies least overhead routing approach. STAR protocol maintain the topology of the entire network so its need more memory requirements. Every node creates a limited topology of the network based on the information aggregated from neighboring node network. It is best for city scenario.

- **Optimized link state routing protocol:**

OLSR is a routing protocol optimized for mobile ad-hoc network that can use on other wireless network. Link state algorithm stability is following the OLSR protocol. It keeps the information on all likely routes to the network node using topology control message. On topological changes, each node sends the efficient information to a number of selective nodes that will retransmit the data to another node. Throughout the MANET the OLSR uses Topology control and Hello messages to find out and after that circulate link state information. Hello messages are used to find the status of link and neighbors. Topology control messages are used to send the broadcast information to the neighbors in selected list.

II. Literature Survey:

Vehicular ad-hoc network routing protocol performance based on parameter values. A recipe of these standards it is rigid to get an optimal blend for better Quality of service in VANET. The Author is used to Particle Swarm Optimization method to get a best collection in AOMDV in real situation. The primary results show (1.96%) in Packet Delivery Ratio, 37.07% drop in Network Routing Load and 80.65% drop in Average End-to-End delay using optimal combination of value of parameters [9].

Enhancement the total time security and non-security requisition for vehicular ad-hoc network needs knowledge of the progressive network characteristic since these signals conclude equally the performance of routing protocol and the work ability of a function over VANET. Different keys are used numbers of clusters, neighbor allocation, including node degree and link duration. The author arranges real word road topology and the whole instant data extracted from the freeway in this analysis. Moreover, we use a more realistic, obstacle-based channel model and contrast the performance of this experienced model to the most commonly used and including lognormal shadowing and unit disk models. The author analysis on the key flow disclose that both lognormal and unit disk model gives real VANET topology property. We initiate matching system to change the frameworks of the lognormal model according to the vehicle correlation and a density model to take into account the evolution of the link individuality over time. The present method has been indicated to provide a good match with the calculation and difficult-to-implement obstacle-based model. The framework of the present method has been depended on density of vehicles on four distinct highways [10].

OLSR is originally calculated for ad hoc networks. It gathers the data to create and support the route between origin to target with minimum cost by again and again replace Hello and control messages. The total communication cost of function for all nodes rate mainly depend the requisite concert metrics. OLSR ordinary form is deficient along with VANET since high mobility and limited Wi-Fi area that cause fast changes in its topology. In this Author, PSO technique through OLSR tuning to find optimal framework by number of the acknowledgement act metrics produced in a real VANETs simulation. The OLSR simulation results show with optimum framework produce better performance in urban environment as compared to the ordinary OLSR [12].

The design and effectuation of a entire range of many kinds of networks are getting empowered by the current progress in software, hardware and communication technologies that are being spread in several environments. The Vehicular Ad-Hoc Network (VANET) has taken up too much involvement in the last couple of years. VANET has got large potential to develop vehicle and road safety, traffic ratio, and comfortableness and apart from this comfort to both drivers and passengers that's why it has been an active area of research, standardization, and development. Current research attempts have provided a strong emphasis on unusual VANET design architectures and implementations. Exclusive areas including routing, broadcasting have been focused by a lot of VANET research work. Quality of Service (QoS), and security, our survey is done for the recent research results in these areas. A review is presented by us of wireless access standards for VANETs , and reveal some of the current VANET demos and enhancements in the US, Japan, and the European Union. Moreover, some of the simulators currently available to VANET researchers for VANET simulations are deeply explained by us and we assess their advantages and limitations. Ultimately, we contour some of the VANET study challenges and that still require to be addressed for enabling the ubiquitous deployment and wide spread adoption of scalable, reliable, robust, and secure VANET architectures, protocols, services and technologies [16].

