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A Survey On Software Defined Vehicular Adhoc Network

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Abstract: ***The term connected vehicles have much importance in the field of wireless network. In this new era where everything stay connected vehicular communication have greater priority. Vehicular communication helps in avoiding collision, predicting road traffics, road conditions, knowing obstacles. It enables vehicle to vehicle communication, vehicle to pedestrian communication, vehicle to infrastructure communications etc. Since VANET captured advanced business opportunities in automobile industry, more and more researches are going on this field. In order to improve, quality, scalability, reliability, low latency etc certain other technologies such as cloud, SDN (Software Defined Network) are coupled with VANET. To improve the security of VANET and overcoming the challenges, researches are going in this field. In this paper various vehicular communications techniques starting from VANET architecture to advanced facilities in this field are discussed and analyzed. We are mainly focusing on SDN (Software Defined Network) enabled VANET technologies.***

Keywords:Vehicular adhocnetwork(VANET), SDN (Software Defined Network), connected vehicles.

I. INTRODUCTION

Vehicular Adhoc Network(VANET) [1] is an application included in Mobile Adhoc Network(MANET) which have high relevance in the current time .It helps in achieving road safety and give preference to collision avoidance and it helps in comforting people .Recently Vehicular Adhoc Network have much importance in research fields . Emerging technologies provide advancements day by day in this technology. In this era the number of private vehicles is increasing everyday. The worse part of this is the increased number of collisions which is a serious issue. So the need for connected vehicles arises. Connected vehicles can improve driving experience as well as road safety. One of the best technology used for connecting vehicles is the Vehicular Adhoc Network (VANET).Development of Vehicular Adhoc Network technologies started from early 1990's and still going on.VANET offers attractive as well as advanced opportunities. In this technology each moving vehicle isconsidered as a node in a mobile network. Each node can communicate with others that is a vehiclecan communicate with other vehicles as well as with the Road Side Units (RSU). Alsocommunications such as vehicle to pedestrian, vehicle to Base Station(BS), vehicle to Infrastructureare provided now. Advancements such as cloud technologies can improve the efficiency of theconnected vehicles. When we go through the different technologies in VANET we can understandthat as new inventions on wireless technology increases it is highly improving efficiency of thisvanet also. Providing more secure features to VANET is very effective for converting cities tosmarter ones. Since collision control is very important for improving facilities provided by intelligenttransportation System (ITS) development in this area is highly attractive in automobile industry. Avehicle is provided with Car On Board units (obus) which is the communication device used here. Car On Board units (obus) contains Global Positioning System (GPS), different sensors etc foreffective management of its positions conditions message passing etc. In addition certain wirelessinterfaces such as wifi, Bluetooth, 4G/3G LTE are enabled in Car On Board units (obus). Eachvehicle can communicate using these Car On Board units (obus). These Car On Board units (obus)can also communicate with road-side-units (rsus). Road-side-units (rsus) are used for getting roadconditions, traffic prediction etc. VANET usually provide coverage for about 300 meters. Butvehicular network is quite large one. So one solution is dividing the whole network into smaller cellsand the communication of each cell is done via cellular communication methods. Each cell is providea Base Station and cells communicate using this. An example illustration of VANET is shown below

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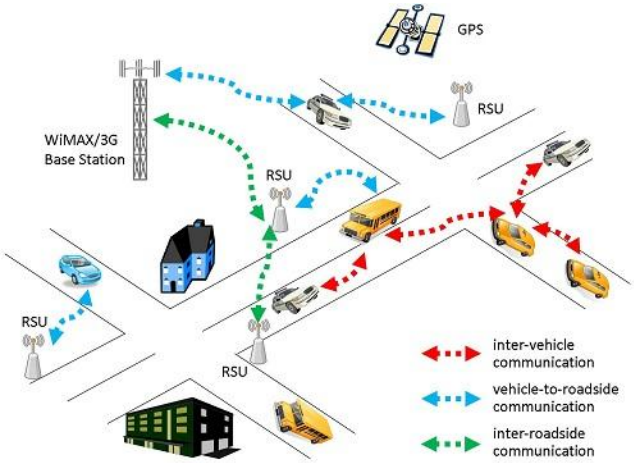

