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Multi-Hop Data Dissemination in Vehicular AD-HOC Networks

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***Abstract*- Vehicular Ad Hoc Network (VANET) is a type of Mobile Ad Hoc Networks (MANET). The field of VANETs began picking up consideration in 1980s and has now been a dynamic field of innovative work. VANETs give us with the base to growing new frameworks to improve drivers' and travelers' security and comfort. Multi hop data dissemination is the significant undertaking go over in VANET that will be proposed here. There are numerous routing protocols that have been proposed and surveyed to enhance the effectiveness of VANET. The simulator has been favored over outside investigation since it is straightforward, simple and cheap. In this paper, simulation of one of the routing protocols i.e. AOMDV is done on simulators which permit users to produce true versatility models for VANET simulations.**

***Keywords*- VANET, AOMDV, MANET, RSA.**

I. INTRODUCTION

Late advances in wireless networks have prompted the presentation of another sort of systems called Vehicular Ad Hoc Networks (VANETs). VANETs is the subclass of Mobile Ad Hoc Networks (MANETs). It sends the idea of consistently fluctuating vehicular movement. VANETs give us with the foundation to growing new frameworks to improve drivers' and travelers' security and comfort. VANETs are distributed self-arranging systems shaped between moving vehicles furnished with wireless communication gadgets. VANETs have a couple recognizing attributes from MANETs. These are: Highly powerful topology.

Designed Mobility

- Boundless Battery Power and Storage
- Propagation Model
- On-board Sensors

There are two sorts of nodes which are utilized as a part of VANET i.e. static nodes and versatile nodes. Versatile nodes are additionally called as On-board Units (OBUs). OBUs are computer controlled gadgets which are mounted on every single vehicle in the system. Static nodes are Road-Side Units (RSUs), which are situated at convergences, close to the road and parking areas [7]. A proficient advantage of RSU is that it goes about as an gateway in numerous VANET applications, for example, web surfing and map download and so forth.
Figure 1: Node types in VANET

Despite the fact that VANET have a few attributes like self-sorted infrastructure less system, which are normal with wireless ad hoc networks, VANET likewise have some interesting qualities that makes it productive and robust. Some of these attributes are as per the following: i. High versatility of nodes. ii. Quickly changing system topology. iii. Ongoing, time-delicate information trade. iv. Unbounded network size. v. Vital impact of security and protection. vi. Sufficient energy and capacity limit.

In view of VANETs novel attributes like high dynamic nature of network, loads of exploration work have been performed for the advancement of routing protocols. The key thought for outlining a routing protocol is to give a most ideal way between vehicles by minimizing the overhead, end to end delay and other imperative parameters.

In view of the hierarchical standard of the MANET conventions (AODV, DSDV), there is an issue of designing a routing protocol. High dynamic nature of VANET make variable connection for data transmission. In this way, these basic routing protocols which are utilized as a part of MANET can't fulfil the execution prerequisites of VANET. Bunches of routing protocols have been proposed lately. Out of these proposed routing protocols, Ad-hoc On Demand Distance Vector (AODV) protocol is most significantly utilized protocol. It is a reactive, single way, on-demand protocol. As we say prior that hierarchical configuration of AODV convention can't fulfil the execution of VANET. So in this paper we introduce improved AODV called Ad-hoc On Demand Multipath Distance Vector (AOMDV).

Ad-hoc On Demand Distance Vector (AODV) routing protocol is a protocol for MANET and different wireless adhoc networks. It is mutually created in Nokia Research Center of University of California, Santa Barbara and University of Cincinnati by C.Perkins and S. Das. It is an on-demand as well as distance vector protocol, implying that a route is set up by AODV from a destination just on demand. AODV is equipped for both unicast and multicast routing scenarios. It keeps these routes as long as they are attractive by the sources. Moreover, AODV makes trees which interface multicast bunch individuals. The trees are made out of the gathering individuals and the nodes expected to associate the individuals. The sequence numbers are utilized by AODV to guarantee the freshness of routes. It is of self-beginning, loop free and scales to extensive quantities of mobile nodes.

II. PROPOSED SYSTEM

A. AODV

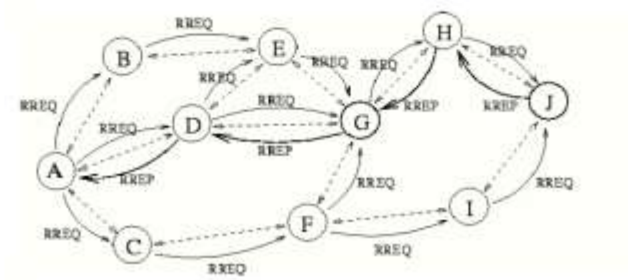

Figure 2: A Possible path for Root replies if wishes to find a route to J. AODV define three types of control messages for route maintenance

Figure 2 explains the route discovery and maintenance of AODV [6]. RREQA is a route requesting message transmitted by a node which requires a route to a node. As an enhancement AODV utilizes an extending ring system when flooding these messages. Each RREQ conveys a Time To Live (TTL) esteem that states for what number of hops this message ought to be sent. This value is set to a predefined esteem at the first transmission and expanded at retransmissions. Retransmissions happen if no answers are received. Data packets holding up to be transmitted (i.e. the parcels that started the RREQ).

