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Utilization of 5G in IoVs for Road Traffic Management: a Survey

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Abstract:- **Internet of Vehicles (IoVs) is a expected convergence of the mobile Internet and the Internet of Things (IoT). IoVs are emerging form of IoT. 5G is the latest technology in wireless broadband. 5G based IoVs is the new form of IoVs. 5G technology has aroused people's attention with its promise of flexible networking. Due the increase in urban population urban traffic is increased every day. This leads toward traffic congestion and increases in the number of accidents. Different traffic management systems and technologies are developed to enhance traffic performance. 5G based IoVs are built to lessen traffic accidents, relieve congestion and reduce pollution. Different road applications like road protection, traffic flow efficiency, and infotainment are greater to enhance the performance of IoVs. In this paper, our focus is on traffic efficiency. Different architectural layers of IOVS are studied for the evaluation of traffic efficiency. We are going to survey traffic management systems that are based on 5G technologies. A detailed literature evaluation is the contribution of this paper. Finally, a tabular evaluation is given for the summarization of our literature overview**.

Keywords:- *Internet of vehicles (IoVs), Traffic efficiency, 5G technologies.*

I. INTRODUCTION

In Europe alone, around forty *thousand* humans die and 1.7 million are injured yearly in traffic accidents. In the identical time, traffic will increase on our roads leading to traffic blockages, increased travel time, gasoline consumption and multiplied pollutants [1]. Internet of vehicles (IoVs) is emerging shape of VANETs that connects vehicles on the road and globally. Number of cars increase on the roads makes road infra-structure congested, effects into extra fertilities, gas consumption and environmental troubles.D2D communication is an important part of IoVs. To meet the current traffic requirements IoVs should also have communications, Processing, storage power, and learning and should have security abilities. New programs are being developed to remedy these problems. One of them is 5G.5G is basically a fifth-generation wireless broad band technology. 5G has capability to provide speeds hundred times quicker than the 4G. 5G will increase network expandability up to hundreds of thousand connections. Different *5G* technologies are currently used and enhanced to improve the performance of IoVs. For V2v, v2R and V2I communication, most major access technologies which are used are: (1) IEEE WAVE (wireless access of VehiculAr Environment) standard, which includes the specification of (DSRC), the *IEEE* 802.11p for the PHY, *MAC* layers and the *IEEE* 1609 family for the higher layers. DSRC (dedicated short range commu-nication) and *5G* cellular technologies help in future to enhance traffic efficiency. *DSRC* can be serve as a backup technology to *5G* . DSRC is basically planned for vehicle to-vehicle commu-nication and for serious safety of applications only, whereas *5G* technology has a broad capability with scope for vehicle-to-Vehicle commu-nication and the info-tainment. In *5G* radio units and spectrum Wi-Fi and the bluetooth is used. It can also reports technical problems of vehicles, to the producers and allowing them for the updation of vehicle firm ware etc. The benefits of *5G* over the DSRC is , that *5G* can be run over current infrastructure, though also the cellular stations, up grades are also needed. the new road side stations and the new infra-structure is needed for the DSRC. Fifth generation along with LTE helps to enhance traffic efficiency and road safety for IoVs.

Different road side applications are used to enhance traffic management systems. These application reliefs to enhance better traffic management system for IoVs. Traffic management system is used to reduce congestion, collisions etc. in roads. It helps to reduce delays in roads. There are three kinds of vehicular plans that are discussed below [53].

- Road safety
- Traffic performance
- Infotainment

A. Active Road Safety Applications

Measures taken to avoid road injuries are a part of this utility. Defensive safety application also help drivers to: preserve a ,safe place to hold a nonviolent distance force with in the road. It avoids over taking in crucial conditions . information, communications and the positioning Technologies provide solutions for en-hancing traffic safety. With an era – where the functionality either autonomously on board the car co-operatively , they are based on v2V or Infrastructure for conversation, the wide variety, of injuries and there harshness can be abridged, leading in decrease of the numbers of accidents. Road applications like Collision, congestion, head On, rear cease, are also active Road safety application. These applications are also recycled in IoVs to meet the road safety of internet of vehicles.

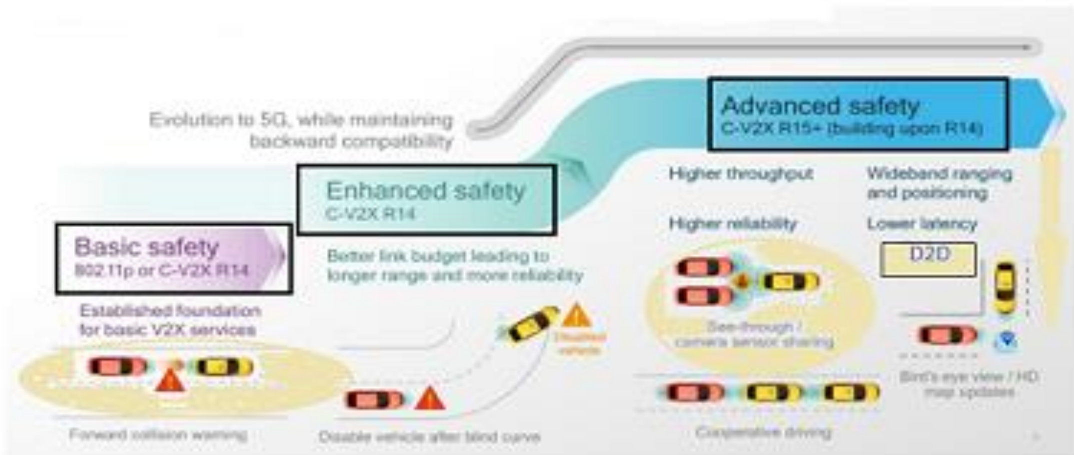

Fig 1:- Traffic Safety Applications using 5G technologies

B. *Traffic Performance*

High-volume intersections (mainly during peak hours) position an especially hard undertaking to traffic engineers and planners. They are interested to decreasing delays and enhancing protection for motorists and pedestrians. The important side consequences of traffic congestion encompass increased pollution, fuel consumption for drivers, and greater financial losses in phrase of time wasting. To reduce congestion, delays, and crashes, researchers have recommended several revolutionary intersection designs for heavy traffic drift situations. Along these Traffic performance and control programs: Speed management and Co-operative navigation, cooperative driving using systems, traffic resource management, and content material sharing structures are also advanced to improve traffic efficiency.

