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VANET ROUTING PROTOCOL FOR MULTIHOP VOICE TRANSMISSION

K. M. VISHANI[1] & A. A. BAVARVA[2]

[1]M.Tech Student, Department of Electronics and Communication, R.K University, Rajkot, Gujarat, India

[2]Department of Electronics and Communication, R.K University, Rajkot, Gujarat, India

ABSTRACT

Voice transmission over vehicular ad-hoc networks (VANET) play an important role in intelligent transport systems. In recent year there has been an interest in the quality oriented adaptive voice delivery, including over Vehicular Ad hoc Network. In this paper, a performance of routing protocol is consider in terms of throughput based on Multihop network communication solution is presented which makes use of ad-hoc modes in order to deliver quality oriented voice content to high speed vehicles. Simulation based testing shows how voice transmission to vehicles when using Multihop mechanism achieves significantly higher throughput with AODV protocol in comparison to the DSDV protocol.

KEYWORDS: Multihop, Ad hoc Voice Transmission, Vehicular Ad hoc, Network

I. INTRODUCTION

In last decade, there has been significant work on intelligent transport system with special focus on vehicular safety. In a particular communication between vehicles [1], there could be a number of routes available to transmit to transmit data. The interest toward supporting additional services including voice applications, In this context, significant research performed on voice delivery over high speed vehicular networks showed that in order to support Multihop voice services comparing different routing protocol. It is necessary to support high data rate, low loss rate and good connectivity [2]. This paper proposes a design which integrates Multihop communications into high speed vehicular networks which resulting in one of the most promising solutions to meet the demand of voice transmission in vehicular ad hoc networks. In such architecture, communication with the end users in multiple hops, through different vehicles which act as mobile relay nodes [3]. Vehicle to vehicle communication which results in Multihop vehicular ad hoc network is considered in this paper as the underlying model for next generation vehicular ad hoc networks. This solution is to increase the throughput and avoid the frequent handovers by using different routing protocol experienced by vehicular to vehicular communications and at the same time, minimize the packet loss. Shorter data transmission distances in each hop results in lower transmit power for each transmitter and so in power saving

Figure 1: Multihop Vehicular to Vehicular Transmission

Figure 1 shows an illustration of voice transmissions in a vehicular network. Voice data is transmitted from one vehicle to other vehicle in Multihop fashion. In the context of voice streaming in vehicular ad hoc networks, there are two significant challenges. The first challenge is the transmission of high quality voice in dynamically changing wireless network affected by issues such as contention, mobility and congestion. Second challenge is to minimize the packet loss and transmission delay [4].

In this paper, Multihop transmission is considered for high quality voice transmission. Some of the well-known routing protocols are considering these in VANET brought frequent communication break which is mainly attributed to nature of node. To meet the VANET challenges these algorithms are suitably modified [5]. The performance is analyzed in terms of the throughput for different Multihop routing. The paper is organized as follow. Section two presents related works, section three describes system architecture including Multihop vehicular ad hoc communication solution and section four consider different routing protocol. Simulation setup and result analysis are presented in section five and conclusion is drawn in last section.

II. RELATED WORKS

The vehicular ad hoc network is basically different from wireless ad-hoc network that are implemented on road side ad-hoc network. Vehicles have greater power supply or energy than normal mobile device, as often energy can be derived from vehicle itself. From the size of vehicle, large number of sensors can also be fitted onto the vehicles. This is beneficial for safety, security, communication, distribution of highway information, internet access, location map, automatic parking, infotainment and other services deployed [6]. The vehicles usually travel at high speeds and thereby have great difficulty in maintaining vehicle to vehicle connectivity. Considering a fixed access point to cover all roads at short distance one from another, huge and expensive investment is required IEEE 802.11P standard has been proposed for dedicated short range communication in high speed vehicular wireless network [7]. It operates at 5.9 GHZ range [8] and supports up to 120 mph with a nominal transmission range of 300 m (up to 1000m) and default data rate of 6 Mbps. This will be related to the improvement of highway safety, traffic flow and other intelligent transport system application in variety of environment called wireless access in vehicular environment. For fast access, wireless access in vehicular environment doesn’t allow IEEE 802.11 active authentication, association and scanning.