RREPA route answer message is unicasted back to the originator of a RREQ if the recipient is either the node utilizing the requested address, or it has a legitimate route to the requested address. The reason one can unicast the message back, is that each route sending a RREQ reserves a route back to the originating node.

B. AOMDV

It is an improvisation to AODV furthermore gives two fundamental services i.e. route discovery and Route maintenance. Dissimilar to AODV, each RREP message is being considered by the source node and in this way various paths found in one route discovery. Being the hop by hop protocol, the intermediate node keeps up multiple path sections in their individual routing table. As a streamlining measure, as a matter of course the contrast amongst primary and a substitute path is equivalent to single hop.

The routing table at every node additionally contains a rundown of next hop alongside the relating hop counts. Each node keeps up a promoted hop count for the destination. Promoted hop count characterized as the "Maximum hop count for all the paths" [11]. Route promotions of the destination are sent utilizing this hop count. A substitute way to the destination is acknowledged by a node if the hop count is not exactly the promoted hop count for the destination.

Comparison between AODV and AOMDV

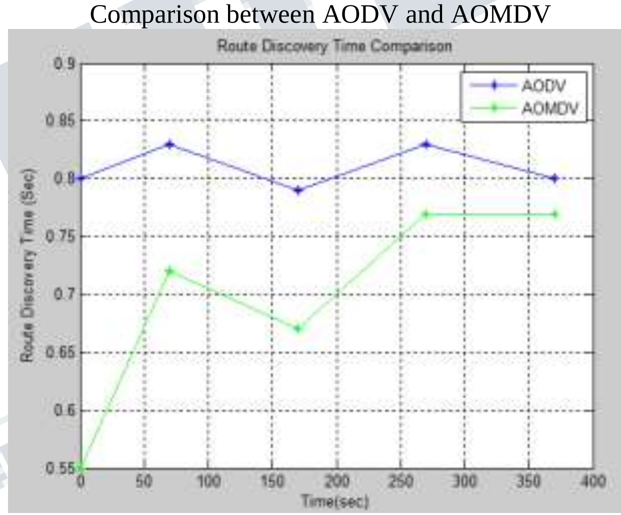

Figure 3: Route Discovery Time

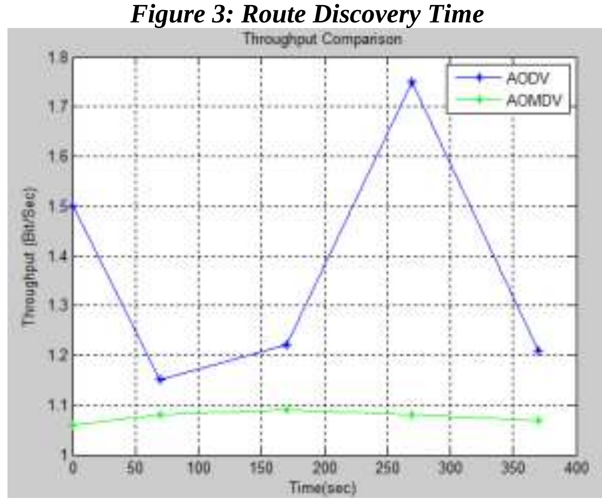

Figure 4: Total Network Throughput

C. RSA Key Generation

Usually RSA is used for data encryption but here we are using for key generation for vehicles when they registered, i.e, it is used as key generation method.

Algorithm of Key Generation

1. Pick Random Primes p,q of the right size, let n:=pq be a k-bit integer.
2. Repeat
3. Pick a random odd such that$|e|\leq K$.
4. Until gcd($e,\emptyset(n)$)=1.
5. Compute d:=$e-1$mod $\emptyset$(n).
6. Return (p,q,d,e).