By wireless devices increasing in demand and ad-hoc wireless networks getting larger, scalable routing protocols are needed. While more new portable wireless and computing technologies are opening up stimulating possibilities for the future of wireless mobile computing. Less networks of mobile devices associated by wireless because it is a self-configuring infrastructure. According to time topology is changed in ad-hoc networks. In system we will concentrate on existing protocols that give association in the network. Particularly, in this ad-hoc network, any node may compact the routing protocol functionality by disorder the route discovery process. In this network, routing is a difficult assignment and has expected a incredible amount of thought from researches. In this paper, the author provides an analysis of a broad range of routing protocols. There are two type of routing protocol like: on-demand and table-driven [14].

III. Problem Formulation:

Problem analysis:
In this paper we are analysis the packet sending problem. By default value of OLSR protocol is used and that it is not show the optimal result. When they are show the packet deliver ratio is less and end to end delay is high. So we are changing the default value of OLSR protocol by using the optimization technique and find out the optimal result of sending packet.

Problem statement:
1. Simulation of OLSR protocol with standard value.
2. Optimization framework to automatically tune the OLSR configuration.
3. Performance evaluation of optimized OLSR Protocol

Proposed solution:
In existing of mobility and failure, the topology of whole network is maintaining the network information. OLSR protocol periodically exchange different messages. HELLO, TC, and MID messages.

• HELLO messages are exchanged between neighbours' nodes (1−hop distance). They are in work for neighbourhood detection, to accommodate for link sensing, these messages having data around the neighbour nodes are performed periodically.

• Topology control messages are induced through multi point relay to specify and that another node has chosen it as their MPR. The routing table calculations have to use the stored data of all network node. In entire network, the same messages are forwarding to the other nodes. Since topology control messages are transmitted regularly a sequenced quantity is used to know between recent and old ones.

•The detail information on their network interfaces through sent MID messages in use to take part in the network. This data is required as the nodes may have multiple interfaces through different location take part in the communication.

The OLSR components are organized with a set of framework predefined in the OLSR.

MAIN OLSR PARAMETERS

Parameter	Standard Configuration	Range
HELLO INTERVAL	2.0 s	R € [1.0, 30.0]
TC INTERVAL	5.0 s	R€ [1.0, 30.0]
MID HOLD TIME	3× TC INTERVAL	R €[3.0, 100.0]

The optimization approach used to find automatically efficient OLSR framework form is passed out by coupling at two differ stages: a simulation status and an optimization process. Met heuristic method is used in the optimization block to find best solutions in permanent search spaces so that in this work. Our simulation process for assigning a computable worth to OLSR presentation of total form of communication cost.

Fig. 4.1 illustrates, after using met heuristic needs the estimate of a solution, it call to the simulation process of the uncertain OLSR formation over the distinct VANET scenario.

In order to calculate the condition of the different OLSR form communication cost functions have been defined in terms of two of the most QoS metrics.

Commonly used QoS metrics in this area:

1. PDR to the part of the information packets commenced through an application that are correctly and completely dispatched.

2. End-to-End Delay that is the variation between time of information package is proceed through an function and the time this packet is received at its end.

The communication cost function is calculated by packet delivery ratio, throughput and end to end delay after that simulation results return in mobile vehicular network scenarios.

The communication cost function represents the fitness function of the optimization problem addressed. The objective at this time consists in maximizing PDR, and minimizing E2ED.

Results:

In this section we are using optimization technique for optimal results. We are using various optimization techniques. Firstly PSO, secondly GA and third SA and compare the result each other.

To decline the E2E delay and increase the delivery ratio, throughput the genetic algorithm. The information is determined and communication from origin to end. In this result we perform the OLSR simulation and calculate its performance.

In this paper an aim is invented to discuss the impact of "Hello Packet'' on the E2E delay, delivery ratio and throughput. An attempt is made to overall improve the performance through varying time interval and discussing the variation show by results.

- **PSO OPTIMIZATION:**

PSO is developed by Dr. Eberhart and Dr.kennedy in 1995, inspired from the nature and behavior dynamic movement with communications of insects, bird and fish. The total number of particles uses to represent a group around in search space view for top solution. Every particle's movements are changed by its local best known particles. The main aim of PSO optimization method is to resolve an unconstrained minimization crisis.

