ISSN: 0975-766X
CODEN: IJPTFI
Available through Online *Review Article*
www.ijptonline.com

AN OVERVIEW ON ROUTING PROTOCOLS OF VANETS

E. Amala Tamil arasi[1], G. Mary Valantina[2]
[1]Department of Telecommunication Engineering, Sathyabama University, Chennai 600119, India.
[2]Department of Telecommunication Engineering, Sathyabama University, Chennai 600119, India.
Emails: liana_chelsia@yahoo.com valantina78@gmail.com

Received on 05-02-2016 *Accepted on 29-02-2016*

Abstract

Recent advancements in communication technology are enabling implementation of different types of network in various environments. One of which is Vehicular Ad Hoc Network (VANET). It is a challenging subclass of Mobile Ad hoc Network (MANET) which enables intelligent communication between vehicles and also between vehicle and roadside infrastructures. It is a promising approach for the Intelligent Transport System (ITS). The impermanent link discontinuity issue is brought about by the quickly alterable topology impact on the execution of information transmissions. The broadcast storm issue genuinely influences the effective rate of message conveyance in VANETs. The key test is to conquer these issues and to provide routing protocols with lower communication delay, the low communication overhead, and the lower time complexity. The challenges and points of view of the routing protocols for VANETs are finally discussed.

Keywords: VANET, intelligent communication, challenges, and routing protocols.

I. Introduction

At the present time private vehicles are utilized day by day by numerous people groups. The most concerning issue with respect to the expanded utilization of private transport is the expanding number of fatalities that happen because of mischances on the streets; the cost and related threats have been perceived as a major issue being stood up to by current society. VANET gives a remote correspondence between moving vehicles, utilizing a devoted short range correspondence (DSRC). DSRC is basically IEEE 802.11a changed for a low overhead operation to 802.11p; the IEEE then institutionalizes the entire corresponding stack by the 1609 group of guidelines alluding to remote access in vehicular situations (WAVE). The vehicle can correspond with different vehicles straightforwardly shaping vehicle to vehicle

correspondence (V2V) or speak with settled hardware alongside the street, alluded to as a street side unit (RSU) framing vehicle to framework correspondence (V2I). These sorts of interchanges permit vehicles to share various types of data, for instance, wellbeing data with the end goal of mischance aversion, post-mishap examination or roads turned parking lots. Another sort of data can be dispersed, for example, voyager related data which is considered as non-secure data. The goal behind conveying and sharing this data is to give a wellbeing message to caution drivers about anticipated that perils all together would diminish the quantity of mishaps and recovery individuals' lives, or to give travelers lovely excursions.

This field draws in scientists from distinctive fields to create VANET applications, conventions and reenactment apparatuses. A few difficulties are confronting analysts and engineer. In this manner, a few papers and articles have attempted to cover these issues.

In this paper, we exhibit a key archive which can give itemized data to analysts and engineer in order to comprehend the primary viewpoints and difficulties identified with VANET. It covers diverse issues, for example, system construction modeling, correspondence areas, difficulties, applications and recreation tools.

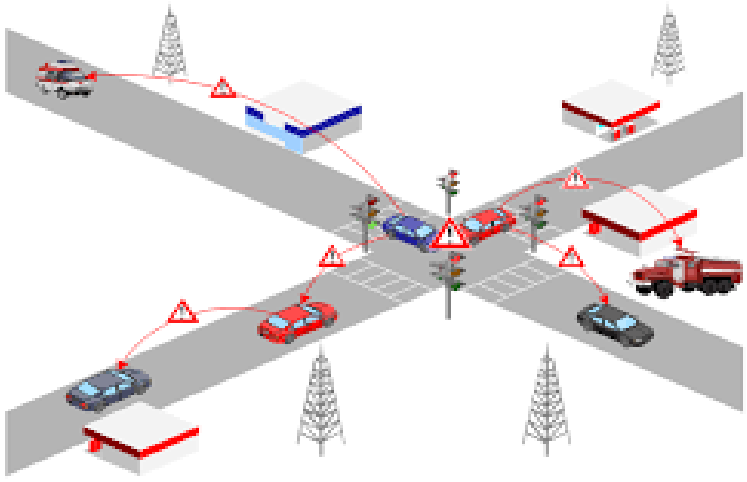

Fig 1. Communication in vehicular ad hoc networks.

