Link Stability Based Hop By Hop Multicast Protocol For Vanets

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Abstract

Vanets are new emerging and challenging technology that makes an improvisation in traffic safety and efficiency. The constant growth of automobile industry is increasing the demand for car safety and the car to car connectivity. It creates a path for intelligent transportation system(ITS).The information that is carried by the vehicles can enrol safety measures The group-oriented services are one of the primary application classes that are addressed by VANETs in recent years. To support such services, multicast routing is used. Thus, there is a need to design stable and reliable multicast routing protocols for VANETs to ensure better packet delivery ratio, lower delays and reduced control overheads. In this paper, we propose link stability based hop by hop multicast routing scheme that finds stable multicast path from source to receivers. The multicast path is constructed by using route request and route reply packets with the help of multicast routing information cache and link stability database maintained at every node. A multicast routing protocol that implements multicast distribution through recursive unicast trees. The main goals of LSHBH are to support unicast clouds, allowing incremental deployment to have a stable tree structure, by minimizing the impact of receiver departures, and to construct low-cost trees, to reduce administrative costs and to lower error rate. The proposed scheme is simulated over a large number of VANET nodes with wide range of mobility and the performance is evaluated. It is observed that proposed scheme produces better packet delivery ratio, less control overheads and reduced packet delay compared to on-demand multicast routing protocol (ODMRP).

Keywords: ITS, link stability: multicast routing: ODMRP.

1. INTRODUCTION

There are many characteristics and challenges that should be taken into consideration when developing multicast routing protocols, like the dynamically changing network topology, limitation of network scalability. There are different types of protocols like unicast protocols [1], [2], cluster based protocols [3] In this paper we discuss about multicast routing for vehicular Ad hoc network which is different from other Ad Hoc networks [4]. Generally there are two types of multicast routing protocols in wireless networks. Tree-based multicast routing protocol, mesh based routing protocol [5]-[8]. In the tree-based multicasting, structure can be very much unstable in multicast ad-hoc routing protocols, as it needs frequent re-configuration in dynamic network. One such example is Multicast extension for Ad-Hoc On-Demand Distance Vector (MAODV) and Adaptive Demand- Driven Multicast Routing protocol (ADMR). The second type is mesh-based multicast protocol. Mesh-based multicast routing protocols are more than one path may exist between a source destination pair, Core-Assisted Mesh Protocol (CAMP) and On-Demand Multicast Routing Protocol (ODMRP) are an example for these type of classification[9]. One approach to multicast is to maintain a multicast tree in straight roads. Existing protocols for multicasting encounters quite a lot of troubles in mesh maintenance and regular reconfiguration when link breakage occurs. The extreme dependency of these protocols on upstream and downstream nodes leads to storage and control overhead. Furthermore, various protocols consider the shortest path as a decisive factor for path selection, Existing forwarding state for the multicast distribution mesh for the source and the group. The nonexistence of data and Keep-alive messages within a certain period of time is an indication of forwarding mesh disconnection. Existing multicast protocols are either hybrid or mesh-based. Mesh-based schemes set up a single path connecting any two nodes in the multicast group. These schemes need least amount number of copies per packet to be sent along the branches of the mesh, therefore they are bandwidth efficient. On the other hand, as mobility increases, link failures start the reconfiguration of the

complete mesh. In Link stability based approach [9] multicast protocol has a tree construction algorithm which finds the end-host in the particular subnet by examining node by node. This is achieved by checking every node IP address against destination IP. The tree management algorithm of LSHBH uses three control messages. Messages are periodically sent to the source by the receivers. The source node periodically produces messages that are multicasted in the network. While the messages travel down in the tree, the intermediate nodes may possibly create messages that are responsible of refining the tree structure. In this paper, we propose link stability based hop by hop (LSHBH) multicast routing scheme that establishes a route from source to multicast destinations in VANET. A multicast Tree is created with stable links when a source node wants to send data to receiver nodes. A multicast channel in LSHBH is recognized by the unicast address of the source and is a class-D IP address allocated by the source. This solves the address allocation problem while being compatible with SSM's channel description. so, LSHBH can support IP Multicast clouds as leaves of the distribution tree. The tree management scheme used in LSHBH minimizes the impact of member departures in the tree structure. There are no route changes for other members when a member leaves the group because the unicast routes are symmetric.

A multicast routing protocol that implements multicast distribution through recursive unicast trees. The main goals of LSHBH are to maintain unicast clouds and to allow incremental deployment to have a stable tree structure, by reducing the impact of receiver departures, and to construct low-cost trees, to reduce administrative costs and to lower error rate.