For this purpose also using simple beaconing application which periodically sends packate (called beacons) reporting vehicles status for active safety application [9] In case of real time voice transmission in vehicular wireless network, the unpredictability and constantly varying nature of wireless channel along with high speed of vehicles require solutions to be proposed to address this issues such as feedback based adaptive mechanism for efficient voice delivery to AS. Nearly QPAMS proposed for wireless network and obtained good result in cellular network [10].

III. SYSTEM ARCHITECTURE

A. Network Model

Here scenario considered for the deployment of vehicular ad hoc network is area where there is good road connectivity and traffic is not dense. Vehicles are assumed to move at a minimum velocity of 36 km/h and it can be increase up to 72km/h. in these cases of Multihop mode, CBR voice is considered as application traffic which makes use of UDP. Packet size is set to 500 bytes. A random way point mobility model is considered in the network design. Made formal changes to Physical layer in the system design. Operating frequency is 5.9 GHz. MAC design is similar to IEEE 802.11e enhanced distributed channel access duality of service extension. Within the MAC layer packet queue exists for each access categories. In different scenario different speed is considered for the vehicles. The transmission range of a single hop is around 1 km. hence maximum number of hops between vehicles can be considered.

B. Voices Streaming

To support high quality voice streaming in vehicular ad hoc network, feedback based approach is considered. Using principle of QOAS, state of the adaptive voice streaming scheme is considered [11]. It monitoring QOS transmission related parameters and sending feedback to the server which adjusts voice transmission rate. This is based on random loses have great impact on perceived quality. The main aim of integrating quality oriented voice delivery with the IEEE 802.11p standard is to maintain high end user in two difficult conditions. First when the vehicles are moving with high speed and second when there is quick handover between different nodes and sender.

IV. ROUTING PROTOCOL

VANET routing is a major challenge facing distributed routing node so must design a dedicated and efficient Multihop routing protocol. There are number of routing protocols available in the different literature [12]. Not all protocols consider for the best performance under certain conditions. So, in order to access Multihop vehicular wireless network impact on the performance of voice data delivery, different modes and good routing protocols are considered in this paper.

A. Destination Sequence Distance Vector (DSDV)

The DSDV routing protocol, originally proposed for mobile ad-hoc networks (MANET). The reason for considering DSDV for vehicular networks is that each route is tagged with a sequence number indicating how old the route is. DSDV is based on the Distributed Bellman-Ford algorithm. Each node manages its own sequence number by assigning higher value at regular intervals. When a route update with the higher sequence number received by a node, the old route is replaced with new one. The main drawback of DSDV is that it requires regular updates of the routing tables, which use battery power importantly, a small amount of bandwidth even if when the network is idle. Whenever the topology of the networks is going to changes, anew sequence number is necessary before the network re-arranges this making DSDV not suitable for highly dynamic networks. DSDV don't provide multi routes to destination node and has no control over the network congestion which decreases the routing efficiency [13].

B. Ad-Hoc on Demand Distance Vector (AODV)

Ad hoc on demand distance vector (AODV) routing protocol is one of the several published routing protocols for mobile ad hoc networking [14]. AODV is reactive routing protocol. It is based on the on-demand algorithm capable of both unicast and multicast transmissions. When there is no data packet to be sent, no routing overhead is required. So it reduces the network overhead. The main reason for selection of AODV for vehicular networks is that, the protocol maintains the routes only while necessary by the sources. AODV guarantees loop free routes by using sequence number that indicate how fresh a route is. When vehicles want to send a packet, the route discovery process broadcasts a Route Request Messages to discover the destination node. Route request message will be flooding to a determined hop count: the maximum time to live value. If the destination receives the Route Request, it replies with a Route Reply. The number of hops of the route discovery process is determined by the predetermined maximum TTL value. The difference between the scopes of route discovers and overhead of flooding routing messages is critical for the AODV performance.

V. SIMULATION SETUP

For analyzing the effect of delivery on voice traffic, a vehicular wireless network with 7 vehicles (nodes) is considered in the simulation model. During the initial simulation, the speed of the each vehicle is consider different from 40 to 72 km/h. depending on the mode of communication, the vehicles communicating directly or using Multihop. In simulation, the number of hops is minimized by selecting the farthest vehicle within the source transmission range as the relay vehicle which forwards the message. To this aim, each vehicle that has received the message with duration that is directly proportional to the distance between the considered vehicle and the message source. In scenario 2, speed of each vehicle is considered about 54 km/hr and different routing hop is given between source and destination vehicle. The vehicle with longest signal is the farthest vehicle from the source and becomes the next forwarder. Same in scenario 3, speed of each vehicle is considered about 72 km/hr and Multihop communication between source and destination vehicle is considered.