II. Characteristics of Vanet

VANET is an application of MANET but it has its own distinct characteristics which can be summarized as:

A. High Mobility

The nodes in VANETs as a rule are moving fast. This makes harder to foresee a hub's position and making insurance of node protection.

B. Rapidly changing network topology

Because of high node versatility and irregular velocity of vehicles, the position of hub changes much of the time. As a consequence of this, system topology in VANET's tends to change as often as possible.

C. Unbounded system size

VANET can be executed for one city, a few urban areas or for nations. This implies that system size in VANET is geologically unbounded.

D. Continuous trade of data

The specially appointed nature of VANET inspires the hubs to assemble data from alternate vehicles and street side units. Henceforth the data Exchange among hub gets to be visited.

E. Remote Communication

VANET is intended for the remote environment. Hubs are joined and trade their data by means of remote. Thus, some security measure must be considered in correspondence.

F. Time Critical

The data in VANET must be conveyed to the hubs within a time constraint so that a choice can be made by the hub and perform activity accordingly.

G. Adequate Energy

The VANET hubs have no issue of vitality and calculation assets. This permits VANET use of requesting procedures, for example, RSA, ECDSA execution furthermore gives boundless transmission power.

H. Best Physical Protection

The VANET hubs are physically better secured. In this way, VANET hubs are harder to trade off physically and decrease the impact of framework assault.

III. Challenging Issues In Vanet

Although the characteristics of VANET distinguishes it a different network, but some characteristics impose some challenges to deploy the VANET.

These challenges can be categorized into following categories:

A. Specialized or technical Challenges

The specialized difficulties manage the specialized impediments which ought to be determined before the sending of VANET. A few difficulties are given beneath:

a) *Network Management*

Due to high versatility, the network topology and channel condition change quickly. Because of this, we can't utilize structures like tree in light of the fact that these structures cannot be set up and kept up as quickly as the topology changed.

b) *Congestion and collision Control*

The unbounded system measure additionally makes a challenge. The activity burden is low in provincial ranges and night in even urban zones. Because of this, the system segments as often as possible happens while in surge hours the activity burden is high and subsequently system is congested and crash happens in the system.

c) *Natural Impact*

VANETs utilize the electromagnetic waves for correspondence. These waves are influenced by the earth. Consequently to send the VANET the natural effect must be considered.

d) *MAC Design*

VANET by and large utilize the mutual medium to convey henceforth the MAC outline is the key issue. Numerous methodologies have been given like TDMA, SDMA, and CSMA and so on. IEEE 802.11 received the CSMA based Mac for VANET.

e) *Security*

As VANET gives the street wellbeing applications which are life basic thus the security of these messages must be fulfilled.

B. Social and Economic Challenges

Aside from the specialized difficulties to send the VANET, social and sparing difficulties ought to be considered. It is hard to persuade producers to fabricate a framework that passes on the activity signal infringement in light of the fact that a purchaser may reject such sort of shocking. Then again, buyer values the notification message of a police trap. So to spur the producer to convey VANET will get minimal motivation.

IV. Outline of Routing Protocols

In VANET, the routing conventions are grouped into five classifications:

1) Topology or topography based routing protocol,

2) Position or location based routing protocol,

3) Cluster based routing protocol,

4) Geo cast routing protocol, and

5) Broadcast routing protocol.

These conventions are portrayed on the premise of the territory / application to which it's suited for.

A. Topology Based Routing Protocols:

These routing protocols use link information that already exists in the network which performs packet forwarding. They are further partitioned into Proactive and Reactive.

a) Proactive routing protocols

The proactive routing implies that the routing of information, as next sending hop is kept up out of sight independent of correspondence solicitations.

The upside of proactive steering convention is that there is no route discovery since the destination route is put away out of sight; however the inconvenience of this convention is that it gives low inactivity to continuous application. A table is developed and kept up inside of a hub or node. So that, every passage in the table shows the following bounce node towards a sure destination.

It likewise prompts the up keep of unused information ways, which causes the decrease in the accessible data transmission. The different sorts of proactive steering conventions are: LSR, FSR.

b) Reactive/Ad hoc based routing

Responsive routing opens the route just when it is vital for a tribute to correspond with one another. It keeps up just the courses that are at present being used, thus it diminishes the burden on the system.

