International Research Journal of Engineering and Management Studies (IRJEMS)
Volume: 03 Issue: 04 | April -2019 ISSN: 1847-9790 || p-ISSN: 2395-0126

FF-AOMDV Routing Protocol Based on SDN and Fog Computing for Vehicular Networks

G.Sribarkavi#1, N.Selvarani#2
PG student Department of CSE, A.V.C.College of Engineering, Mannampandal, India
Sribarkavi96@gmail.com
Assistant professor Department of CSE, A.V.C.College of Engineering, Mannampandal, India
Selvaranikmu23@gmail.com

Abstract - *In this project we are using the Fitness Function – Ad hoc On demand Multipath Distance Vector routing protocol (FF-AOMDV) multicast is to implement the Fog computing in vehicular networks including dead-line and bandwidth constraints. The FF-AOMDV routing protocol is used to find the optimal path from source vehicle to destination vehicles using the priority based scheduling .The priority based scheduling algorithm is used to find the priority of the vehicles. Between the vehicles to manage the traffic using this SUMO tool (Simulation of Urban Mobility) and VEIN tool is used to transmit the data in geographical area. Finally we simulate the packet delivery ratio, end-to-end delay, multicast energy consumption and packet loss ratio.*

Keywords: *FF-AOMDV (Fitness Function Ad-hoc On Demand Multipath Distance Vector), SUMO (Simulation of Urban Mobility), RSU (Road Side Unit), BS (Base Station), SDN (Software Defined Networking), CDN (Content Delivery Network), MABC (Micro Ant Bee Colony), SDGR (SDN-based geographic routing.*

1.INTRODUCTION

A vehicular network is the real-time implementation network. This vehicular network is used to help the drivers for accessing the required information, and they can exchange the information's between the vehicles in different locations [1]. This network mainly contains the two types of nodes: mobile and fixed. The road side units (RSU) and base stations (BS) are mainly used to transporting information between the vehicles. In a VANET the vehicle speed will be different so it affects the link and performance of the network. [2] Routing process is the challenge one in VANET and it leads to high overhead, energy consumption, bandwidth consumption and increased the packet loss because to continuously search the correct and optimal path needs to exchange the high number of control packets. This network contains the three types of connection 1) Vehicle to Vehicle (V2V), 2) Vehicle to Infrastructure (V2I) and 3) Infrastructure to Infrastructure (I2I).

In an [3] SDN contains the two parts: control and data plane. The purpose of this division is to simplify the functions and increase programming, virtualization and availability and also SDN plays a major role in the routing process by selecting the optimal path efficiently with minimum resources. SDN can be applied in vehicular networks to improve management, increase flexibility and apply V2V and V2I connections, select path and channel. The energy consumption is one of major parameters in FF-AOMDV routing protocol.

The contributions of this paper are as follows:

- To merge the two layers 1) vehicular networks with fog computing and 2) SDN layer.
- To select the optimal path with minimum energy and take into account deadline and bandwidth constraints.
- Using partitioning algorithm and priority based scheduling algorithm is used to classify and schedule the requests based on their application type and deadline constraint [4].

The fog computing framework was invented to work as a simple cloud to offer many networks, computing and storage capabilities at the edge of the network to reduce the number of tasks that are transferred to cloud computing. There are many advantages of using this framework such as supporting continuous movement of nodes, location awareness, and efficient handling of real time tasks that require quick response.