C. *Infotainment Applications*

The “Internet of vehicles” may even create new commercial enterprise fashions from constructing and servicing cars, imparting cloud-based infotainment, to crash prevention and intelligent traffic control. Co-operative nearby services, Global Internet services are important applications for IoVs. Infotainment applications used a lot of resources as it need much bandwidth for videos sharing, online gaming. The use of faster mobile standard like LTE and UMTS (universal mobile telecommunications systems) enables infotainment application in IoVs. Digital networking offer new opportunities for the infotainment services.

Our focus for this paper is on traffic efficiency of IoVs. In section 2 consist of IoVs architecture section 3 consist of taxonomy of traffic efficiency systems are described. Section 4 composed of literature survey section 5 consist of open problems section 6 consists of conclusion.

II. PROPOSED ARCHITECTURE FOR IOVS

In this paper we also review proposed architecture of IoVs. The main contribution of this topic is that we Review it to understand how these layers helpful in traffic management of IoVs. *Nanjie* (2011) anticipated a three layer architecture for IoVs. The major consequences for road traffic management is the Client layer, all sensors within and the outside of the Car is liable for Vehicle speed, positions, collision detection, and vehicle-to-road and road condition. It is also responsible to identify driving patterns of the cars. *Wan* et al (2014), this architecture helps in IoVs road traffic in terms of car-to-car commu-nication. Its cloud layer provide traffic load conditions thus reduce traffic congestion. In Bonomi (2013), commu-nication layer covers vehicles commu-nication mostly for V2v. It commu-nicate links using the 802.11p Protocol. In Kaiwartya *et al.* (2016), this architecture not well satisfy the conditions of road traffic for IoVs. Gandotra, Kumar, and Jain (2017), the D2D commu-nication is possible, thus it enables v2v commu-nication.it also helps in resource management. Juan *et* al. (2018), this proposed architecture layer helps a lot in IoVs road traffic management. It provide D2D commu-nication as well as vehicle-to-human interaction in user acquisition layer. In data acquisition layer it provides different technologies that are based on 5G. These technologies may help in improvement of traffic [2].In the figure 2 different proposed architectures of IoVs layer are described. This figure illustrate how these layers contribute to improve traffic management systems in IoVs.

