Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 3, Issue. 9, September 2014, pg.758 – 763

RESEARCH ARTICLE

STUDY AND ANALYSIS OF VARIOUS ROUTING PROTOCOLS IN VANETS

Pooja Malik
Department of Computer Science & Engineering,
R.N College of Engineering & Management, Rohtak
poojamalik2425@gmail.com

Vikram Nandal
Department of Computer Science & Engineering,
R.N College of Engineering & Management, Rohtak
vikramcse@live.com

ABSTRACT: Routing in Vehicular Ad hoc Networks is a challenging task due to the unique characteristics of the network such as high mobility of nodes, dynamically changing topology and highly partitioned network. It is a challenge to ensure reliable, continuous and seamless communication in the presence of speeding vehicles. The performance of routing protocols depends on various internal factors such as mobility of nodes and external factors such as road topology and obstacles that block the signal. This demands a highly adaptive approach to deal with the dynamic scenarios by selecting the best routing and forwarding strategies and by using appropriate mobility and propagation models. In this paper we review the existing routing protocols for VANETs and categories them into a taxonomy based on key attributes such as network architecture, applications supported, routing strategies, forwarding strategies, mobility models and quality of service metrics. Protocols belonging to unicast, multicast, geocast and broadcast categories are discussed. Strengths and weaknesses of various protocols using topology based, position based and cluster based approaches are analysed. Emphasis is given on the adaptive and context-aware routing protocols. Simulation of broadcast and unicast protocols is carried out and the results are presented.

1. INTRODUCTION

VANET consists of a collection of vehicles that are equipped with wireless communication devices, GPS and digital maps [1]. Vehicles can dynamically set up an ad hoc network without the aid of infrastructure and messages can be transferred to the destination beyond the radio transmission range via multi-hops communication. VANET is a vehicle to vehicle & vehicle roadside wireless communication network. It is an autonomous & self-organizing wireless communication network, where nodes involve themselves as servers and/or clients for exchanging & sharing information [2].

Various types of routing protocols comes under VANETs such as:

(1) Geocast Based Routing Protocol: It is a location based multicast routing protocol. Each node delivers the message to other nodes that lie within a specified predefined geographic region based on ZOR (Zone Of Relevance). The philosophy is that the sender node need not deliver the packet to nodes beyond the ZOR.

(2) Broadcast Based Routing Protocols: It includes simple flooding techniques or selective forwarding schemes to counter this network congestion.

(3) Cluster Based Routing Protocols: Each cluster is represented by a cluster head. Inter-cluster communication is carried through cluster heads whereas intra-cluster communication is made through direct links.

