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International Journal for Modern Trends in Science and Technology, 8(08): 28-32, 2022

ISSN: 2455-3778 online
DOI: https://doi.org/10.46501/IJMTST0808005
Available online at: http://www.ijmtst.com/vol8issue08.html

Autonomous Vehicle Communication using Internet of Vehicles (IOV)

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To Cite this Article
Dekka.Satish, K.Sai Priyanka, K.Chandrika, P.Bharadwaj and J.Sri Lekha. Autonomous Vehicle Communication using Internet of Vehicles (IOV). International Journal for Modern Trends in Science and Technology 2022, 8(08), pp. 28-32. https://doi.org/10.46501/IJMTST0808005

Article Info
Received: 25 June 2022; Accepted: 30 July 2022; Published: 04 August 2022.

ABSTRACT

In recent years, The evolution of intelligent transport systems (ITS), has been increasing in components to monitor different variables in the vehicles. Internet of Things (IoT) is enabling thecollection of a variety of information of all types of components for monitoring the environment and systems. Also, as part of this evolution, the original concept of Vehicular Ad-hoc networks (VANETs) is being transformed into a new concept, the Internet of Vehicles (IoV), whichinvolves Vehicle to Infrastructure(V2I),Vehicle to Vehicle (V2V)communications.With the rapid development of computation and communication technologies, IoV promises huge commercial interest and research value, thereby attracting a large number of companies and researchers. The emergence of the Internet of Vehicles (IoV) aims to facilitate the next generation of intelligent transportation system (ITS) and is a distributed network that supports the use of data created for autonomous cars and boosts road safety, efficiency by connectingvehicles to form the Internet of Vehicles(IoV) and it is capable to make its own decisions about driving customers to their destinations.

KEYWORDS: Internet of Vehicles (IoV), Vehicle-to-Vehicle (V2V) Communication, Vehicular Networks, Vehicular Security, Omnet++ Simulator, Sumo, Veins, Inet.

1. INTRODUCTION

Today, technological improvements are movingtowards highly intelligent and connected devices in our digital world. This impacts all industries and automotive is not an exception. Modern vehicles are slowly becoming more and more autonomous with the help of sensors and communication techniques.

An emerging technology that is spreading across all aspects of our lives is the Internet of Things. It lays the foundation for a whole new field in the area of transportation and vehicular network that is the Internet of Vehicles(IoV).Inour paper, we describe that leverage Vehicle-to-Vehicle with other vehicles for better communication to improve road safety and make the vehicles to reach its destination in time by using the simulators like Omnet++,Sumo,Veins and Inet.

IoV complements autonomous cars beyond sensors' line-of-sight, facilitating vehicle-to-vehicle (V2V) communications in a smart transportation environment it is hard to detect vehicular security due to rapid dynamics and location privacy,

THE INTERNET OF VEHICLES:

The Internet of Vehicles (IoV) is a distributed network that supports the use of data created by connected cars and vehicular ad hoc networks (VANETs). An important goal of the IoV is to allow vehicles to communicate in real time with their human drivers, pedestrians, other vehicles, roadside infrastructure and fleet management systems.The IoV supports five types of network communication:

Intra-: Systems that monitor the vehicle's internal performance through On Board Units (OBUs).

Vehicle to Vehicle (V2V)**:** Systems that support the wireless exchange of information about the speed and position of surrounding vehicles.

Vehicle to Infrastructure (V2I)**:** systems that support the wireless exchange of information between a vehicle and supporting roadside units.

Vehicle to Cloud (V2C) systems that allow the vehicle to access additional information from the internet through application program interfaces .

Vehicle to Pedestrian (V2P) systems that support awareness for Vulnerable Road Users such as pedestrians and cyclists.

A.How Does The Internet Of Vehicles Work?

IoV uses V2V (vehicle-to-vehicle), V2R(vehicle-to-road), V2H (vehicle-to-human) and V2S (vehicle-to-sensor) interconnectivity, for creating a social network with intelligent objects as participants. This leads to the existence of the Social Internet of Vehicle (SIoV). Essentially that's the vehicular instance of the SIoT.

IoV is a complex network in which real-time communication takes place among two or more entities, using many different technologies like a navigation system, mobile communication and sensor networks for information exchange and instruction systems.

The different types of sensors installed in vehicles, smart terminals, and platforms spread across modern cities' infrastructure, gather information, which is processed and communicate securely among all entities. Based on this data, vehicles are guided in real-time.