Responsive routing comprises of a route revelation stage in which the query packets are overwhelmed into the system for the way inquiry and this stage finishes when the course is found.

The different sorts of responsive steering conventions are AODV, PGB, DSR and TORA.

B. Position or location Based Routing Protocols:

Position based routing comprises of class of routing algorithm. They share the property by utilizing geographic positioning data as a part of request to choose the following hops.

The packet is sent with no guide information to the one jump neighbor, which is nearest to the destination. Position based directing is helpful since no worldwide course from source hub to destination hub should be made and kept up. Position based directing is comprehensively partitioned in two sorts: Position based greedy V2V protocols, Delay Tolerant Protocols.

a) Position Based Greedy V2V Protocols

In greedy strategy , the middle of the road node in the route forwards message to the most remote neighbor toward the following destination. The greedy methodology requires that middle of the road hub ought to have position of itself, the position of its neighbor and destination position. The objective of these conventions is to transmit information parcels to destination at the earliest opportunity that is the reason these are otherwise called as min delay routing protocols. Different sorts of position based greedy V2V conventions are GPCR, CAR and DIR.

b) Greedy Perimeter Coordinator Routing (GPCR)

GPCR is based upon the way that city road frame a characteristic organizational diagram. GPCR does not require an outside static road map for its operation**.** GPCR comprises of two parts: A Restricted Greedy forwarding procedure and A repair system for routing algorithm.

A GPCR takes after a destination based avaricious sending system, it routes messages to hubs at convergence. Since GPCR does not utilize any outside static road delineate hubs at convergence are hard to discover. GPCR utilizes a heuristic technique for discovering hubs situated at convergences and assigns those hubs as facilitators. The organizer has the obligation of settling on directing choices.

There are two methodologies utilized for organizer determination they are

- Neighbor Table Approach: The nodes intermittently transmit beacon messages which contain their position data and last known position data of all neighbors, by listening to beacon messages a node as data about its own position, the position of its neighbor and neighbor neighbor. Utilizing this data node X view itself as to be inside of the crossing point.

- Correlation coefficient approach**:** For this situation hub utilizes its position data and the position information of its intermediate neighbor to discover the correlation coefficient, p x y.

This methodology performs superior to anything neighbor table methodology. By utilizing this

Approach the calculation can keep away from conditions on external road map.

c) Connectivity Aware Routing Protocols (CAR)

Auto conventions discover a course to a destination; it has one of a kind attributes that it keeps up the store of fruitful course between different source and destination sets. It likewise predicts the position of destination , vehicle repairs the route as the position changes.

The nodes utilizing CAR conventions send occasional Hello beacons that contain their speed vector data. On getting Hello beacons a node will record sender in its neighbor table and compute its own particular speed vector and speed vector of its neighbor. Signals can likewise be piggybacked on sent information bundles to lessen wastage of transfer speed and clog. Passages terminate from the neighbor table when the separation between hubs surpasses the edge esteem. The CAR conventions set up the documentation of a gatekeeper which is a geographic marker message, it is supported and went starting with one vehicle then onto the next to engender the data. A watchman is an impermanent message that has an ID, a TTL (Time to live) tallies, a range and some state data. Auto gives two types of watchmen. The Standing watchman and The Traveling gatekeeper . Routing errors may happen because of the corresponding hole between the stay directs or due toward gatekeepers. So CAR convention has two recuperation procedures to adapt to the issue. The principal procedure is Time out calculation with dynamic holding up cycle. The second procedure is stroll around error recovery. The CAR convention can create virtual data as gatekeepers, which is a particular point of interest over different conventions.

d) Diagonal-Intersection-Based Routing Protocol (DIR)

DIR convention builds a progression of corner to corner crossing points between the source and destination vehicle. The DIR convention is based upon the geographic directing convention in which source vehicle topographically advances the data packets towards the first corner to corner convergence, second inclining crossing point thus on until the last slanting convergence lastly geologically reaches to assignment vehicle.

DIR vehicle is auto movable, Auto flexibility implies that one subway with low information bundle postponement between two neighboring slanting convergences, which is powerfully chosen to forward information parcels.