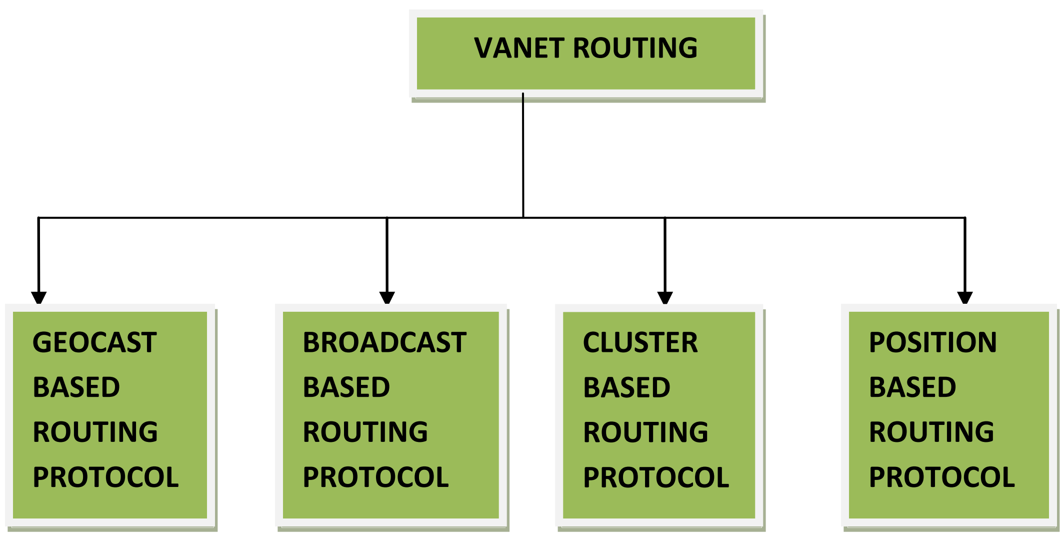

Figure 1.2 Routing Protocols

(4) Position Based Routing Protocols: employs the awareness of vehicle about the position of other vehicles to develop a routing strategy.

2. RELATED WORK

In this paper Position Based Routing Protocol is considered.

Position-based routing protocols perform the routing decisions based on the geographic information of the nodes. This type offers an alternative approach known to be more robust to face the mobility issues. Indeed, no global knowledge of the network topology is required; a purely local decision is made by each node to make a better progress towards the destination. Therefore, all nodes are required to be aware of their physical positions as well as their neighbours' positions. They also assume that the sending node knows the position of the destination. A location management service is responsible for querying this information.

The Position based routing protocols such as GPSR, GSR, SAR combine the position information with topological knowledge about the road and the surroundings.

The idea is to build a spatial model representing the underlying road topology and select a routing path that overlaps with the streets. For this purpose, graphs are used to represent road maps where vertices are crossroads and edges are road segments. The edges of the graph are weighted with static data extracted from the street maps.

3. PROPOSED WORK

According to the greedy algorithm the sender will select the node in the last circle of the transmission range of the sender node. As it is closest to the destination but at the same time as it is clear from the diagram it is just about to move out its transmission range. So there is very high probability that it might move out of the transmission range by the time packet reach to it. So there is very high probability of packet dropping in using greedy method for forwarding the packet. The proposed algorithm, therefore, does not use greedy forwarding in selection of the next relay node on a straight road/highway. Instead, it uses two factors, connection reliability (R) and distance factor (D) to calculate the transmission feasibility (F). If the destination node is within the transmission range, then the relay forwards the packet directly to it. Else, it proceeds on calculating F for each entry in its neighbor table, the calculation for R, D and F are discussed in following section.

3.1 Connection Reliability (R):

So the mathematical concept of average acceleration is used to define connection reliability (R). For this purpose average acceleration of nodes is calculated at the source/relay node, i.e. each node calculates the R factor for its neighbors, and not as a part of the beacon message received from the neighbor.

Suppose node A receives a beacon message from node B. If node A does not have any entry for node B in its neighbor table, a new entry is created for node B and link quality factor R is assigned an average value of 3 (*R* varies on a scale of 1 to 5 where 1 indicates least link stability and 5 indicates maximum link stability). If node A has an entry for node B in its neighbor table, *R* is calculated on the basis of the difference in previous and new speed values and the previous value of *R*. For example, if change in speed of B is ±5 to ±10, *R* is left unchanged. If change in speed of B is less then ±5, R is incremented by 1 for $R<5$; else *R* remains unchanged. And if change in speed is more than ±10, then R is decremented by 1 for $R>1$; else R remains unchanged.

3.2 Distance Factor:

To minimize chances of packet dropping resulting from movement of chosen node outside relay node's transmission range, we choose to divide neighbors of a node into 5 regions with boundaries T/5, 2T/5, 3T/5, 4T/5, T. Neighbors are weighed on the basis of the region in which they lie. For this purpose we introduce D, distance factor (ranging from 1 to 5). The region between 3T/5 and 4T/5 it is given the highest preference w.r.t D factor (W=5) as the nodes in this region have low probability of moving out of range quickly and are not so close to the source/relay that multiple hops are created within the same transmission range.