- **GENETIC OPTIMIZATION:**

GA is a heuristic exploration in case imitator the process of normal range. GA show the potential solution when uses the natural selection, crossover and mutation are apply to population. GA represents the binary string and start with a set of population and according to fitness that select a new value. In this algorithm allocate reproductive chance in this way that chromosome which show the best result to the target problem and give more opportunity to reproduce the proper chromosome solution.

- **SIMULATION ANNEALING:**

SA is a probabilistic technique for relative the global optima of the given function. It is a metaheuristic search to change global optima value to large space. Annealing in metal, heat the metal in high temperature and them cool it down very slowly then the atom will place them in a pattern. Accepting best solution is an original property

of metaheuristic.

Table -1: Comparison of techniques

Name	OLSR with GA	OLSR with SA	OLSR	OLSR with PSO
Total packet sent	10512	10512	10512	10512
Total packet received	7302	5306	6138	7205
Total packet dropped	3246	5358	4530	3347
Total packet forwarded	14366	7982	8289	13525
Packet delivery ratio	69.46%	50.48%	58.30%	68.54%
Throughput of the network	3.6510	2.6530	3.0690	3.6025
Average end to end delay	0.503314257 ms	0.768815980 ms	0.657637041 ms	0.572357226 ms

PDR (Packet Delivery Ratio): In packet delivery ratio we are check the completely delivered packet from source to send out by the sender and destination to receive the packet by receiver.

$$\sum \text{total receive packet} / \sum \text{total send packet}$$

The protocol performance is better if the value packet delivery ratio is large.

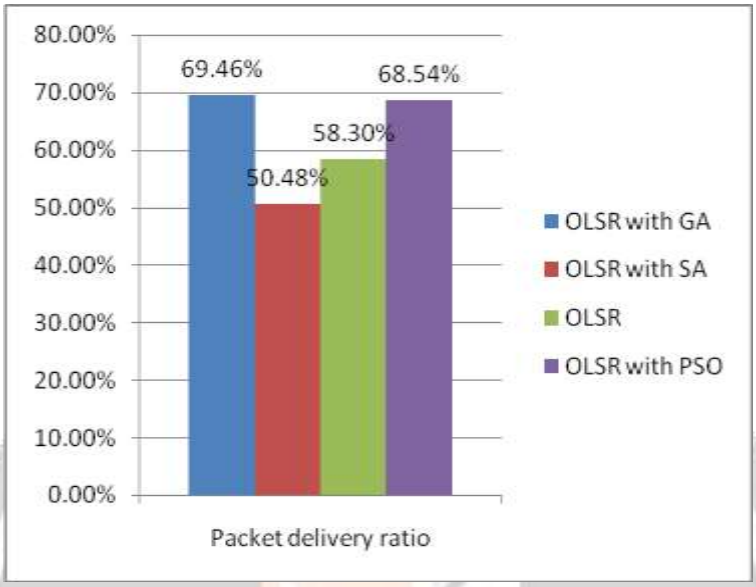

Fig. 4 packet delivery ratio

From the above figure 4 we explain that as the rate of the nodes raises the packet delivery ratio through various optimization techniques and find the best result. In this graph OLSR with Genetic Algorithm is show the best packet delivery ratio.

Throughput: It is computing in a given time a system can process how many units of information. Interrelated actions of system output include, the rate through that some exact workload can be done, and respond time, the quantity of time between a single associate end user request and receiving of the response.