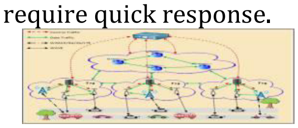

Figure 1: VANET Environment

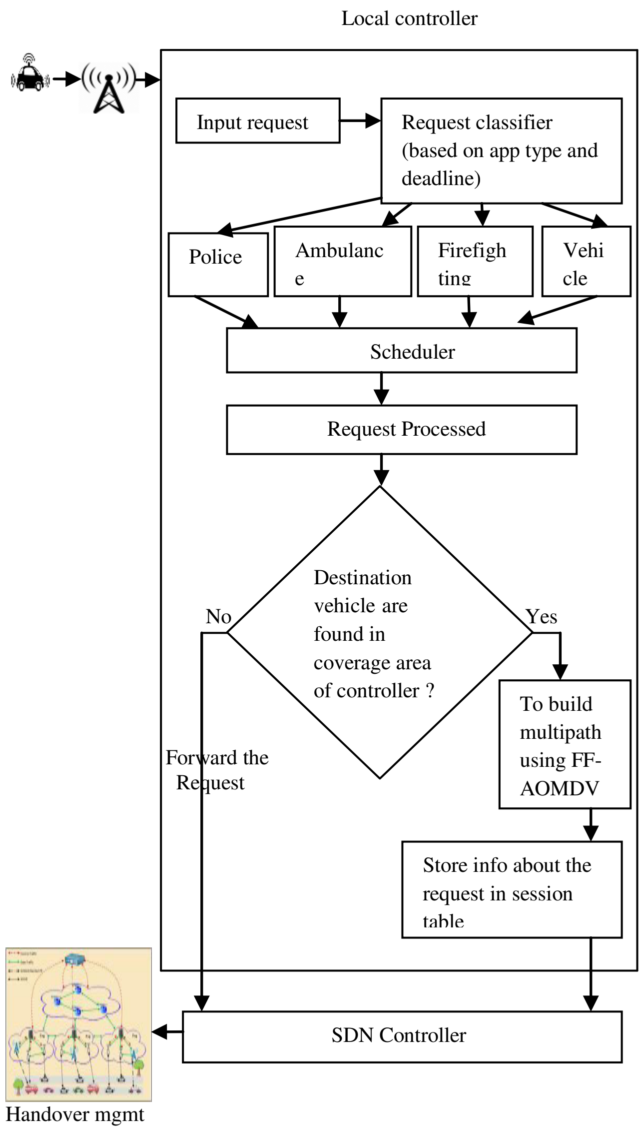

Figure 2: System Architecture

2. RELATED WORKS

Meneguette et.al [1] proposed a new content delivery network (CDN) it has been successfully adapted to delivering the content in traditional internet. To increase the availability of content and also without compromising the network overhead, regardless of traffic conditions and road networks. SAMCDN is divided in two main components: (i) The replication component is designed to select appropriate vehicles to replicate content inside an area of interest (AoI) so they can start the dissemination and keep the content available during the entire application's lifetime; (ii) the dissemination component focuses on the delivery of data within an AoI. Some simulations were performed through the NS3 simulator in which the proposed solution presented an excellent performance compared with other six baseline solutions, in both urban and highway road networks, in terms of content availability and network resource consumption is achieved the 80% in highways and also 98% of urban areas to reduce the packet loss (approximately 5% in highway scenarios and 15% in urban scenarios. The advantage of the paper is reducing the load on the master server by transferring the part of the responsibility to surrogate servers. Content delivery is more challenging in VANET for some particular characteristics, such as dynamic topology and large-scale scenarios.

Ji et.al [2] presents an SDN-based geographic routing (SDGR) protocol for VANET, based on node location, vehicles density and digital map. Software-Defined Networking (SDN) is used to decouple the network management from data transferring. In SDGR, the central controller gathers information of vehicles and provides a global view to compute the optimal routing paths. In an SDN controller is implement in optimal path forwarding algorithm. Optimal path forwarding algorithm provides a global view of network and also solve both the problem (local maximum and sparse connectivity). The proposed SDGR scheme is implemented in NS2 and compared with existing routing protocols (AODV and GPSR) in VANET. The advantage of this paper is SDGR achieves better performance than AODV and GPSR in terms of both packet delivery ratio and delivery delay time. The limitation of this paper is geographic routings only use local information to make routing decisions which may lead to local maximum and sparse connectivity problems.

Baihong et.al [3] focused an SDN based on-demand routing protocol, SVAO, which separates data forwarding layer and network control layer, as in SDN, to enhance the data transmission efficiency within VANETs. The RSU will play the major role of local controller and the charge of selecting the vehicles to forward packet within a road segment. In an SDN two-level design is used. 1) Global level is distributed and adopts a ranked query scheme to collect vehicle information and determine the road segments along which a message should be forwarded. 2) Local level is in charge of selecting forwarding vehicles in each road segment determined by the global level. We compare SVAO with some popular ad-hoc network routing protocols, including OLSR, DSR, DSDV, and DB based simulations. The advantage of the paper is SVAO performs better and more stable than traditional ad-hoc routing protocol DSR, DSDV, OLSR and DB. SVAO is not suitable for sparse VANET is the main drawback of this paper.