Network is simulated using Network Simulator version 2.35 (NS2). The length of all NS-2 simulation is 20s. since network simulator does not simulate accurately high speed vehicular networks, the Macro Furie patch for IEEE 802.11 has been required, which has inbuilt propagation model. In order to simulate transmission of voice packets, Multihop communication of voice delivery scheme was modeled in network simulator. Voice delivery begins with the lowest available data rate so that we can consider the effect of packet loss. If no drop of packets during transmission, the data rate increases in steps towards maximum rate. If packet loss occurs, the data rate decreases. For different routing protocol taken different Multihop and generated the result of throughput. Throughput is the average number of successfully delivered data packets on a communication network or network node. It describes as the total number of received packets at the destination n out of the transmitted packets. The simulation results in Ns2 show the total received packets at destination in kb/sec.

VI. RESULTS

Throughput analysis for AODV and DSDV routing protocol is considering in results.

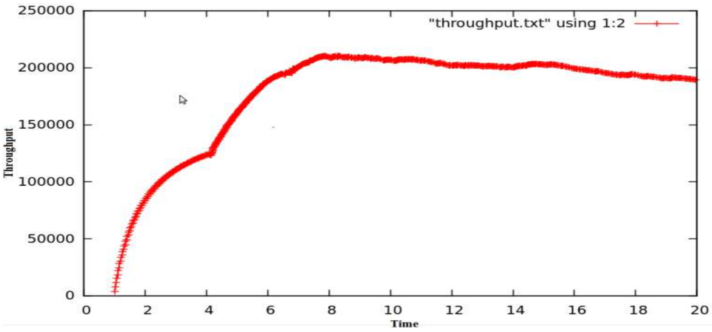

Figure 2: AODV Throughput

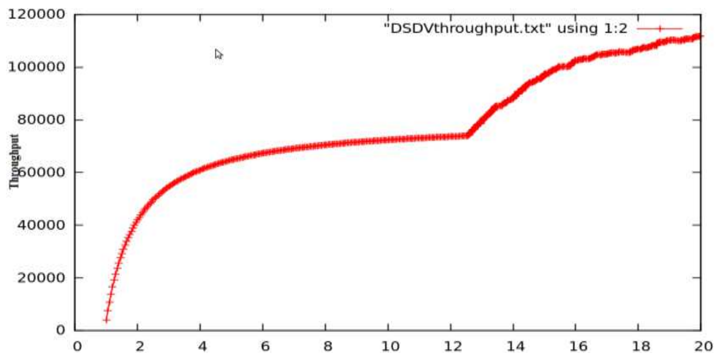

Figure 3: DSDV Throughput

Figure 2 shows the throughput vs. time results of the vehicular ad hoc network communication mechanism for different speed of vehicles when AODV routing protocol are used and throughput for DSDV routing protocol are shown in figure 3, it shows that throughput is decreases in DSDV, it takes more time to transport a packet to the final destination. It can also be seen that by changing the Multihop between source and destination vehicle, the average throughput of the network is higher when AODV protocol is used then DSDV is considered even if increasing speed of vehicles. This causes for the DSDV protocol, every time the vehicle moves from one relay node to another, there is a finite connectivity drop to a finite distance where there is no connection between the vehicles. In the AODV routing protocol, this effect does not occur. This is due to the reason that DSDV is a proactive protocol; it has no control over network congestion which decreases the routing efficiency if change in the dynamics, there is a break in the continuity for a small period. For different scenario of Multihop communication, Average throughput is measured and shown in table

Table 1: Scenario 1

Routing Protocol	Average Throughput (KBPS)
AODV	649.85
DSDV	471.89

Table 2: Scenario 2

Routing Protocol	Average Throughput (KBPS)	Speed of Each Vehicle (Km/H)
AODV	724	54
DSDV	540.73	54

Table 3: Scenario 3

Routing Protocol	Average Throughput (Kbps)	Speed Of Each Vehicle (Km/H)
AODV	828.15	72
DSDV	497.13	72

This is a significant result indicating that irrespective of the routing protocol, the usage of the Multihop vehicular wireless communication scheme is beneficial in terms of throughput. In order to compare the effects of mobility, the speed of all the vehicles in the network was increased from 40 km/h to 72 km/h and loss rate can be considered.