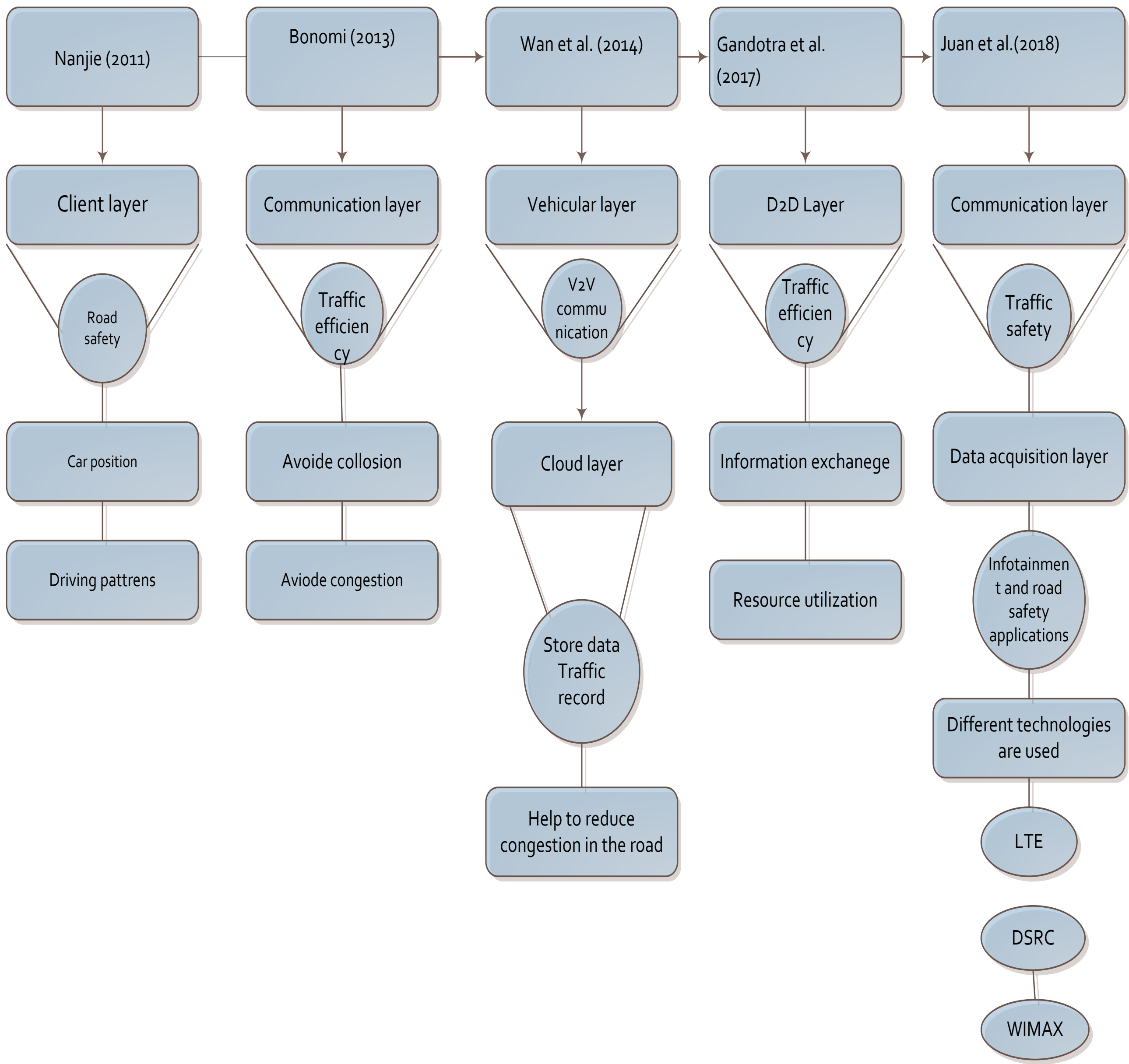

Fig 2:- Proposed architecture of IoVs help in traffic efficiency

III. TAXONOMY OF TRAFFIC EFFICIENCY

Here is a taxonomy of traffic efficiency. For traffic efficiency we take four systems that are currently used to improve traffic performance in IoVs, and then categories in further parts.

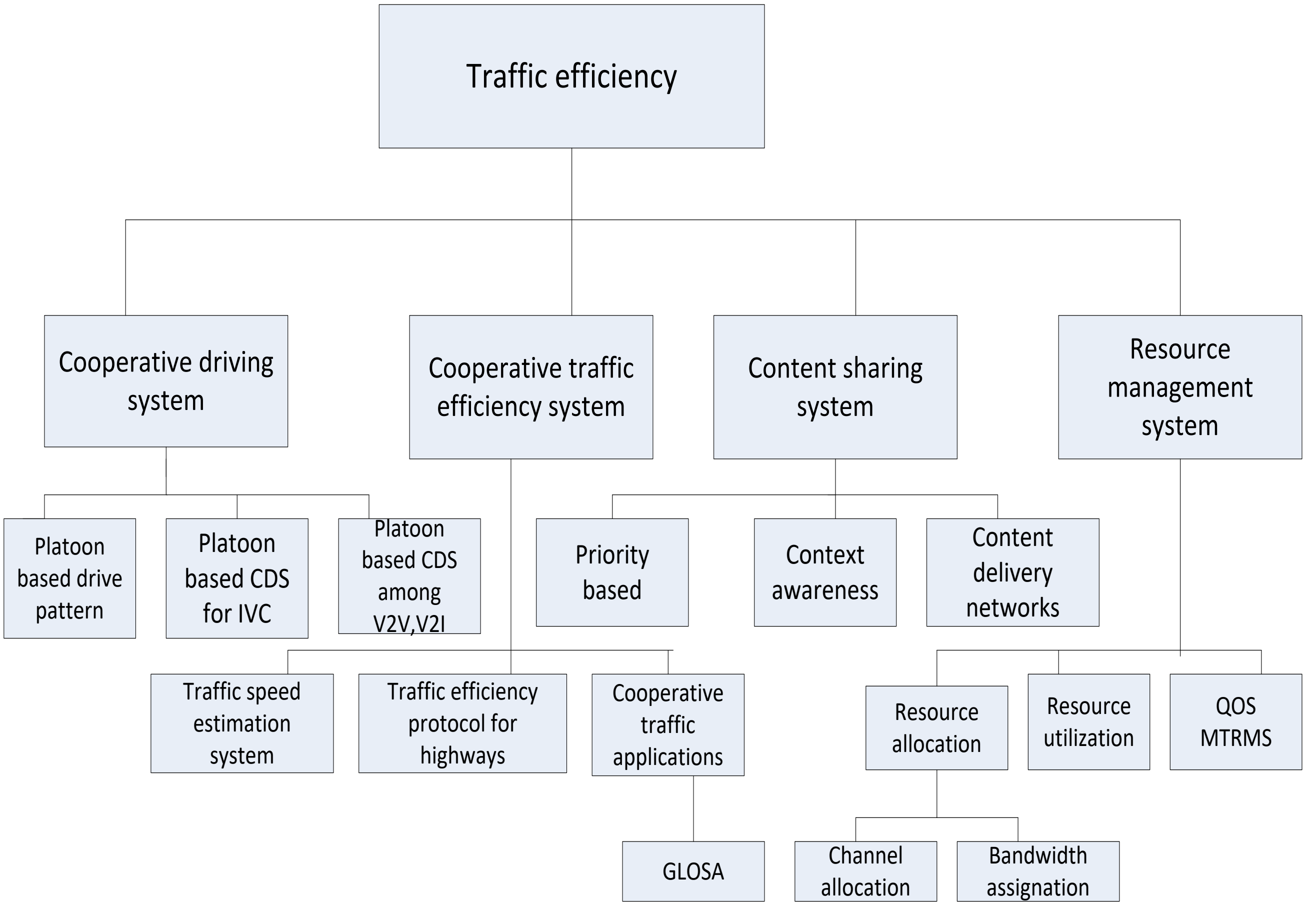

Fig 3:- Systems used to improve traffic efficiency for IoVs: A taxonomy

Co-operative navigation, co-operative systems, traffic resource management, and content material sharing structures are advanced to improve traffic efficiency in IoVs. The detail of these systems are discussed below.

A. Cooperative driving systems

The new advancement of information and communique technologies (ICT) allows a promising cooperative driving which has been meditated to expressively enhance traffic flow performance and traffic safety [3] (Ngoduy and Jia, 2016).These co-operative driving systems (CDS) may be performed via through *vehicle-to-vehicle* (V to V) and car-to-infrastructure (V to I) commu-nication. CDS is primarily based on wireless commu-nication amongst automobiles (V2v) and among vehicles to infrastructure (v to I).Because of the excessive automobile density, the unreliable vehicular communications consisting of packet damage and trans-mission postpone can directly impact the overall performance of the co-operative driving systems (CDS) [4]. Basically co-operative derived systems used vehicle-following models to describe human behavior when using on Roads, which include acceleration/deceleration, lane changing, and many others.