Sahebgharani et.al [4] presents a scheduling policy for data distribution from RSUs to vehicle. The vehicle request is sent through the nearest RSU but however urgent requests should have higher priority to be served first. Some vehicles may ask for the same data, if we can postpone some requested data and it multicast before the deadlines, several requests may be served through a single multicast. We propose a scheduling algorithm to download data from RSU and also serve the multiple requests using multicast technique, regarding the priority of data. The requests are categorized in two types 1) normal request and 2) emergency requests. In an RSU to serve the each request based on queue. Then we select one of the two queue with D*S/W scheduling schemes which considers service deadline, data size and data type. To serve the multiple request using the multicasting technique. The advantage of the paper is D*S/W scheduling policy along with their multicasting technique the several requests simultaneously offer desirable performance and scalability which leads to higher service ratio and optimized quality of service.

Zhang et.al [5] focused an efficient and reliable communication in VANETs heavily depends on the construction of strong routes among vehicles. Relating with graphic theory, an undirected acyclic graph G is adapted to characterize of VANET, and then the routing problem is transformed to Steiner Minimum Tree (SMT) searching problem. Existing study proves that SMT is NP-hard problem. The QoS constrained multicast routing problem is to measure the quality include energy consumption cost and transmission delay cost. The objective is to maximize the network lifetime of MABC and minimize the communication cost. MABC algorithm works on a micro population for reducing the computational time, whereas it should not be too small to being effective. The micro ABC (MABC) algorithm is tested on three cases with increasing the number of destiny nodes. In all cases, the MABC algorithms successfully find the optimal path. The main advantage of the paper is to increase the network lifetime and reduce the communication cost. MABC is effective and reliable to handling the QoS constrained based on multicast routing problem.

3. PROPOSED WORK

Source vehicle send the request (IP address of source and destination, application type, data size and deadline) to the nearest fixed node (or) Rode side unit (or) Base station. RSU (or) BS forward this request to the local controller. The local controller classifies the request based on the application type (emergency, firefighting and police) and given to the priority for this application based on the deadline (i.e. 4s). The vehicle (firefighting, ambulance and police) deadline could be low it has the high priority. The destination vehicle is found in the coverage area of the local controller to build the multipath after that it will store the information of this request in a table called session table. This table has seven columns that are: session no, source and destination IP address, application type, data size, and deadline constraint after that send the table directly to SDN controller [6].

If else destination vehicle are not found in the coverage of the controller to forward the request to the SDN controller. Using the partitioning concept to divide the entire geographical area in to smaller geographical area. The SDN controllers maintain the general table [7]. These table save the complete information about the entire specific geographical area. Special tables maintain each of the smaller specific geographical area in its database. To export the specific area in real open street map and the file is saved in map.osm. The OSM data not only contains the road network and also contains the additional polygons such as building and rivers. So we import the additional polygons that file is saved in typemap.xml. Using the veins tool to transmit the data in geographical area based on optimal path.

4. DESCRIPTION

4.1 Vehicular node routing

The source vehicle wants to send some data to a destination vehicle, first it send a request to the nearest fixed node (RSU or BS). The nearest fixed node is called source fixed node. This request contains the IP addresses of source and destinations, application type, data size and deadline constraint. The nearest fixed node will forward this request to the local controller.

4.2 Priority analyzing in local controller

The request will forward to the nearest local controller. After that classified the request based on the application type and deadline. In this paper it contains the four application types which represent the vehicle types that are firefighting, ambulance, police and normal vehicles. It contains the four queues in each controller. Then the requests enter the each queue are scheduled based on the priority. The each request should be assigned the priority based on the deadline where the requests with low deadline constraint take a high priority.

4.3 SDN controller

The destination vehicle is found in the coverage area of the local controller, it will build the multipath by using FF-AOMDV [9]. After that it will store the information of this request and request in a table called session table. This table has six columns that are: session no., source IP address destinations IP addresses, application type, data size and deadline constraint. Then it sends the table to SDN controller. If the destination vehicle is not found in the coverage area of the local controller, it will forward the multipath request to the SDN controller. At this point, the SDN controller determines the geographical area that the multicast request came from.