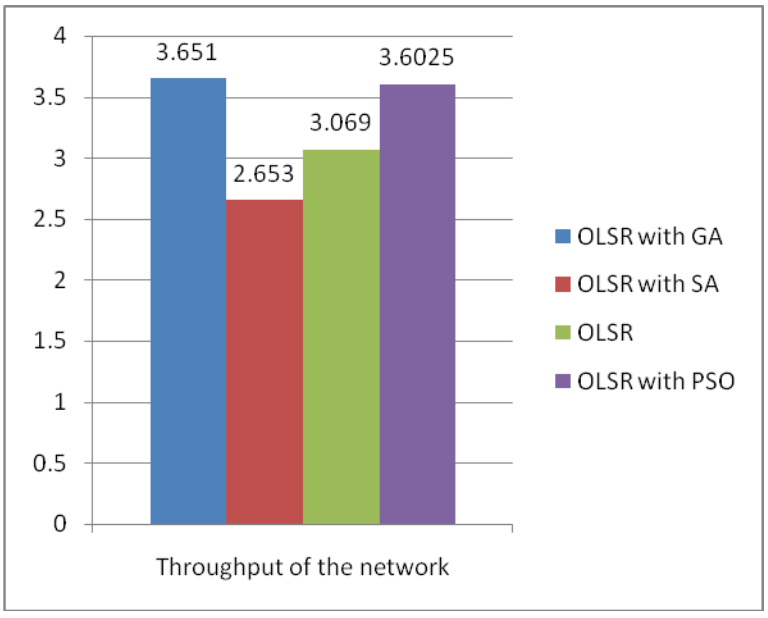

Fig. 5 throughput of the network

From the above figure 5.6 we explain that the throughput of the network. It is measure of the total amount of packet reaching the receiver from the dispatcher to the time it takes the recipient receiving the end packet and we are applying the various optimization techniques for best result. In this graph OLSR with Genetic Algorithm show the best result.

End-to-end Delay: It refers to the time taken by a data packet to circulate across a network as of source to destination. The packets are successfully delivered to destinations that counted in end to end delay.

$\sum$ (reach time – send time) / $\sum$ total links

In E2E delay, the lower value is greatest performance of the protocol.

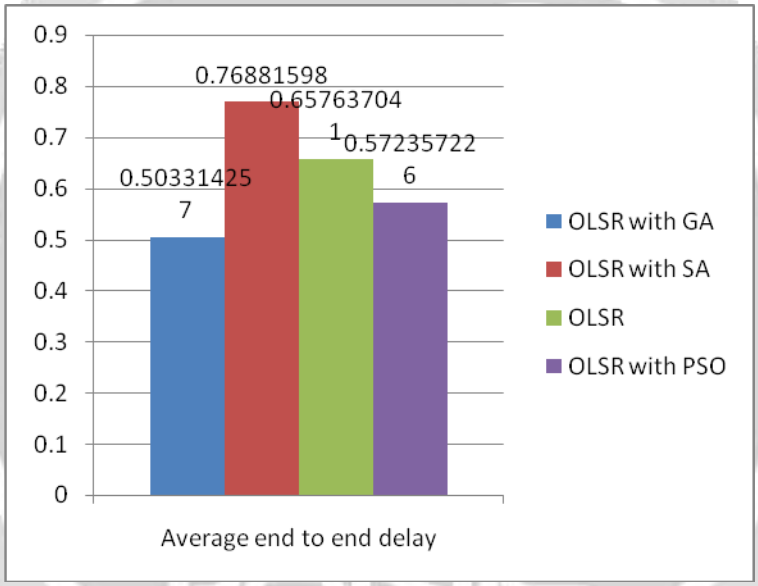

Fig. 6 Average end to end delay

From the above figure 5.7 we explain that as one way delay (end to end delay). It is measure the average time taken by a packet arrive to terminal. We are applying the various techniques for best result. In this graph OLSR with Genetic Algorithm show the best results.

Conclusion:

In this, we have explained the optimal OLSR parameter tuning protocol to be used in VANETs with applying optimization mechanism. In that way we want to maximize the performance of this protocol. The number of possible configurations is very large, thus the problem of finding such a combination mainly is very difficult. By analysis these tuning protocol and get the better performance of sending packet. Using various optimization algorithm is improved the PDR, throughput and E2E delay. In this circle, we have approved the optimized configurations raised by comparing with the standard tuning parameter and each other.