3.3 Transmission Feasibility (F):

Before forwarding the packet to destination node, the best node among the chosen nodes is selected on the basis of transmission feasibility (F). The transmission feasibility depends on one more parameter, in addition to connection reliability and distance factor, whose value is decided on the basis of its direction. It is denoted by 'm'. If the node is in the direction of the destination node then it is assigned a value +1 else if it is opposite to the direction of the destination node it is assigned a value -1.

After getting the values of all the three parameters i.e. R, D, m. We can now calculate the value of transmission feasibility (F).

FOR CITY/HIGHWAY SCENARIO:

The packet forwarding strategy used in most of the position routing protocols was the greedy forwarding. According to the greedy algorithm the sender will select the node in the last circle of the transmission range of the sender node.

ALGORITHM FOR CITY/HIGHWAY:

Step1. If the destination node is within the transmission range then forward the packet, else go to next step.

Step2. Calculate the IC field of every node in the neighboring table.

Step3. Calculate the connection reliability (R) of every node in the neighboring table.

Step4. Calculate the distance factor (D) for every node in the neighboring table.

Step5. Calculate the value of m_{st} for all nodes in the neighboring table.

Step6. Calculate the value of transmission feasibility (F) from the values of R,D and m_{st}.

4. RESULT AND ANALYSIS

4.1 Simulation Scenario*:*

We have used these set of constant parameters for simulation:

- Two scenarios are taken city and highway.
- Grid size taken for both the scenarios is 1000m*1000m.
- No. of vehicles in city scenario is 50 and in highway is 30.
- The velocity of vehicles varies from 18 to 90 Km/h in city scenario and from 72 to 144 Km/h in case of highway.
- Transmission range is 250m.
- Packet size is 512 Bytes

4.2 Simulators Used:

NS-2 appeared as a network simulator that provides significant simulation of transport, routing, and multicast over wired and wireless networks. NS-2 code is written in C++ and OTCL and is kept in a separate file that is executed by OTCL interpreter, thus generating an output file for NAM (Network Animator). It then plots the nodes in a position defined by the code script and exhibits the output of the nodes communicating with each other. It supports protocols like TCP,UDP, FTP. VanetMobiSim-The Vehicular Ad Hoc Networks Mobility Simulator (VanetMobiSim) is a set of extensions to CanuMobiSim, a framework for user mobility modeling. The framework includes a number of mobility models, as well as parsers for geographic data sources in various formats, and a visualization module. The set of extensions provided by VanetMobiSim consists mainly on a vehicular spatial model using GDF-compliant data structures, and a set of vehicular-oriented mobility models.

Our proposed protocol is compared to AODV and DSDV in two scenarios on the basis of the following parameters:

(i) Packet Delivery Ratio: Ratio of number of packets received by the destination to the number of packets sent by the source.

(ii) **End-to-end Delay:** The average time taken by packet to reach the destination

4.3 Output Graphs:

Fig.1.3 shows the packet delivery ratio of AODV, DSDV and proposed protocol (MGROOV) with number of nodes under general conditions of simulation scenario. It is clear from the graph that the PDR of proposed protocol is better than that of AODV and DSDV. In both the scenarios, AODV has higher PDR than DSDV but lower than proposed protocol. It shows that in our proposed technique PDR has been increased independently of the scenarios.