The flow chart of proposed system is given below

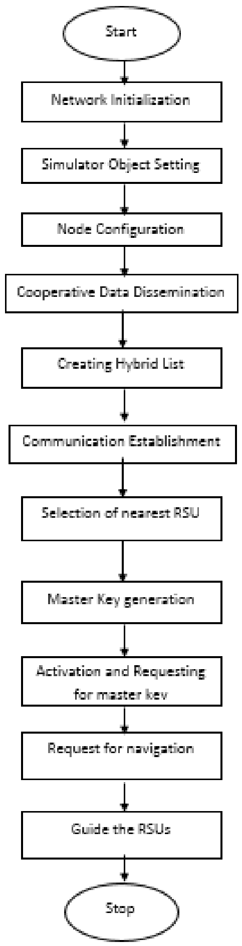

Figure 5: Flow chart of Proposed system

III. RESULTS

Initially, all road side units get their master key from the trusted authority. All the vehicles which enter into network get registered with their nearest road side units. These vehicles later ask for RSU for guidance in reaching their destination. Figure 6 shows RSU getting key from trusted authority, figure 7 shows vehicles getting registered to the network with nearest RSU. Figure 8 shows RSU is guiding Vehicle for its destination. And also comparison between computational overhead, Authentication efficiency and Computational delay of existing system i.e., Cooperative Data Dissemination(CDD) and proposed system Multi-Hop Data Dissemination is shown below.

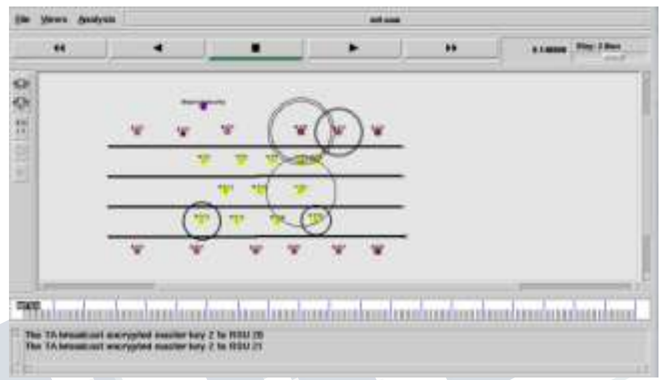

Figure 6: Trusted Authority sending master key to RSU

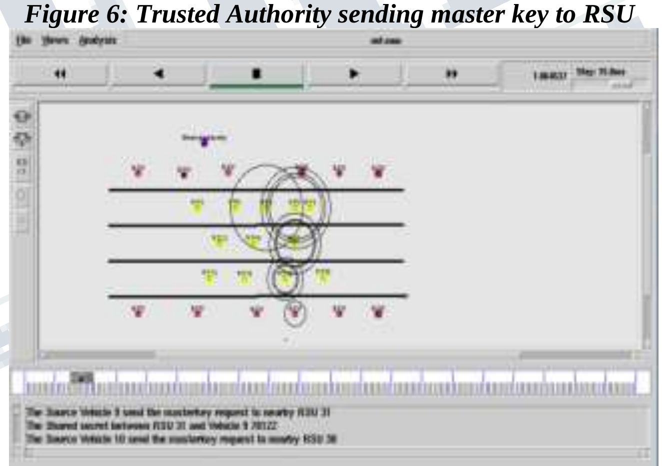

Figure 7: Vehicles getting registered with their nearest RSU

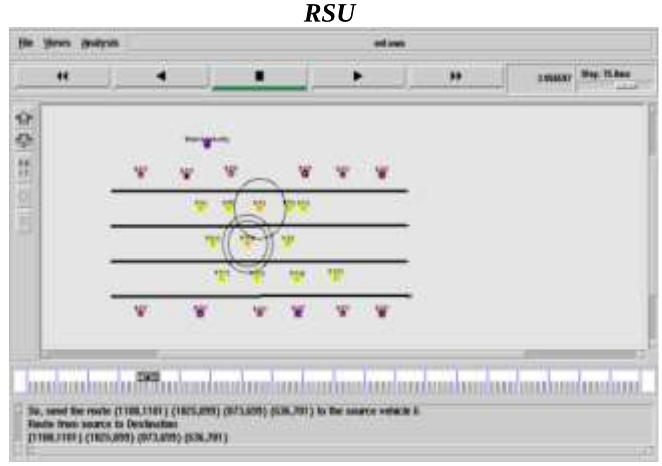

Figure 8: Vehicle getting guided by the RSU

The below figure 9, 10 and 11 shows the result for computation overhead, authentication efficiency and computational delay.