To lessen the information bundle postpone the course is naturally chosen with most minimal sub path delay. DIR convention can consequently modify directing way to keep the lower packet delay.

e) Delay Tolerant Protocols

In an urban situation where the vehicle is thickly pressed to find a node to convey a message is not an issue, but rather in provincial expressway circumstance or in urban areas during the night less vehicles are running and setting up end to end route is troublesome. So in such cases, certain considerations should be given in sparse networks. The different sorts of Delay Tolerant Protocols are MOVE, VADD, and SADV.

f) Motion Vector Routing Algorithm (MOVE)

The MOVE algorithm is an algorithm for the sparse VANET scenario. In these situations, the vehicle goes about as versatile switch that have a discontinuous network with different vehicles. Connection opportunities must be examined precisely since they happen rarely and worldwide topology is likewise quickly changes.

The algorithm must anticipate whether sending messages will give progress toward an expected destination. MOVE algorithm expects that every hub has information of its own position, heading and destination. From this data the present vehicle hub can ascertain the nearest separation between the vehicle and message destination. MOVE algorithm utilizes less cushion space. MOVE algorithm is uniquely intended for inadequate systems and for vehicles that exchange information from sensor systems to base station.

g) Vehicle Assisted Data Delivery (VADD)

VADD utilizes a carry and forward system to permit packets to be conveyed by vehicle in sparse systems for sending when the node enters the broadcast range, in this way permitting a packet to be sent by hand-off in the event of inadequate systems. VADD require every vehicle to know its own position furthermore and requires an outer static road map.

Every packet has three modes: Intersection, Straight Way and Destination, where every mode depends on the area of the node conveying the packet. In Intersection mode is utilized when the bundle has come to a convergence at which steering choices can be made for the packet to be sent to a vehicle along any of the accessible headings of the crossing point. In Straight Way mode the present node is on a street where there are just two conceivable headings for the packet

to go, to the present node or the other way. In Destination mode is the point at which the packet is near its last destination.

h) Static Node Assisted Adaptive Routing Protocol (SADV)

SADV goes for the diminishing message conveyance delay in meager systems. SADV likewise progressively adjusts to allowing so as to fluctuate movement thickness every node to quantify the measure of time for message conveyance. SADV expect that every vehicle knows its position through GPS and every vehicle has gotten to outside static road map. SADV has three unique modules they are as per the following:

Static Node Assisted Routing (SNAR): SADV works in two modes: "In Road Mode" and "Crossing point Mode". SNAR make utilization of ideal ways, which are resolved on the premise of chart preoccupied from the guide. Connection Delay Update (LDU): LDU keeps up the postponement network powerfully by measuring the postponement of message conveyance between static nodes. Multipath Data Dissemination (MPDD): MPDD helps in multipath directing.

C. Cluster Based Routing

Clusters based routing is favored in groups. A gathering of nodes distinguishes themselves to be a piece of the bunch and a node is assigned as group head will broadcast the packets to the cluster.

Great versatility can be accommodated extensive systems, however system delays and overhead are brought about when framing groups in exceptionally versatile VANET. In cluster based routing, virtual system base must be made through the grouping of nodes so as to give scalability. The different Clusters based routing conventions are COIN and LORA_CBF.

D. Broadcast Routing

Broadcast routing is regularly utilized as a part of VANET for sharing, movement, climate and crisis street conditions among vehicles and conveying ads and declarations. The different Broadcast directing -conventions are BROADCOMM, UMB, VTRADE, and DV-CAST.

E. Geo Cast Routing

Geo cast routing is fundamentally an area based multicast routing. Its goal is to convey the packet from source node to every single other node inside of a predefined geological area (Zone of Relevance ZOR). In Geo cast routing vehicles outside the ZOR are not alarmed to stay away from the superfluous hurried response. Geo cast is viewed as a role as a multicast administration inside of a particular geographic district. It typically characterizes a sending zone where it

coordinates the flooding of the packets with a specific end goal to diminish message overhead and system clog brought about by just flooding parcels all around. In the destination zone, unicast routing can be utilized to forward the packet. One trap of Geo cast is system dividing and also unfavorable neighbors, which may block the best possible sending of messages. The various Geo cast routing protocols are IVG, DG-CASTOR and DRG.

Table-I: Comparison of routing protocols.