References:

[1] Nitin Goyal, Alka Gaba, "A New Approach of Location Aided Routing Protocol Using Minimum Bandwidth in Mobile Ad-Hoc Network", International Journal of Computer Technology & Applications, Vol. 4, No. 4, pp. 653-659, July 2013.

[2] Nitin Goyal, Alka Gaba, "A review over MANET-Issues and Challenges", International Journal of Enhanced Research in Management & Computer Applications, Vol. 2, Issue 4, pp. 16-28, April-2013.

[3] Tanuja Khurana, Sukhvir Singh, Nitin Goyal, "An Evaluation of Ad-hoc Routing Protocols for Wireless Sensor Networks", International Journal of Advanced Research in Computer Science and Electronics Engineering, Vol. 1 , Issue 5, July 2012.

[4] Nitin Goyal, Maynak Dave, Anil Kumar Verma, "Fuzzy Based Clustering and Aggregation Technique for Under Water Wireless Sensor Networks", International Conference on Electronics and Communication System (ICECS-2014), Feb 2014.

[5] Harpreet Chawla, Nitin Goyal, "Quality of Service and Scalability in Vehicular Ad Hoc Networks", International Journal of Engineering Research and General Science, Vol. 3, Issue 3, May-June, 2015.

[6] Alka Gaba, Nitin Goyal, "Review over Diverse Location Aided Routing", Global Journal for Current Engineering Research, Vol. 2, No. 2, pp. 141-144, 2013.

[7] Mohit Kumar, Nitin Goyal, "Reviewing Underwater Acoustic Wireless Sensing Networks", International Journal of Computer Science and Technology, Vol. 5, Issue 2, June 2014.

[8] Pratibha Kamboj, Nitin Goyal, "Survey of Various Keys Management Techniques in MANET", International Journal of Emerging Research in Management & Technology, Vol. 4, Issue 6, June 2015.

[9] Radhika Chauhan, Nitin Goyal, "A Review on Tuning Of OLSR Routing Protocol IN VANET", International Journal of Advanced Research and Innovative Ideas in Education, Vol. 2 , Issue 2, pp. 508-512, May 2016.

[10] Nitin Goyal, Mayank Dave, Anil Kumar Verma, "Energy Efficient Architecture for Intra and Inter Cluster Communication for Underwater Wireless Sensor Networks", Wireless Personal Communications, SPRINGER, pp 1-21, April 2016, DOI: 10.1007/s11277-016-3302-0. ISSN: 0929-6212

[11] D K Lobiyala, C P Kattia,A K Giria,b, "Parameter Value Optimization of Ad-hoc On Demand Multipath Distance Vector Routing using Particle Swarm Optimization", International Conference on Information and Communication Technologies (ICICT 2014), 2015.

[12] Nabeel Akhtar, Sinem Coleri Ergen, Oznur Ozkasap, "Vehicle Mobility and Communication Channel Models for Realistic and Efficient Highway VANET Simulation", IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, VOL. 64, NO. 1, JANUARY 2015.

[13] Zuriati Ahmad Zukarnain, Nori M. Al-Kharasani, Shamala K. Subramaniam, " Optimal Configuration for Urban VANETs Routing using Particle Swarm Optimization", International Conference on Artificial Intelligence and Computer Science (AICS 2014), 15 - 16 September 2014.

[14] Hemagowri J, Baranikumari C, Brindha B, "A Study on Proactive Routing Protocol in Ad-hoc Network", International Journal of Modern Engineering Research.

[15] Sherali Zeadally, Ray Hunt, Yuh-Shyan Chen, Angela Irwin, Aamir Hassan, " Vehicular Ad Hoc Networks (VANETS): Status, Results, and Challenges" Telecommunication system, SPRINGER, pp 217-241, August 2012