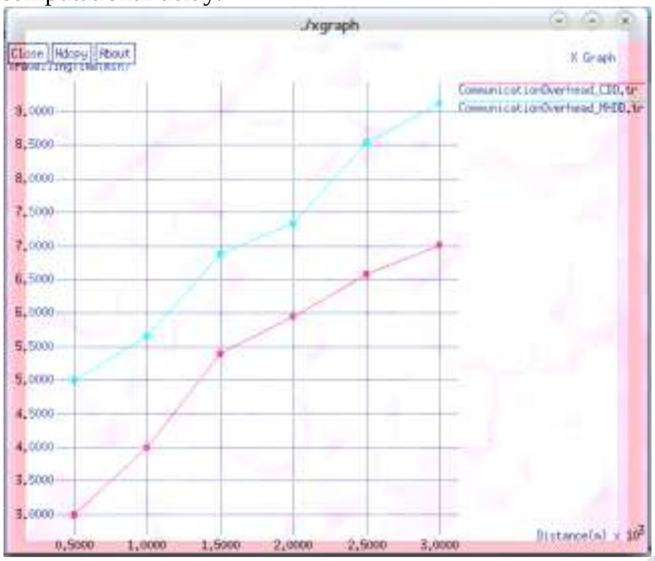

Figure 9: Graph for Computational Overhead

Travelling Time (min)		Distance (m) x 10^3
CDD	MHDD	
3	5	0.5
4	5.7	1
5.4	6.8	1.5
5.9	7.35	2
6.6	8.51	2.5
7	9.2	3

Table 1: Results for Computational Overhead

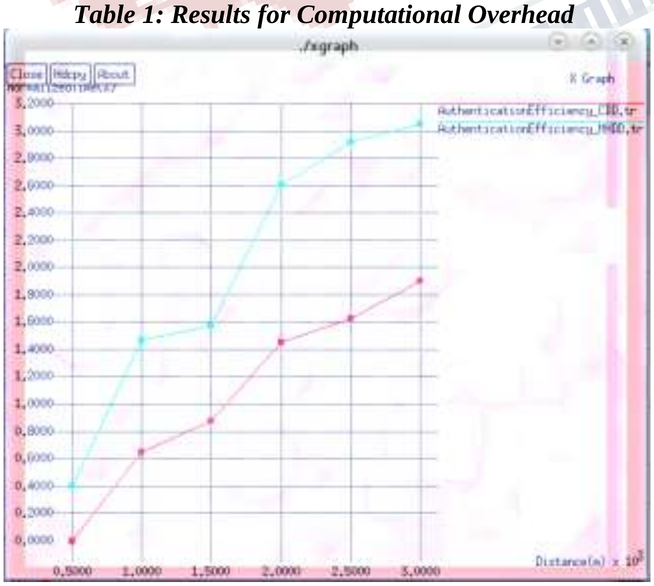

Figure 10: Graph for Authentication Efficiency

Normalized Time (min)		Distance (m) x 10^3
CDD	MHDD	
0	0.4	0.5
0.64	1.46	1
0.86	1.59	1.5
1.44	2.61	2
1.62	2.92	2.5
1.9	3.04	3

Table 2: Results for Authentication Efficiency

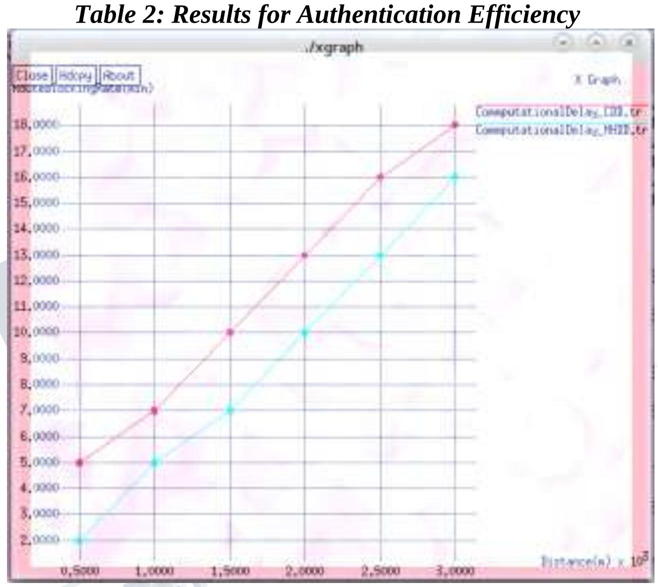

Figure 11: Graph for Computational delay

Route Blocking Rate (min)		Distance (m) x 10^3
CDD	MHDD	
5	2	0.5
7	5	1
10	7	1.5
13	10	2
16	13	2.5
18	16	3

Table 3: Results for Computational Delay

IV. CONCLUSION AND DISCUSSION

In this paper, Enhanced AODV is simulated with realistic mobility model. NS2 is used for simulation. Then graphs are plotted using Tracegraph for evaluation. The results include different parameters like authentication efficiency, delay and computational cost. The multi-path data dissemination is shown effectively. As future work, AODV can be still improved for robust routing and security must also be given importance.

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