VII. CONCLUSIONS

This paper considering the comparison of AODV and DSDV routing protocol for measuring throughput and benefits of using a Multihop solution for high quality voice streaming in vehicular ad hoc network. AODV routing protocols is superior to that when single hop wireless vehicular mechanism is considered for average throughput. This is very significant result representing the way for further research in proposing new solutions and redesigning routing protocols to consider Multihop hybrid communications if speed of vehicle is increase. The proposed protocols in [15] used topology information with the position based routing to deliver data from source to destination. This would create high quality voice delivery in high speed vehicular adhoc networks without any deploying new infrastructure.

VIII. REFERENCES

1. Y. Liu, J. Bi, J. Yang; "Research on Vehicular Ad Hoc Networks", Chinese Control and Decision Conference (CCDC), 2009, pp 4430 – 4435.

2. C. E. Palazzi, S. Ferretti and M. Roccetti, “communities on the road: fast triggering of interactive multimedia services” Multimedia Tools Applications, Springer, May 2009.
3. M. Guo, M. H. Ammar, and E. W. Zegura, “V3: A Vehicle to Vehicle Live Video Streaming Architecture”, IEEE Pervasive Computing and Communications, Hawaii, USA, March 2005.
4. K. Collins, G. M. Muntean, “Route based Vehicular Traffic Management for wireless access in vehicular Environment”, IEEE Vehicular Technology Conference (VTC), Valgary, Canada, September 2008.
5. F. Li and Y. Wang; “Routing in Vehicular Ad Hoc Networks: A Survey”, IEEE Vehicular Technology, Volume 2, No. 2, June 2007; pp. 12-22.
6. C. Kevin, U. Lee, and M. Gerla., "Survey of Routing Protocols in Vehicular Ad Hoc Networks", Advances in Vehicular Ad-Hoc Networks: Developments and Challenges reference, IGI Global, 2010, pp. 149-170
7. D. Jiang, V. Taliwal, A. Meier, W. Holfelder and R. Herrtwich, “Design of 5.9Ghz DSRC based vehicular safety communication”, IEEE Transaction on wireless communications, Vol. 13, No. 5, pp 36-43, October 2006
8. G. M. Muntean, P. Perry and L. Murphy, “A comparison based study of Quality oriented video on demand”, IEEE Transactions on Broadcasting, Vol 53, no. 1, part 1, pp. 92-102 March 2007.
9. J. kenney, “VANET: vehicular applications and Inter-Networking Technologies”, UK, John Wiley and sons, 2010
10. H. Venkatraraman, S. Agrawal, A. Maheshwari and G M. Muntean, “QPAMA quality oriented prioritized adaptive multimedia cheme over two hop wireless networks”, world congress on engineering and computer science berkely, USA, 2010.
11. H. Venkatraraman, G. M. Muntean and H. Haas, “Spatial Reuse Efficiency Calculation for Multihop wireless networks”. AEUE journal, science direct, Elsevier, 2010.
12. C. Perkins, “Ad hoc networking” Addison-Wesley Professional January 2001.
13. J. Broch, D.A. Maltz,, D. B. Johnson, “A Performance Comparison of Multi-Hop Wireless ad Hoc Network Routing Protocols in Mobile Computing and Networking” 1998
14. S. Allal and S. Boudjit, “Geocast Routing Protocols for VANETs: Survey and Geometry-Driven Scheme Proposal,” Journal of Internet Services and Information Security (JISIS), vol. 3, no. 1, pp. 20-36, February 2013
15. C. Lochert, H. Hartenstein, J. Tian, D. Herrmann and M. Mauve, “A routing strategy for vehicular ad hoc networks in city environments,” IEEE Intelligent Vehicles Symposium (IV2003), pp. 156–161, June 2003.
16. M. Altayeb, I.Mahgoub, “A Survey of Vehicular Ad hoc Networks Routing Protocols”, ISSN transaction on routing Protocol, Vol.3, No.3, 2013
17. T. Issariyakul, E. Hossain, “Introduction to Network Simulator NS2”, Springer Science Business Media, LLC, 2009
18. F. J. Martinez, C. K. Toh, J. C. Cano, C. T. Calafate, and P. Manzoni,. “A survey and comparative study of simulators for vehicular ad hoc networks (VANETs)”, Wireless Communications and Mobile Computing, 2009.