B. Driving Patterns

Traditional models of driving system do not provide enough information for departure, lane changing, arrival patterns, queue length etc. Platoon patterns are developed to manage these requirements. Two types of platoon patterns are derived [54]. 1. Signal-based platoon patterns in which performance measures like block queue, stop rate and delay is evaluated. **2.** Lane-based platoon patterns in which platoon length departure arrival patterns are studied and their patterns are evaluated. A lane based pattern is used to model the network performance It produces better results in retrieving signal coordination quality as well as improve signal compensations [5].

C. Platoon Based CDS for Inter-Vehicle Communication

Basically, in a Cooperation primarily based Driving Systems (CDS), cars get adjoining facts via inter-car vehicular commu-nication exchange (IVC) and then approve an appropriate manipulate the law to attain a sure goal, together with preserving a regular inter-car design within the equal platoon [6].

D. Platoon Based CDS for Inter-Vehicle, V2V, and V2I Communication

In platoon primarily based CDS [7] scheme the vehicles dynamically inherent the specific vehicle's behaviors . This in-formation can also be exchanged amongst vehicles, for example the placement and speed of a car ; the con_versation topology also clarifies the connectivity structure of vehicular networks. It includes pre-decessor supporter, chief– follower, and bidirectional. They also manage regulation together with sliding-mode and able to manipulate consensus to be carried out on every vehicle, which will outline the automobile-following rule in the related traffic float [4]. Switching topology in cars may cause function errors, for vehicle- to-infrastructure, vehicle get commu-nication from the infrastructure. Some cell deployment consists of base stations and road stations unit. These cells based on mini antennas provide infrastructure-related information e.g route condition, weather conditions etc. [8].

E. Cooperative Traffic Efficiency Systems

These kinds of systems are advanced to enhance traffic performance .some traffic systems are discussed below:

F. Traffic Speed Estimation System

Several studies have investigated the traffic statistics from CFVD (cellular floating vehicular data).However, they can't be accomplished at once to predict the destiny of traffic information in dynamical environments. An analytic model is proposed to evaluate the traffic flow according to the amounts of HoS (handovers), NLUs and to estimates the traffic thickness according to with the amounts of CAs [9]. Many pre-diction algorithms are also used to estimate speed. In devices, the auto -speed can be envisioned in line with the anticipated traffic flows and predicted traffic densities . For car speed forecasting, a *backpropagation neural* network algorithm is measured to predict the upcoming car speed through the modern-day traffic statistics [10].

G. Traffic Performance Protocol for Highways

Highway injuries frequently includes deadly happens, because of the excessive speed of traffic. Traffic performance enhancement protocol for highway road situations uses *VANETs* technology to detect the emergency instances over the highways' situations it provide safety from collusion [11]. It investigates the most appropriate reaction for each automobile shifting in the route of an emergency case over the dual roadway. It recommends the extremely moral reaction to the driving force of each vehicle within the network range of the detected emergency case. There are circumstances of high way traffic flows free flow and syn-chronized drift. The traffic thickness of car inside the former scenarios is much low and automobiles can circulate liberally at their wanted places. On the other Hand, in the other scenario, the traffic density is much high, and auto-mobiles are synchronized over every lane [12].

H. Cooperative Traffic Applications

Cooperative traffic programs are basically used for signal traffic management. The use of cars as free-powerful mobile traffic sensors can offer signals with accurate statistics approximately for traffic situations. Based on the obtained restraint messages, the software allows vehicles to keep away from the roads with traffic incidents by Chosen alternative routes. The warning messages are broadcasted by the usage of WAVE short message protocol [13] over IEEE 802.11p.Moreover, in the future technology may be used to update the costly traffic alerts based on roadside infrastructure with in-car connection manage mechanisms that are supported via Wi-Fi exchange (virtual traffic lights) [14]. A cooperative traffic service is implemented in Veins-4.4 to check the traffic scenario in congested areas [15].IoVs are mostly based on WAT (wireless access technologies). The main domain in the WAT is car driving, traffic management, cars safety, road infrastructures. IoVs can be combined with other advanced technologies like "vehicular cloud Computing" (VCC) techniques, fog computing, "Software-defined networking" (SDN),"Network Function Virtualization" (NFV) and *5G* [16]. These progress in vehicle technologies provide safe, efficient and calm driving system within time maintained information with the use of internet and *5G*.

I. Green Light Optimal Speed Advisory (GLOSA)

This technology can also be used to better synchronize vehicles with traffic indicators through (GLOSA) structures [17]. Traffic signals completed with Wi-Fi communications era will be capable of transmit Signal, phasing and timing (SPaT) records to cars . A GLoSA provides its driver with speed guidance that will allows him her to per-mit road traffic green signs [18].

J. Content Sharing Systems

Information sharing and its gathering of information on vehicles, roads and their surrounds is the crucial system for IoVs. Many systems are advanced to adorn content sharing. To this purpose, it is miles well worth noting that the outcomes of standardization activities, *IEEE802.11p, IEEE1609 in the USA, ETSI ITS*(Intelligent Transportation System) and ISO CALM (Continuous Air-interface long and medium range) in EU, proposed more advantageous communication paradigms regarding both (v2V) and (v2I) communications for content sharing [19].Some other papers investigate the optimization of the context consciousness inside the LTE assisted V2X paradigm. To maximizing traffic congestion in IoVs the records of sharing amongst automobiles, satisfying LTE communication, QoS requirements and capacity boundaries, in a distributive way [20].