Fig 1.VANET

SDN (Software Defined Network) is a new approach in networking an alternative to traditional oneswhich controls the whole network in a centralized and systematic way. In this paper a survey ondifferent VANET technologies, their advancements, security issues and solutions are discussed. Weare mainly focusing on SDN (Software Defined Network) enabled VANET technologies. Theadvantages of SDN (Software Defined Network) matches the issues in VANET, so we can trustsdvn (Software Defined Vehicular Network). The aim of using VANET technology is road safety,efficient communication, traffic prediction, road condition analysis, collision avoidance, providingroad signal alarm, location analysis etc.

II. LITERATURE REVIEW

The architecture for SDVN (Software Defined Vehicular Network) [2] was developed by He et alin 2016. Network is sliced into cells for better performance. Effective bandwidth utilization helpsin avoiding packet collisions. SDVN (Software Defined Vehicular Network) integrated with 5Gmobile communications [3] along with cloud computing is developed by xiaohuge. Fog cells arealso incorporated with 5G SDVN (Software Defined Vehicular Network). Since the throughputof fog cells are effective than usual methods it can decrease the transmission delay of differentvehicle densities thus improve efficiency and reliability. It utilize multihop relay network so theproblems and challenges relating frequent handover of vehicles can be minimized.To improve the security of SDVN (Software Defined Vehicular Network) an approach wasdeveloped by Maxim Kalinin called Software Defined Security(SDS). It focuses on data flowscontrol, security policy enforcement, access control and confidentiality in VANET [4]. Thisapproach provides high flexibility and it is node independent. It is well adopted for VANET.The SDS is implemented in 4 levels.

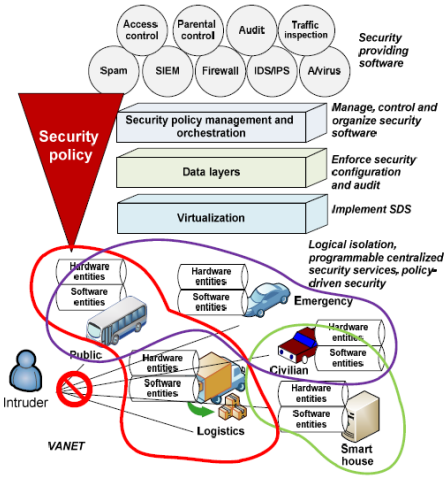

Fig 2. Sds architecture

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Ku et al. Proposed an improved architecture for both vehicle to vehicle (v2v) and vehicle toinfrastructure (v2i) based on 802.11 p. Itincludes sdn along with different wirelesstechnologies. For reliable communication between vehicles here proposed local agent baseddistributed control mode and hybrid mode [5] along with centralized mode. An sdn basedarchitecture for geo broadcast routing in vanet [6] was developed by liu et al. It usesautomatic rsu management component. When compared with traditional ip networking, here packet in message are used. Thus reduces bandwidth consumption and provide low latency.software defined networking-based vehicular adhoc network with fog computing called fsdnwas developed by gyumyoung. Fsdn vanet architecture consists of sdn controller, rsu controller; rsu, base station and openflow enabled obu as a fog device. This architectureis beneficial in terms of data streaming and lane change assistance services [6]. It is able toresolve many of the challenges faced by vanet. The fog framework for this architecture wasdeveloped by using fog coordination model along with resource management.