4.4 Handover management

The destination vehicle is moved from one coverage area to other coverage area using the handover algorithm to find it. Each fixed node uses a flow table to save vehicle information found in its domain and sets a timeout for each of these vehicles. If the timeout is ended no notification is received from the destination vehicle, then fixed node send the notification to the closest local controller. The vehicles enter the domain of another fixed node, which updates its table and send a notification to the closest local controller. The local controller then updates its information and sends a notification to the SDN controller [10].

4.5 Optimal path selection and routing FF-AOMDV

FF-AOMDV protocol is to send data of size M from the source vehicle to the destination vehicles with minimum cost of energy taking deadline and bandwidth constraints based on this type of constraint to find the optimal path.

5. CONCLUSION

In this experiment, we proposed a new energy efficient multi-path routing protocol called FF-AOMDV in VANET simulated using omnet ++ and the traffic has been analyzed using the SUMO tool under three different scenarios, varying speed of the vehicle, packet size and simulation time. The performance of FF-AOMDV routing protocol was tested based on these metrics (packet delivery ratio, throughput, end-to-end delay, energy consumption and network lifetime). Finally we compare the performance of FF-AOMDV routing protocol in MANET and FF-AOMDV routing protocol in VANET.

6. FUTURE WORK

FF-AOMDV protocol only gives the 50% to increase network lifetime and energy consumed in our proposed work. So we are going to CBLTR (Cluster Based Life-Time Routing) protocol. To increase the route stability and average throughput in a segment topology, reduce end-to-end delay in a grid topology scenario, and reduce the control overhead messages in the clusters.

REFERENCES

[1] Meneguette, Rodolfo I., et al. "A novel self-adaptive content delivery protocol for vehicular networks." *Ad Hoc Networks* 73 (2018): 1-13.

[2] Ji, X., Yu, H., Fan, G., & Fu, W. (2016, December). SDGR: An SDN-based geographic routing protocol for VANET. In *2016 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData)* (pp. 276-281). IEEE.

[3] Dong, Baihong, et al. "Software defined networking based on-demand routing protocol in vehicle ad hoc networks." *2016 12th International Conference on Mobile Ad-Hoc and Sensor Networks (MSN)*. IEEE, 2016.

[4] Sahebgharani, Sana, and Mohammad Shahverdy. "A scheduling algorithm for downloading data from RSU using multicast technique." *2012 Ninth International Conference on Information Technology-New Generations*. IEEE, 2012.

[5] Zhang, Xiu, Xin Zhang, and Cheng Gu. "A micro-artificial bee colony based multicast routing in vehicular ad hoc networks." *Ad Hoc Networks* 58 (2017): 213-221.

[6] Liu, Yu-Chun, Chien Chen, and Suchandra Chakraborty. "A software defined network architecture for geobroadcast in VANETs." *2015 IEEE International Conference on Communications (ICC)*. IEEE, 2015.

[7] He, Zongjian, et al. "Sdn enabled high performance multicast in vehicular networks." *2016 IEEE 84th Vehicular Technology Conference (VTC-Fall)*. IEEE, 2016.

[8] Bitam, Salim, Abdelhamid Mellouk, and Scott Fowler. "MQBV: multicast quality of service

swarm bee routing for vehicular ad hoc networks." *Wireless Communications and Mobile Computing* 15.9 (2015): 1391-1404.
[9] Santamaria, Amilcare Francesco, Cesare Sottile, and Peppino Fazio. "PAMTree: partitioned multicast tree protocol for efficient data dissemination in a VANET environment." *International Journal of Distributed Sensor Networks* 11.5 (2015): 431492.
[10] Shrivastava, Anurag, et al. "An improved multicast based energy efficient opportunistic data scheduling algorithm for VANET." *AEU-International Journal of Electronics and Communications* 83 (2018): 407-415.
[11] Liu, Xiaoyun, and Gongjun Yan. "Analytically modeling data dissemination in vehicular ad hoc networks." *Ad Hoc Networks*52 (2016): 17-27.
[12] Zhu, Haojin, et al. "Security in service-oriented vehicular networks." *IEEE Wireless Communications* 16.4 (2009): 16-22.