K. Priority-Based Content Sharing

Named Data networking (NDN) has been recently proposed as a noticeable resolution for content material delivery within the IoV. The vehicles are prepared with variety of wireless commu-nication technologies. They change facts aimed to assist protection, traffic efficiency, and monitoring and infotainment applications. NDN shifts from the IP communique model, focused on "wherein" the content is protected, to a content distribution model that caring about "what" content to be retrieve. In NDN, application-degree content name are without the delay use for the content healing, as a result allowing a node to commu-nicate without any need of call-to-*IP* deal with decision. It also classifies the content of priority with the well-known call prefixes and makes use of the "freshness" parameter executed in NDN packets to similarly represent the content material demands. It vigorously molds the ndn forwarding choices consistent with the call prefix of content, via selecting the out going interface(s) and nicely tuning the different timers of broadcast trans-missions over the 802.11 OCB interface. The applicability of NDN in vehicular network has investigated in the last year's [21], [22], [23] Indeed, NDN receiver -pushed connection less communications based on the trade of packet kind of referred to as Interest and data—and pervasive in the-network of caching particularly suit for the vehicular environments. Content retrieval in NDN starts off evaluation while the supporter nodes requests a Data [13] packets by the broadcasting of an Interest, which it includes a ranked content call. There are not any limits in side the call of components and their compositions.

L. Context Awareness

Co-operative awareness Messages (CaMs) are ex-changed in VANETs to help and exchange in-formation among cars and to help cooperative connections amongst networked cars [24]. Such messages provide positional information, as well as, become aware of the status of neighboring vehicles. In last year's many researchers and business, corporations have considered the usage of the LTE cellular network as an alternative solution for vehicular networking packages, especially for the delivery of FCD message flows. A framework for RAT selection in *5G* extremely-dense community environments based on a context-aware, consumer-orientated scheme, specifically COMPASS is investigated. It selected the best RAT for every one of the active flows of a UE in the network. The pro-posed mechanism collects and subsequently strategies context data monitored and aggregated through the UE, taking gain of new progresses and 3GPP tendencies inside the LTE-EPC structure (e.g. ANDSF capability) [25].From the possible of urban state for IoVs in another paper an FCD series protocol LTE cellular community is developed, in which tremendous offloading is received via resorting to V2V direct commu-nication hyperlinks. It optimize consultant vehicle nodes and sending them through LTE channels [26].

M. Content delivery networks

Content delivery is a key functionality for growing the Internet of Vehicles. In such networks, cars act as sensors of the urban mobility by means of continuously changing messages with every other vehicle, the cellular network, and also the infrastructure (roadside units). However, the task is to transporting content in such a dynamic network is a way from trivial. In an article [27], the improvement of Content Delivery Networks (CDN) is inspected inside the context of vehicular networks. Roadside devices aid the communication by means of replicating and turning in contents to cars within their range of coverage.

N. Resource Management System

Resource management system is a big problem in the vehicular environment. Resource allocation, resource scheduling, resource utilization all are important for resource management to manage resources in vehicular environment LTE-A.

O. Resource Allocation

It is the process in which different resources are hand over to vehicles to manage traffic. High bandwidth is needed for infotainment applications like video streaming e gaming, there is a need for the proper channel to increase bandwidth and QoS. The two important resource allocation is

P. Channel Allocation

Chanel allocation is associated with spectral frequency. Several viable channel usage situations are analyzed, particularly, WAVE compliant mode, for symmetric channels, precedence and site traffic stations, and combination of the network mode. WAVE compliant mode is follows in the U.S [28]. In network switching the accomplishment between the single CCH and multiple SCHs. Symmetric channel format: this reflects the two channels as a identical, and every source decides which channel it uses or it can use the stations arbitrarily. Priority and traffic network: this makes the use of one channel solely for excessive priority protection messages and the other channel for all non-priority safety messages. Combined station mode: this combines two 10 MHz networks to the single 20 MHz channel [29]. The assistance of high significance low inexpression messages is important for the vigorous protection programs. Thus, the Priority and traffic network usage arrangement is chosen for multichannel operations. A variety of suggestions has made for the usage of the 30- MHz frequency band dedicated for highway protection and the traffic efficiency. An analysis of the channel allo-cation for the 30-MHz frequency band committed to protection-related C2x commu-nication.

Q. Bandwidth Assignation

To successfully proportion the available radio sources among the eligible user is one of the vital problems to be addressed. Proper bandwidth able to enhancing mobile Spectral efficiency while creating a minimal impression on cellular communications. It ensures the distinct QoS (quality of Service) necessities of the ITS programs [30].

R. Channel Utilization

Radio channel satisfactory enhance useful resource utilization performance. Better channel usage from c2x conversation growth reliability for safety messages [31]. Its miles typically depending on bandwidth. Higher bandwidth provides better throughput for vehicular structures. With the first-class of available Bandwidth allocated for C2x commu-nication, this valuable resource must be used successfully to quantify assets that are utilized in an advanced method.

S. QOS Multimedia Traffic Resource Management System (MTRS)

The important concept of QoS-aware multimedia resource management mechanism schedule resources with the help of numerous traffic records. The channel availability makes sure that the transmission is possible. The goal of *QoS-MTRS* is to enhance the diversity, completeness and usual traffic facts price below radio resource boundaries. It is better than BQA (bandwidth and QoS-conscious scheduler), Greedy, and FCFS in terms of appearance chance of receiving a pair of form of traffic data types according to region block , replication ratio, normal traffic records cost, cease-to-stop delay, system throughput, area insurance [32]. It can be implemented to LTE-A for assisting excessive-bandwidth needs for the Internet of vehicles [33].