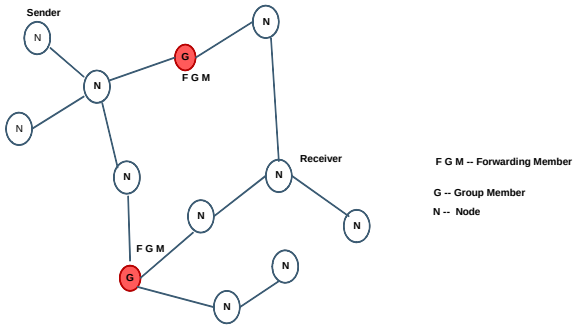

Fig 1. Node architecture in forwarding group member

Forward member is the group header of the multicast link to distribute the information. AODV protocol is used to deliver the data packets to all of the nodes combination of both tree-based and mesh-based multicasting routing protocols used for hybrid.ODMRP (On-Demand Multicast Routing Protocol) is applied to enhance the multicating routing .While forwarding the information from source to destination,we have many forward nodes,so there is many hop count,and to reduce we are using (ODMRP)protocol.We are creating group member using reduce the hop count.Group member means it identifies path and data transmission to node it reduce the number of transmission.It can change the path quickly to one leader to other leader.Packet delay and time delay has bean reduced.

2. Link stability based hop by hop multicast routing

2.1 Dynamically Node Addition

All the nodes that are attached to the particular node will be displayed in the list and the left and the right node to which the message has to be sent are chosen from the list. As we desire to send a message the data will be sent to those nodes which are selected from the list.

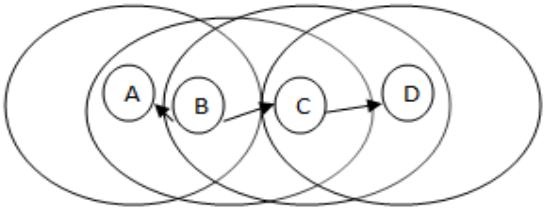

Fig 2. Dynamically node addition

A mesh is created between the members of the group by a Mesh Creation technique that include broadcasting a Control Packet to identify the members of the Group. This is an "Expanded Ring Search" algorithm. Every part of the mesh [10] formed comprises of a Logical Core node that is entirely responsible for

maintaining the tree and its members. The core is chosen by using a “Core Resolution” algorithm. From the mesh a User Multicast Tree is built. The tree is created in such a way that the nodes of the tree are the members of the group formed. The core node periodically sends a message to all the members of the group to maintain the tree created.

2.2 Path Discovery

The shortest path from the source node i.e. the root to the left and the right is found out and the request is sent from the left and right nodes to the root node by which the shortest path is found and the message is sent along the shortest path found through the found shortest path[11].

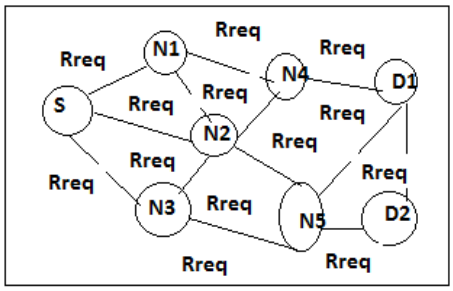

Fig 3. Path discovery

Source S broadcasts Rreq packet to discover the route for two multicast receivers D1 and D2.Nodes N1, N2, N3 *receive* Rreq packet from Source S. The paths are updated to Source S in its MRIC by using next hop as Source S. The link stability database is also updated and stability factor of next hop in MRIC.Node N1 broadcasts Rreq packet to N4 and N2. Node N3 broadcasts to N2 and N5. Node N4 broadcasts Rreq to D1.If any node in the middle analyse that the packets are duplicated then those packets are discarded.D1 and D2 updates MRIC and link stability database. Now, D2 and D1 have path to the source *S*, D1-N4-N1-S, D2-N5-N3-S.

Mesh creation through the route request Rreq packets and route reply Rrep packets, Finding stable routes between source to destination by selecting SFNs using link stability metric. The link stability is calculated using the power received at a node, packet losses and the distance between nodes. Our contributions in this paper are as follows. Defining route request and route reply packets to create a mesh by using Transmission power and antenna gains. Establishment and maintenance of routing information for hop by hop routing for a multicast connection by using route request and route reply packets based on link stability. Selecting a node for stable forwarding for multicast paths based on link stability computed using the parameters such as distance between the nodes, received power and link quality.

3. Simulation

The simulation is carried out using the NS-2 simulator, Table 1 gives the simulation parameter values.