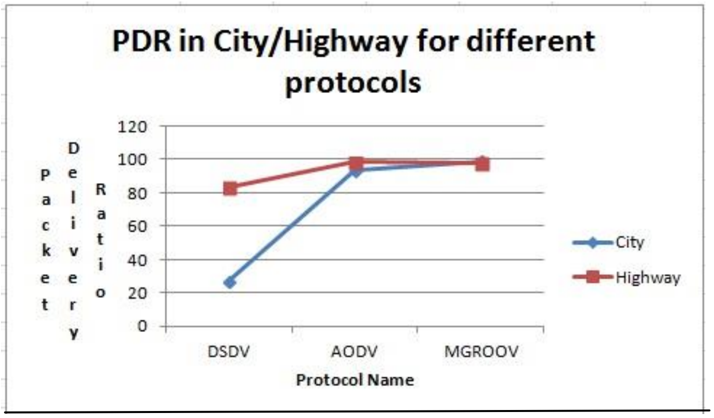

Figure 1.3 Packet Delivery Ratio

Fig.1.4 shows the end-to-end delay of both the protocols with varying node density. Initially the difference in the end-to-end delay of both the protocols is high due to the high difference in their PDR initially. As the node density increases the difference decreases, same is the reasoning for this i.e. the difference in PDR also decreases. So our proposed protocol has comparatively higher end-to-delay.

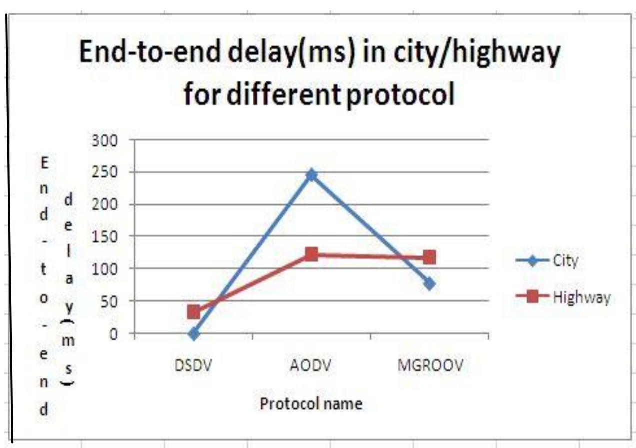

Figure 1.4 Average End-To-End Delay

5. CONCLUSION

We conclude that our proposed protocol has comparatively higher end-to-delay. This can be attributed to two facts:

(i) Higher packet delivery ratio of our proposed protocol and

(ii) The average number of hops traversed in proposed protocol as doesn't always give preference to the boundary region nodes

And also, the PDR of proposed protocol is better than that of AODV and DSDV which shows that in our proposed technique PDR has been increased independently.

REFERENCES:

[1] Tiecheng Wang, Gang Wang, Beihang University, China, "TIBCRPH: Traffic Infrastructure Based Cluster Routing Protocol with Handoff in VANET", 19th annual Wireless and optical communication conference (WCC), IEEE Digital Library, pp 1-5, 2010.

[2] G. Xue, J. Feng, and M. Li, "A Passive Geographical Routing Protocol in VANET," in Proceedings IEEE Asia-Pacific Services Computing Conference, Yilan, Taiwan, December 2008, pp. 680–685

[3] T. Taleb, M. Ochi, A. Jamalipour, N. Kato, and Y. Nemoto, "An efficient vehicle-heading based routing protocol for VANET networks," in Proc. IEEE WCNC, Las Vegas, NV, April 2006, pp. 2199–2204.

[4] Supeng Leng, Liren Zhang, Huirong Fu, Jianjun Yang; "A Novel Location-Service Protocol Based on *k*-Hop Clustering for Mobile *Ad Hoc* Networks".

[5] Karp, B. and Kung, H.T.,"Greedy Perimeter Stateless Routing for Wireless Networks", Proceedings of the Sixth Annual ACM/IEEE International Conference on Mobile Computing and Networking (MobiCom 2000), pp. 243-254, Boston, MA, August, 2000.

[6] Lochert C, Hartenstein H, Tian J, Fussler H, Hermann D, and Mauve M,"A Routing Strategy for Vehicular Ad Hoc Networks in City Environments", Proc. of IEEE Intelligent Vehicles Symposium, pp. 156-161, 2003.

[7] Boon-Chong Seet, Genping Liu, Bu-Sung Lee, Chuan-Heng Foh, Kai-Juan Wong, Keok-Kee Lee; "A-STAR: A Mobile Ad Hoc Routing Strategy for Metropolis Vehicular Communications", 2004.