Fengshen developed ultra-wide bandwidth-based range/gps tight integration approach [11]in order to provide relative position awareness in intelligent transportation system. The receiverof commercial global navigation satellite systems (gnss) is unable to meet all the requiredservices of this application. So a new tightly coupled cooperative positioning was proposed. It integrate bothultrawide bandwidth and inter vehicular range measurements. That is aparticular vehicle will have gps measurement along with inter vehicular range measurements.to improve the efficiency of messages passing through vanet a multimedia multimetric map-aware routing protocol [12] is used. It enables to send video-reporting messages through vanetwhich improves user experience. The main aim of the technology is the efficient managementof accidents. After occurrence of accident the vehicle can make short videos on situation andsend to authorities such as police emergency services etc to make them aware of the level ofseriousness of accidents. For the efficient message passing the multimedia multimetric map-aware routing protocol (3mrp) is used. The simulation results show that this technology isbeneficial for collision management and ideal for smart cities.

A scalable sdn-enabled architecture that integrates a heterogeneous vehicular network withthe mobile edge computing (mec) technology is introduced by jianqi liu [7]. This architectureis efficient in decreasing the overall delay and offload the traffic load from the backbone network.mec is the implementation of cloud computing at the edge of mobile network. Sdn controlleris enabled as the administrator. A vehicle can exchange information with other vehicles well asroad side units and base station. Vanet is used for vehicle to vehicle communication. Forthe high volume data exchange between the vehicle and remote data center a wired network isused as in the figure shown below.

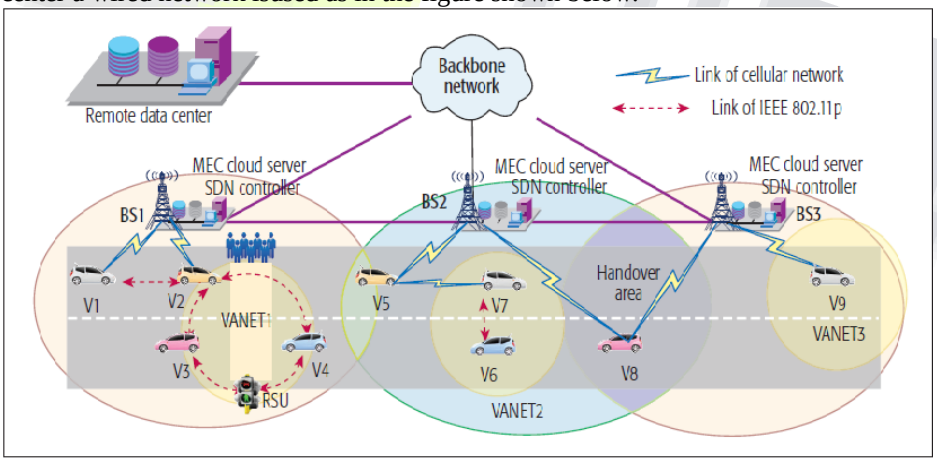

fig 3.the sdn-enabled architecture of heterogeneous vehicular network

Mec cloud server is installed at the base station. Since in mec cloud is at the edge itreduces the overall delay. It also reduces the round drip time. The network status and service requirements arecontinuesly updatedby the sdn controller. It follows openflow protocoland protocol-agnostic digital transceivers are used. A case study on this architecture namely reliable communication in urban traffic management was proposed. It compares the kpi(key performance indicator) of this architecture for different density of vehicles and from thesimulation results it is found that the scalability reliability etc of this architecture is very high.it provides low latency and improves the user experience. Controller upgrade and managementare flexible and convenient when compared with those technologies of the same production cost.the architecture is shown below.

Smart collision avoidance and hazard routing mechanism for intelligent transport network [8] was developed by gurpreet singh. Thepaper deals with efficient collision handling inautonomous cars. It is based upon the intelligent data propagation along with the vehiclecollision and traffic jam prevention schema [9], which is very helpful in enabling smart cities.it also focus on robust hazard routing protocol for intelligent vehicular networks which helpsin improving overall performance. Since the network topology of vehicular network is alwayschanging resource allocation and management using even fog technology is also challenging. Soto avoid the problem with fog computing mehdi sookhak introduced fog vehicular computing (fvc)[10]. Here the unused resource are used. The requestedservices arefulfilled based on available resources. Effective utilization and analysis of big data generated from various sourcesplays vital role in the success of smart city services such as healthcare, transportation, energy,community life, education, business etc. A scalable sdn-enabled architecture that can integratevarious smart city components and provides reliable and timely scheduling for big data transferto enable smart city services [13] is developed for these big data processing. It integrates differenturban
Ict enabled services into a single system, then the city can be smart and is able to provideaccess to different services such as sharing information easily. The time-constrained big datatransfer scheduling (tbts) problem is analyzed and present an intelligent strategy to solve thetbts issue by using the sdn controller. Sdn conduct dynamic flow control and multi-pathtransfer scheduling. This algorithm can schedule the multi-flow transfer dynamically and it hashigh network utilization. It will support big data transfer in terms of low transfer delay andhigh bandwidth utilization.