Table 1.Simulation parameters

PARAMETERS	VALUES
Simulator	NS-2
Simulation Area	1000*1000 m
Number of nodes	50
Transmission range	250m
Mobility model	Random waypoint
Node speed	10 to 50m/s
Packet size	512 bytes

We run the simulation 500 s every time and the numerical results are all averaged. The performance is compared between LSHBH and ODMRP using the network simulator and the results are shown

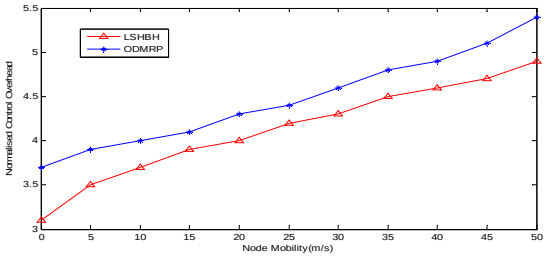

Fig 4.Comparison of Control Overhead

The Control overhead of LSHBH is lower compared to ODMRP as shown in Fig 4. Because it selects different stable forwarding node in a mesh during link failure instead of going for immediate route discovery.

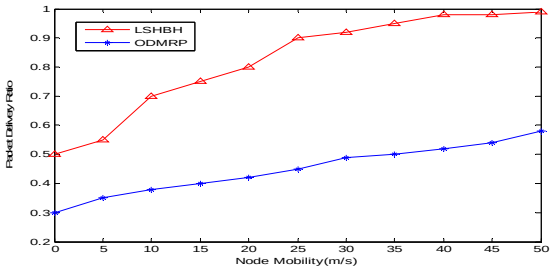

Fig 5.Comparison of Packet Delivery Ratio.

The packet delivery ratio graph as shown in Fig 5.proves that our proposed protocol proves better ratio than ODMRP. In LSHBH, if the entire forwarding node's links associated with multicast node not succeed, then the node rediscovers the mesh and stable route. A forwarding node is always present in the network therefore the packet delivery ratio of proposed is high.

4. Conclusion

This paper proposed link stability based hop by hop multicast routing scheme that finds stable multicast path from source to receivers. The main goals of LSHBH are to maintain stable tree structure, by reducing receiver departures, and to construct low-cost trees, to reduce administrative costs and to lower error rate. Simulation is done over a large number of VANET nodes with wide range of mobility and the performance is evaluated. Finally, the simulations results confirm effectiveness of our proposed protocol in efficient multicast delivery in terms of packet delivery ratio, less control overheads. However in the future, we will seek better multicast routing with new smart scheme.

References

[1] C. Lochert, H. Hartenstein, J. Tian, H. Füssler, D. Hermann, and M. Mauve, "A routing strategy for vehicular ad hoc networks in city environments", in Proc.of the IEEE Intelligent Vehicles Symposium, 2003, pp. 156–161.

[2] G. Korkmaz, E. Ekici, F. Özgüner, and U. Ösgüner, "Urban multi-hop broadcast protocol for inter-vehicle communication systems", In Proc. of the first ACM workshop on Vehicular ad hoc networks, 2004, pp. 76–85.

[3] R. Santos, A. Edwards, R. Edwards, and N. Seed, "Performance evaluation of routing protocols in vehicular ad-hoc networks", *International Journal of Ad Hoc and Ubiquitous Computing*, vol. 1, pp. 80–91, 2005.

[4] Aslinda Hassan, Mohamed H. Ahmed, M.A. Rahman,"Performance evalaution for multicast transmission in VANET"",IEEE CCECE 2011 – 001105 M

[5] Hasnaa Moustafa and Houda Laboid,"Multicast Routing In Mobile Ad hoc Networks",Telecommunication Systems,Springer,Sep 30,2004.

[6] S. J. Lee, W. Su, J. Hsu, M. Gerla, and R. Bagrodia, "A performance comparison study of ad hoc wireless multicast protocols," *Proceedings of the IEEE INFOCOM'00*, 2000.

[7] V. Kumar, O. Katia and T. Gene, "Exploring mesh- and tree based multicast routing protocols for MANETs," *IEEE Transactions on Mobile Computing*, vol. 5, pp. 28–42,2006.

[8] Rajashekhar Biradar, Sunilkumar Manv,"Mesh Based Multicast Routing in MANET:Stable Link Based Approach", International Journal of Computer and Electrical Engineering, Vol. 2, No. 2, April, 2010.

[9] Zhiming Xu, Yu Wang, Jingguo Zhu" A Reliable Multicast Routing Protocol for Highspeed Mobile Ad Hoc Networks: R-ODMRP", journal of software, vol. 5, no. 1, january 2009.

[10] Qingyang Song, Zhaolong Ning, Shiqiang Wang" Link Stability Estimation Based on Link Connectivity Changes in Mobile Ad-hoc Networks"Journal of Network and Computer Applications, vol.35, 6, Nov. 2012

[11] Alvin Sebastian, Maolin Tang, Yanming Feng, and Mark Looi. A Multicast Routing Scheme for Efficient Safety Message Dissemination in VANET. WCNC, pages 1–6, April 2010.