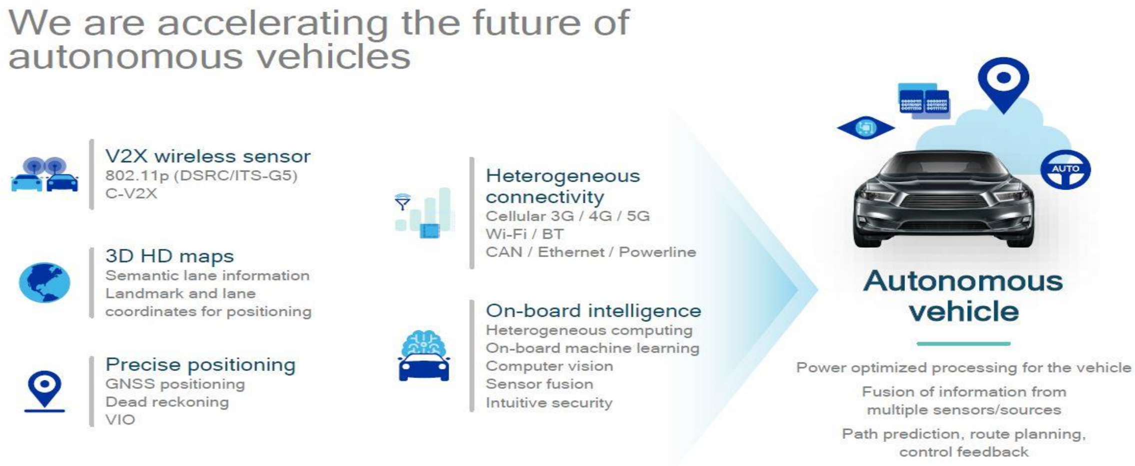

Fig 4:- [53] Future of 5G autonomous vehicles

IV. RELATED WORK

A resource allocation scheme is proposed in [34]. The major standards of this scheme are the control of the system potential and interference situations so that it will meet the performance requirement of D2D vehicular broadcast, in terms of reliability. The authors show their results through radio resource management, that's an important thing for understanding resource efficient and reliable D2D commu-nication. Resource management is an important factor for IoVs in communication as well as for cooperating systems. Liu et al, [35] proposed a modern four-tier structure for urban traffic control with the union of VANETs, *5G* networks," software-defined networks", and mobile edge computing technology. The proposed shape presents better communication exchange and faster responsive speed in a more distributed and active way. The proposed structure has the strength to lower traffic congestion. It has the capability to improve and manage urban traffic. The 4-tier architecture version tested the feasibility and excessive performance of the proposed framework. Wan et al. [36] have fundamental interest on two factors: the taxonomy of CAIV (cloud assisted intervehicle) and reliable traffic prediction. The structure of CAIV is split into three primary architecture kinds: VTC, VAC, and VWC. It moreover evaluates the traditional traffic prediction strategies used by each vehicle to Infrastructure (V2I) and vehicle to vehicle (V2V) commu-nication. On the idea of these prediction techniques, it proposed a mobile crowd sensing technique that guides dynamic route alternatives for drivers to avoid congestion. In [37] author in start estimates the imaginative and prescient of mobile communication's utility within the everyday existence of the society. It also figures out the traffic tendencies and demands for succeeding 10 years from the Mobile Broadband (MBB) company and the internet of things (IoT) attitude, respectively. The requirements from the precise provider and person demands are analyzed, and the unique requirements from regular usage prospects are calculated by means of the defined average overall performance. The benefits of *5G* communications, inside the new idea of the Internet of vehicles, is discussed in [38]. The internet of Vehicle is defined in the time period of low latency, extremely excessive bandwidth and reliability. It delivered the brand new concept of Vehicle to Vehicle (V2v) commu-nication that's ordinarily based on a Device *to Device* (D2d) communication in *5G* cell environs. This article claims that the future of IOV will usually rely upon *5G* communications. This [6] offers an assessment of the routing protocols within the *Internet of Vehicles* (IoVs) from routing algorithms to their valuation techniques. It affords 5 distinctive taxonomies of routing protocols. First, it classifies protocols, based totally on their transmission method into three categories: unicast, geocast, and broadcast.

Secondly, it classifies them into 4 classes primarily based on facts required to carry out routing: topology, position, map, and path-based totally. Third, it identifies them in delay sensitive and delays tolerant parameters. Fourth, it discusses them according to their applicability in extraordinary dimensions, that is, 1-D, 2-D, and 3-D. Finally, it discusses their goal in networks, like homogeneous and heterogeneous ones.

Ahmed et al, [39] reviews present-day traffic control systems and investigate the role and importance of vehicular cloud computing in road traffic control. First, an idea of the vehicular cloud infrastructure in an urban situation is presented to discover the vehicular cloud computing process. Then taxonomy of vehicular clouds that defines the cloud formation, integration kinds.

There is 3 fundamental contributions in [4], (1) it proposed a platoon-based CDS (cooperative driving system) with an attendance of the practical IVC (intervehicle communication). (2) The consensus-based control algorithm is applied inside the CDS, wherein the impact of the IVC, e.g., heterogeneous inter-vehicular commu-nication delay and packet loss, on the device overall performance is ideally studied. This version is verified through numerical simulations below numerous traffic conditions. The simulation evaluation is completed in Omnet++. In [40]described significant use cases and analyzed their requirements for which the future V2X commu-nication systems need to support. The toughest use cases require high link reliability (in most cases, above 99%), low latency (below 10 ms), and high throughput (tens of Mb/s per vehicle), It also performed a qualitative gap analysis of the capability of existing technologies and concluded that the tough requirements of some use cases cannot be supported by any currently available technology.

Jia et al, [3] assembled a novel platoon-based cooperation version with the attention of the realistic vehicles commu-nication. It proposed a consensus-based totally manipulate algorithms on the multi-platoons cooperative using. It additionally analyzed the system performance below the uncertainties within the IVC. Some numerical simulations have been performed to confirm the evaluation in various traffic situations. Both theoretical evaluation and simulation consequences showed that this information performs an important position in stabilizing the platoon-based CDS. The proposed consensus algorithm shows very immoderate flexibility uncertainties, which include the packet loss and size error. This paper [2] layout a vehicular method and advise an improved consensus-installed manage algorithm for the CDS.The effects of *V2X* commu-nication on system's overall performance, inclusive of transmission delay, transmission coverage, measurement noise are theoretically studied in this paper in Omnet++. In [34] exploit direct V2V commu-nication for information exchange among vehicles. A useful resource allocation scheme is designed to dynamically adapt the true-time traffic requirement of the V2V conversation. Additionally, a few key technologies are also proposed and evaluated to toughen the procedure performance of the direct V2V commu-nication.