III CONCLUSION

The wide range of opportunities of connected vehicles in automobile industries increased theneed of advanced researches in this field. Since the network topology is always changing onethe challenges as well as security issues cannot be solved completely. However by integratingvarious emerging technologies researches are trying to solve them upto the maximum. Here wehave discussed some of the technologies in vanet along with sdn (software defined network),mobile edge computing (mec), fog computing etc. The advantages of vanet technology is roadsafety, efficient communication , traffic prediction, road condition analysis, collision avoidance,providing road signal alarm, location analysis etc

IV REFERENCES

[1] elias c. Eze, sijing zhang and enjieliu "vehicular ad hoc networks (vanets): current state,challenges" proceedings of the 20th international conference on automation computing, cranfield university, bedfordshire, (2014).
[2] xiaohuge, zipeng li, and shikuan li"5g software defined vehicular networks" ieee communications magazine doi: 10.1109/mcom.1601144 , (2017).
[3] he z, cao j and liu 2016 "sdvn : enabling rapid network innovation for heterogeneous vehicular communication" ieee network magazine, pp. 17, (2016).
[4] maxim kalinin, peter zegzhda,dmitryzegzhda, yuri vasiliev"software defined security for vehicular ad hoc networks"ictc 2016 978-1-5090-1325-8/16/, (2016).
[5] ku i, lu, y. Gerla, m. Ongaro, f. Gomes and cerqueira, e. "towards softwaredefined vanet : architecture and services" 13th annual mediterranean ad hoc networking workshop (med-hoc-net) ,(2014).
[6] gyumyoung"software defined networking-based vehiculaadhoc network with fog computing" ifip/ieee im 2015 workshop: 7th international workshop on management of the future internet (manfi),(2015).
[7] jianqi liu, jiafu wan, bi zeng, qinruo wang, houbing song, and meikangqiu july "a scalable and quick-response software defined vehicular network assisted by mobile edge" ieee communications magazine doi: 10.1109/mcom.2017.1601150, (2017).
[8] gurpreet singh, pooja gupta, mohdhelmyabdwahab , , "smart collision avoidance and hazard routing mechanism for intelligent transport network" iop conf. Series: materials science and engineering 226 () 012107 ,(2017).
[9] s. Azimi, g. Bhatia, r. Rajkumar and p. Mudalige"vehicular networks for collision avoidance at intersections" sae international journal of passenger cars - mechanical systems, vol.4, no. 1, pp.406-416, (2011).
[10] mehdi sookhak, f. Richard yu, ying he, hamid talebian, nader sohrabisafa, nan zhao, juy"fog vehicular computing ieee vehicular technology magazine", doi: 10.1109/mvt.2017.2667499 ,(2017).
[11] fengshen, joonwayncheon and andrew g dempster,, 9 march , "an ultra-wide bandwidth-based range/gps tight integration approach for relative positioning in vehicular ad hoc networks"iopscience doi:10.1088/0957-0233/26/4/045003, (2015).

[12] ahmad mohamadmezher and monica aguilar igartua , "multimedia multimetric map-aware routing protocol to send video-reporting messages over vanets in smart cities" ieee transactions on vehicular technology, (2015).
[13] maurizio casoni, carlo augusto grazia, and martin klapez"sdn-based resource pooling to provide transparent multi-path communications"ieee communications magazine doi:10.1109/mcom.2017.1601214,(2017).