PROTOCOLS	PROACTIVE PROTOCOLS	REACTIVE PROTOCOLS	POSITION BASED GREEDY PROTOCOLS	DELAY BOUNDED PROTOCOLS	CLUSTER BASED PROTOCOLS	BROADCAST PROTOCOLS	GEOCAST PROTOCOLS
PRIOR FORWARDING METHOD	WIRELESS MULTI-HOP FORWARDING	WIRELESS MULTI-HOP FORWARDING	HEURISTIC METHOD	CARRY AND FORWARD	WIRELESS MULTI-HOP FORWARDING	WIRELESS MULTI-HOP FORWARDING	WIRELESS MULTI-HOP FORWARDING
DIGITAL MAP REQUIREMENT	NO	NO	NO	NO	YES	NO	NO
VIRTUAL INFRASTRUCTURE REQUIREMENT	NO	NO	NO	NO	YES	NO	NO
REALISTIC TRAFFIC FLOW	YES	YES	YES	NO	NO	YES	YES
RECOVERY STRATEGY	MULTIHOP FORWARDING	CARRY AND FORWARD	CARRY AND FORWARD	MULTIHOP FORWARDING	CARRY AND FORWARD	CARRY AND FORWARD	FLOODING
SCENARIO	URBAN	URBAN	URBAN	SPARSE	URBAN	HIGHWAY	HIGHWAY

IV. Applications of Vanets

Various applications are imagined for these systems, some of which are as of now conceivable in some as of late composed vehicles:

_ Vehicle crash cautioning

_ Security separation cautioning

_ Drivers help

_ Helpful driving

_ Helpful voyage control

_ spread of street data

_ Internet access

_ Map area

_ programmed stopping

_ Driverless vehicles

The RSU can be dealt with as an entrance point or switch or even a support point which can store information and give information when required . All information on the RSUs are transferred or downloaded by vehicles. A grouping of utilizations is additionally done by as Car to Car Traffic applications, Car to Infrastructure applications, Car to Home applications and Routing based applications. The creators in [19] examine about the different assaults taking into account their order. In view of the sort of correspondence either V2I or V2V, we are orchestrating the utilizations of VANETs into taking over classes:

1) Safety situated,

2) Commercial situated

3) Conveniently situated and

4) Productivity Applications.

A. Wellbeing or safety Applications

Safety applications incorporate observing of the encompassing street, drawing closer vehicles, surface of the street, street bends and so on. The Road security applications can be named:

I. Real-time activity:

The continuous movement information can be put away at the RSU and can be accessible to the vehicles at whatever point and wherever required. This can assume an essential part in tackling the issues, for example, roads turned parking lots, maintain a strategic distance from blockages and in crisis alarms, for example, mischances and so forth.

II. Co-operative Message Transfer

Slow/Stopped Vehicle will trade messages and co-work to help different vehicles. In spite of the fact that unwavering quality and idleness would be of significant concern, it may robotize things like crisis braking to keep away from potential mishaps. Essentially, crisis and electronic brake-light may be another application.

III. Post Crash Notification

A vehicle included in a mischance would telecast cautioning messages about its position to trailing vehicles so it can require choice with investment close by and additionally to the roadway watch for tow away backing.

IV. *Road Hazard Control Notification*:

Cars telling different autos about street having avalanche or data with respect to street highlight warning because of street bend, sudden downhill and so on.

e) Cooperative Collision Warning

Alerts two drivers conceivably under accident course with the goal that they can patch their ways.

f) Traffic Vigilance

The cameras can be introduced at the RSU that can fill in as data and go about as the most recent instrument in low or zero resistance crusade against driving offenses.

B. Commercial Applications

Business applications will give the driver the excitement and administrations as web access, gushing sound and video. The Commercial applications can be named:

a) Remote Vehicle Personalization/Diagnostics

It assists in with downloading of customized vehicle settings or transferring of vehicle diagnostics from/to base.

b) Internet Access

Vehicles can get to the web through RSU if RSU is filling in as a switch.

c) Digital guide downloading

Map of locales can be downloaded by the drivers according to the prerequisite before making a trip to another region for travel direction.

Likewise, Content Map Database Download goes about as an entryway for getting important data from versatile problem areas or home stations.

V. Real Time Video Relay

On-interest motion picture experience won't be bound to the home's limitations and the driver can request an ongoing video hand-off of his most loved motion pictures.