Chiti et al, [21] investigate the optimization of the context awareness in the LTE assisted V2X paradigm. The aim of this paper is to maximize the information sharing among vehicles, supporting LTE commu-nication QoS requirements, capacity limitations, in a distributive method. The author firstly proposed a clustering based user association method, modeled as the hospital resident (HR) matching game, where CHs (clustering heads) are matched with ONs (owner nodes) to form stable clusters. It handles the HR game with the resident-oriented Gale–Shapley algorithm. Then it proposed an independent user association approach, modeled as the stable feature (SF) sport, wherein every vehicle can install multiple independent links with other automobiles infrastructures without requiring its partners to be related among themselves. It find a distributive answer called the Irving's stable fixture (ISF) algorithm.

An FCD series protocol through LTE mobile network is proposed in [41], where substantial offloading is obtained by using resorting to *V2V* direct commu-nication hyperlinks. To pick out a representative automobile node that aggregate FCD of their respective neighboring vehicle nodes earlier than sending them through LTE channels. It takes advantage of utilizing the devoted spectrum bands assigned for VANET services to lessen the traffic loads imposed at the LTE Wi-Fi access network. The proposed mechanism can be recognized in a manner in which it fully accommodates new technology and requirements, e.g., using the CBF algorithm with Geo Networking protocol for the distribution of logic. In [42], it compares caching architectures from the standpoint of the whole cache measurement that operators want to set up to reach a target hit ratio. An actual-global, massive-scale, crowd-sourced dataset coming from the WeFi app, found that internet topology and caching architecture are the critical reasons influencing the full cache length, that cell operator have given to put in. In unique, fog computing pairs remarkably well with the noticeably localized content material, including navigation information for purpose of self-driving cars.

Lianghai et al, [43] introduced a system structure that permits the direct V2V conversation beneath community control. It also proposed a useful resource allocation scheme that's designed to dynamically adapt to the real-time traffic requirement of the V2V communique. In addition, a couple of key technologies are also proposed and evaluated to boost up the procedure efficiency of the direct V2V conversation.

A high-level overview of several standardization organizations and their efforts to develop commu-nication standards for *5G* and beyond are studied in [44]. This [46] analyzes the mega trends of future mobiles services, the idea of the *5G* services which gives the importance for the truthful experiences of end- users, has also been established. Immersive, intelligent, Omni present, autonomous and public *5G* services are categorized and detailed services scenarios have also been described from the pers-pective of end-users . Depending on these use case, the technical limitations of the 4G, which can also be the technical challenge for the *5G*, have also been analyzed. A detailed analysis of channel allo-cation for the 30-MHz spectrum dedicated to safety-related C2x commu-nication is analyzed in [29]. A comprehensive over view of existing usage of the 30-MHz frequency band dedicated to safety -related C2x commu-nication. It analyzes the advantages and dis-advantages of traffic efficiency and traffic safety approaches based on an extensive set of evaluation criteria. It also provides a recommendation for the channel allo-cation for the 30-MHz frequency band.

Younes et al, [6] proposed a traffic highway performance protocol, its impartial is to target high ways. This aims of this protocol is to detect emergency cases, over the examined road, and advise the best reaction to every vehicle in its region. The proposed protocol prove that this decreases the common delay time of car visiting over motorway eventualities due to the life of emergency cases. It increases the throughput of freed lanes. Moreover, it decreased the percentage of crashed auto-mobiles with the surprising situations.

In [22] authors explore the congestion manage problem on the intersection in VANETs. It states that because of the restricted radio channel resources, a massively wide variety of records change among the stopped cars at the intersection will cause channel congestion problems, for this reason, it affords no safe warranty. At ultimate, a bargaining sport is proposed to determine the surest combination of the sending power and rate for the cluster leaders. The simulation outcomes indicate that JPRA algorithm outclasses IEEE802.11p in phrases of throughput, queuing delay and delivery ratio.

Cristiano et al, [45] looked into the improvement of Content Delivery Networks (CDN) in the context of vehicular networks. Mobile Content Delivery Vehicular Networks (MCDVN) increase to make content material available to cars which can be a part of an internet of vehicles (IoV). After formalizing the MCDVN, it proposes a Sigma Deployment to assess it as the metric. To resolve the Sigma Deployment, it advises Sigma-g grasping heuristic algorithm. The efficiency of Sigma-g is higher than an incremental deployment. The limitation of the paper is that sigma deployment moves towards the NP-hard problem. This [9] analyze models to estimate traffic idea according to the amounts of HOs and NLUs and to an evaluation of the traffic density according to with the quantities of CAs and PLUs. The car's speed can be estimated by keeping with the predicted traffic flows and predicted traffic thicknesses. For automobile pace forecasting, a back-propagation neural network algorithm is considered to predict the coming automobile velocity through the up-to-date traffic information. The experimental outcomes illustrated that the common precisions of vehicles speed estimation of street segments are seventy-nine %, 85%, sixty-three % and eighty-two % for the anticipated car speeds.

Sokratis et al, [27] offer a Context-Aware RAT Selection mechanism, its major elements work on the User Equipment (UE) - aspect, minimizing signaling over head over the air interface and computation load on the bottom stations. Secondly, it explains in detail the archi-tectural perspective; i.e., the extensions needed within the network interfaces that enables the alternate of the specified context information most of them are respective network systems and in accordance with the 3GPP (3rd generation partnership program) trends in terms of the context-aggregating entities. A novel mechanism for the restoration of named IoV content material is proposed in [41].It uses information combined with the call and the freshness characteristic for the ranked transport of content Prioritization is enforced in a – folded manner: (a) in the face choice scheme through allowing Content be requested over a couple of faces in parallel so as to accelerate their retrieval (b) within the distribution of Interest and Data packets over the 802.11 OCB interface with the aid of accelerating the forwarding of HP Interest, Data packets over LP ones. A short overview of recent technologies used in ITS applications to improve traffic efficiency and traffic congestion is provide in [46]. In another paper [47] resource allocation and resource utilization scheme are proposed along with the cooperation of knap snack algorithm called *MCKP* algorithm. This *MCKP* when incorporating in MSU (mobile station units) it leads toward NP-hard problem. To reduce this problem a *2D MCKP* algorithm is proposed. The proposed system reduces the complexity of the algorithm.