VI. Value-included advertisements

This is particularly for the administration suppliers, who need to draw in clients to their stores. Declarations like petrol pumps, thruways eateries to report their administrations to the drivers inside of corresponding extent.

This application can be accessed even without the Internet.

C. Convenience Applications

Accommodation application, predominantly bargains in movement administration with an objective to improve activity effectiveness by boosting the level of comfort for drivers.

The Convenience applications can be named as follows:

1) Route Diversions: Route and excursion arranging can be put forth in defense of street blockades.

2) Electronic Toll Collection: Payment of the tool should be possible electronically through a Toll Collection. A Toll accumulation Point should have the capacity to peruse the OBU of the vehicle.

OBUs worked by means of GPS and the on-board odometer techographs ago down to decide how far the Lorries have headed out by reference to an advanced guide and GSM to approve the toll's installment through a remote connection. TOLL application is useful to drivers as well as to toll administrators.

3) Parking Availability: Notifications with respect to the accessibility of stopping in the metropolitan urban communities, finds the accessibility of openings in parking areas in a certain topographical territory.

4) Active Prediction: It envisions the up and coming geology of the street, which is required to streamline fuel use by changing the cruising velocity before beginning a plunge or a rising. Furthermore, the driver is likewise helped.

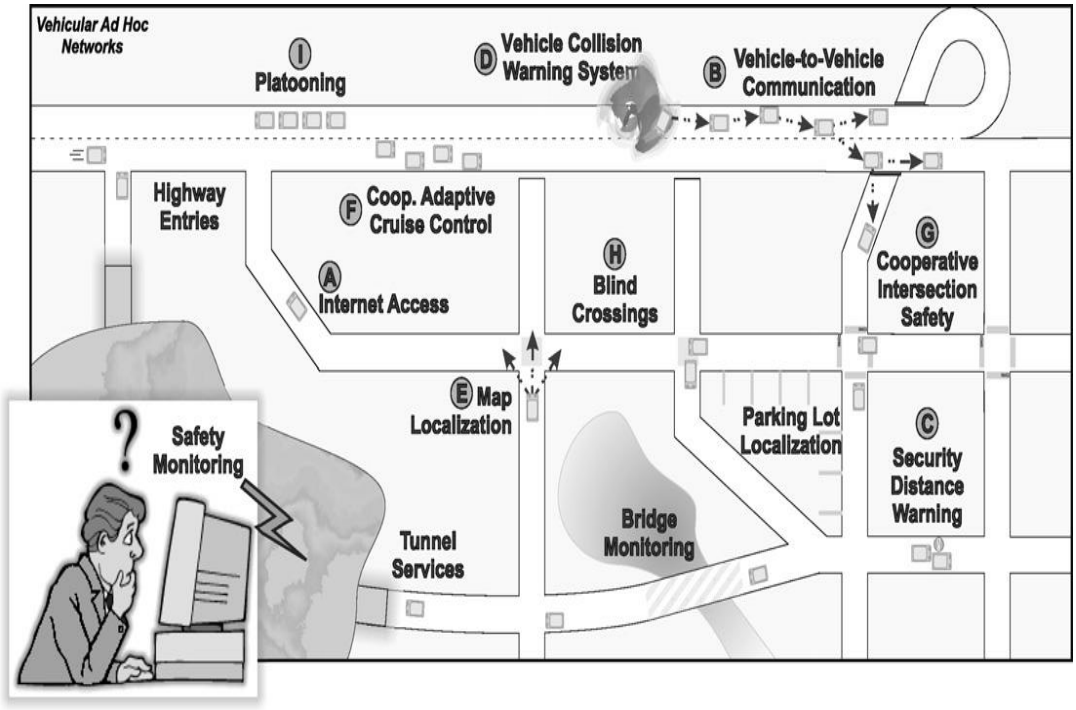

Fig 2. Various applications of VANET.

V. Conclusion

The routing of packets through the VANET is exceptionally intricate because of the high portability of the vehicles and the quick changing system topologies. In this paper, we think about the execution of the directing conventions AODV, DSR, FSR and TORA in such VANET situations on the premise of system recreations.

Our assessment demonstrated the qualities and shortcomings of proactive and receptive specially appointed directing conventions in VANET situations. An imperative perception was that the analyzed routing conventions demonstrated exceptionally heterogeneous execution results. In synopsis, AODV accomplished the best execution all through the movement situations, trailed by FSR. AODV causes just minimal overhead contrasted with alternate conventions in the vast majority of the recreated situations. FSR experiences a high directing overhead at higher activity densities. Another issue of FSR was the long introduction stage while connection state data spread through the system interestingly. DSR likewise experiences a high steering or routing overhead and postponement. Since the topology of the system changes every now and again, the source course data are legitimate for a constrained time frame. Future work will incorporate the reenactment of extra run of the mill street movement situations, keeping in mind the end goal to decide possibilities for streamlining routing conventions in VANETs.

References

1. Bhuvaneshwari.S ,Divya.G , Kirithika.K.B and Nithya.S.: A Survey on vehicular ad-hoc network. Vol. 2, Issue 10, October 2013.
2. Moustafa,H., Zhang,Y.: Vehicular networks: Techniques, Standards, and Applications. CRCPress, (2009).
3. YaseerToor et al., "Vehicle Ad Hoc Networks: Applications and Related Technical issues", IEEECommunications surveys & Tutorials, 3rd quarter 2008, vol 10, No 3,pp. 74-88.
4. Y.- C. Hu and K. Laberteaux, "Strong Security on a Budget," Wksp. Embedded Security for Cars,Nov.2006;http://www.crhc.uiuc.edu/~yihchun/.
5. Maxim Raya e al., "The Security of Vehicular Ad Hoc Networks", SASN'05, Nov 7 2005,Alexandria, Verginia, USA, pp. 11-21.
6. Hannes Hartenstein et al., "A tutorial survey on vehicular Ad Hoc Networks", IEEECommunication Magazine, June 2008, pp. 164-171.
7. Jose Maria de Fuentes, Ana Isabel Gonzalez-Tablas, and Arturo Ribagorda, "Overview of Securityissues in Vehicular Ad Hoc Networks", Handbook of Research on Mobility and Computing, 2010.
8. Murthy, C. S. R.,Manoj, B. S.: Ad Hoc Wireless Networks: Architectures and Protocols.PEARSON,ISBN 81-317-0688-5, (2011).
9. Dahill, B. N. Levine, E. Royer and Clay Shields, "A Secure Routing Protocol for Ad HocNetworks", Proceeding of IEEE ICNP 2002, pp 78-87, Nov 2002.
10. Y. C. Hu, D. B. Johnson and A. Perrig, "SEAD: Secure efficient distance vector routing for mobilewireless ad hoc networks", Elsevier B. V. ,pp 175-192, 2003.
11. P. Papadimitratos and Z. J. Haas, "Secure Data Transmission in Mobile Ad Hoc Network", ACMWorkshop on Wireless Security, San Diego , CA, September 2003.
12. Fasbender, D. Kesdogan and O. Kubitz, "Variable and Scalable Security: Protection of LocationInformation in Mobile IP", IEEE VTS, 46th Vehicular Technology Conference, USA, 1996.
13. Y. C. Hu, A. Perrig and D. B. Johnson, "Ariadne: A Secure On-Demand Routing Protocol for AdHoc Networks", MobiCom'02, pp. 23-26,2002.

14. Fonseca and A. Festag, "A survey of Existing Approaches for Secure Ad Hoc Routing and TheirApplicability to VANETS", NEC Network Laboratories, 2006.
15. Xiaodong Lin et al., “Security in Vehicular Ad Hoc Network”, IEEE communications magazine,April 2008, pp. 88-95.
16. Menezes, S. Vanstone, and D. Hankerson, "Guide to elliptic curve cryptography", SpringerProfessional Computing (Springer, New York 2004).
17. Hof fstein, J. Pipher, J. H. Silverman, "NTRU: A ring- based public key cryptosystem", LectureNotes in Computer Science, Vol. 1423, 1998, pp 267-288.
18. G.MaryValantina,S.Jayashri"Detection of Reliable Path for congestion free traffic in Vanets"International Journal of Applied Engineering Research, ISSN 0973-4562 Vol. 9 No. 21, 2014.
19. G.MaryValantina,S.Jayashri"Trajectory based multicasting in vehicular ad hoc network"International Journal of Pharmacy and Technology , ISSN 0975-766X, Volume-6 Issue-4 Jan-April 2015.

Corresponding Author:
E. Amala Tamil arasi,
Email: *valantina78@gmail.com*