Marko et al. [46] analyze 3GPP standards used in *5G*.it also define some application scenarios for d2d Communication in *5G* networks. According to this paper LTE along the cooperation of 3GPP in *5G* provides best power consumption for both infrastructure and non-infrastructure environment. This [48], develop a modules that are established on *Controller area network* (CAN) bus, OBDII, and 4G-LTE; it also develop a software to check vehicle information on a PC, finally it Implement a database that is related to vehicle diagnostic codes the proposed system architecture is designed for big data inquiry. Ideoia et al, [30] proposed an RRM (radio resource management) methodology for the improvement of spectral efficiency with minimum effects of cellular commu-nication.it ensures *QoS* for *ITS* applications. A CCFC algorithm for multilane traffic scenarios is proposed in [41]. Decentralized algorithm and distributed algorithms are implemented along with CCFC.The *CCFC* algorithm is used to optimize traffic jam for joint situations. Multichannel cooperative based MAC protocol with the assimilation of DSRC is proposed in [49].It enhanced QOS by the transmission of secure messages. An overview of position based routing protocols that are used in V2v commu-nication for the urban environment is provided in [50]. It also discuss their methods and limitations.it evaluates the qualitative parameters of VANETs. A critical review of drawbacks and advantages of IoVs are studied in terms of traffic management in [51]. An investigation of essential conditions of minimum degree of *k*-connected node in vehicular adhoc networks, through a homo-generous variety in high way scenario is studied in [52].It derived a formula to calculate the probability if k nearest neighbor vehicles. The issues challenges and technical issues related to 5G are discussed in [47].

Sr no	References	Year	Problem detected	Proposed scheme	Proposed algorithm/Methods	Simulator	Performance matrices
1	Chiti, F., et al.	2017	User association for content sharing	Gray shapely Hospital resident game based tech.	Clustering technique	Omnet++ Sumo	• Network portioning • Network connection • Connected group featuring
2	Malandrino, F., et al.	2017	information lost during transmission	Fog computing	CDN(content delivery networks)	Omnet++	• CDF • Price of fog • Cache size
3	Salvo, P., et al.	2017	Messaging Dissemination	DSRC LTE CBF algorithm for geo networking	Two phases 1. Setup phase 2. Collection phase	Omnet++ with PLEXE	• Average number of LTE uplink radio channels used per cells • Vehicles density level
4	Chen, C., et al.	2017	Channel congestion cause information congestion	Congestion control scheme based on non-cooperative bargaining game	JPRS algorithm	NS2.35	• Throughput • Queuing delay • Delivery ratio
5	Silva, C. M., et al.	2017	Large deployment of RSUS	Sigma deployment along with heuristic algorithm	MCDVNS	Sumo	• Data networks for RSUS • No. of channel allocation for RSUS.
6	Jia, D. and D. Ngoduy	2016	Reduce gap between traffic flow modeling and commu-nication approach	CDS Cooperative deriving system	Census based algorithm for CDS	Omnet++	• Vehicle length • Maximum deceleration • Average speed • Maximum velocity • Platoon size
7	Younes, M. B., et al.	2016	Road blockage during emergency in highways Change of lane during road accident	Emergency based mechanism Best response recommendation	Traffic efficiency protocol for highways	Ns2.35	• Emergency case sensitivity Vs. • Throughput • Delay

							• Percentage of crashes vehicle
8	Liu, T.C., et al.	2017	Resource scheduling No. of resource wasted Traffic overhead consume resources	QOS MTRS(multimedia traffic resource management system)	AMC(adaptive malutation coding) +LTE-A	NS3	• Throughput • Traffic delay • Location coverage • Duplication rate
9	Jia, D. and D. Ngoduy	2016	Switching topology changings No stability	Generic car flow model WAVE census algorithm	CACC	Omnet++	• Speed error • Platoon length • Position error
10	Liu et al	2016	Decrease of traffic efficiency due to packet loss	Concatenated digital fountain code	DDFC	VANET Mobism	• Throughput • DSR relay • Data receiving rate

Table 1. Some Proposed Techniques for IoVs

V. OPEN PROBLEMS

Here are some problems that we analyzed after reviewing different papers some of them are large deployment of network infrastructure for RSUs. Dynamic topology of both cars as well as network, Resource management and resource scheduling for IoVs, Traffic congestion during the collusion in high ways roads, bandwidth utilization, large Data handling (big data thinking). There is a slit between traffic Flow modeling and commu-nication approaches. Although 5G systems encounter these problems but there should be some infrastructure deployment needed for 5G networks as well as for IOVS.

VI. CONCLUSION

The principal accomplishments in the trans-potation, science in the past few years are the emergence of intelligent vehicles. Intelligent car structures aid drivers in appearing driving tasks which include car following or lane of the changing and are seen as a hopeful approach to the improving traffic protection, performance, and sustainability [41]. In wide spread, intelligent automobile systems may be classified into two organizations, i.e., autonomous structures and cooperative structures. Autonomous automobiles do no longer talk with others. On other hands, cooperative or connected motors 'talk' to each other through vehicle-to-Vehicle (V2v) and Vehicle-to-infra-structure (V2I) commu-nication to decorate the belief of the user environment and to help cooperative cars in mane-uvering collectively below a common place. There is a need of traffic management system that act efficiently in the urban environment to improve traffic efficiency.5G based IoVs are built to lessen traffic accidents, relieve congestion and reduce pollution. Different road applications like road protection, traffic flow efficiency, and infotainment are greater to enhance the performance of IoVs. In this paper, our focus is on traffic efficiency of IoVs with the use of *5G* technologies.*5G* technologies in future play important role in traffic efficiency and road safety for IoVs.

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