2. LITERATURE SURVEY

A Machine-Learning-Based Data-Centric Misbehavior Detection Model for Internet of Vehicles (Prinkle Sharma and Hong Liu)

An Overview of Internet of Vehicles (YANG Fangchun, WANG Shangguang, LI Jinglin, LIU Zhihan, SUN Qibo)

Empowered future IoV with enhanced communication, computing, and caching (Zhuang W, Ye Q, Lyu F)

Smart Internet of Vehicles Architecture based on Deep Learning for Occlusion Detection (Shaya A. Alshaya)

A Simulation Approach of the Internet of Intelligent Vehicles for Closed Routes in Urban Environments (Luis A. Curiel-Ramirez, Javier Izquierdo-Reyes, M. Rogelio Bustamante-Bello)

A Simulation Tool for EvaluatingVideo Streaming Architectures in Vehicular Network Scenarios (Pedro Pablo Garrido Abenza, Manuel P. Malumbres)

Internet of Vehicles and Autonomous Connected Car - Privacy and Security Issues (Joshua Joy and Mario Gerla)

Exploiting mobile edge computing for enhancing vehicular applications in smart cities. (El-Sayed H and Chaqfeh M)

A heterogeneous IoV architecture for data forwarding in vehicle to infrastructure communication (Sherazi H.H.R and Khan Z.A)

Fog based intelligent transportation big data analytics in the Internet of vehicles environment: Motivations, architecture, challenges, and critical issues (Darwish T.S. and Bakar K.A.)

Traffic flow prediction driven resource reservation for multimedia iov with edge computing (Xu X., Fang Z., Qi L., Zhang X.)

3. PROPOSED SYSTEM

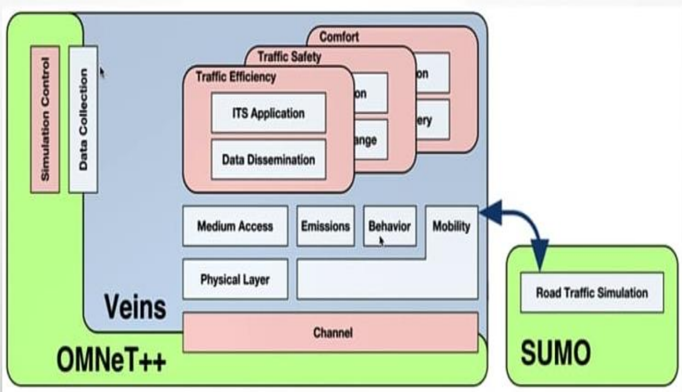
Internet of vehicles technology enables vehicles to communicate with public networks and interact with the surrounding environment.It also allows vehicles to exchange and collect information about other vehicles and roads.

IoV improves upon VANETs by incorporating cellular networks such as LTE,5G etc.,to provide an expansive and reliable communication.

In our project, we decscribe that leverage vehicle-to-vehicle(V2V) and vehicle-to-infrastructure(V2I) communications with other vehicles.

The Internet of Vehicles (IoV) is a distributed network that supports the use of data created by *connected cars* and vehicular ad hoc networks (VANETs). An important goal of the IoV is to allow vehicles to communicate in real time with their human drivers, pedestrians, other vehicles, roadside infrastructure

4. SYSTEM DESIGN & IMPLEMENTATION



Veins, the Open Source vehicular network simulation framework, ships as a suite of simulation models for vehicular networking. These models are executed by an event-based network simulator (OMNeT++) while interacting with a road traffic simulator (SUMO). Other components of Veins take care of setting up, running, and monitoring the simulation.

Road traffic simulation is performed by SUMO, which is well-established in the domain of traffic engineering. Network simulation is performed by OMNeT++ along with the physical layer modelling toolkit MiXiM, which makes it possible to employ accurate models for radio interference, as well as shadowing by static and moving obstacles.

Both simulators are bi-directionally coupled and simulations are performed online. This way, the influence of vehicular networks on road traffic can be modeled and complex interactions between both domains examined.

Domain specific models for vehicular networking build on this basis to provide a comprehensive framework that is still easy to learn and use.

The Veins framework includes a comprehensive suite of models to make vehicular network simulations as realistic as possible, without sacrificing speed. The GUI and IDE of OMNET++ and SUMO can be used for quickly setting up and interactively running simulations.

Veins contains a large number of simulation models that are applicable to vehicular network simulation in general. Not all of them are needed for every simulation -- and, in fact, for some of them it only makes sense to instantiate at most one in any given simulation.

For the sake of testing and evaluating our suggested algorithm, we chose Vines, the VANETs simulator along with SUMO and OMNET++. The vehicles are generated in SUMO and then exported to OMNET++. OMNET++ considers all vehicles as network nodes and simulates the scenario. If any change occurs in the network, Veins can change the scenario of the vehicle in SUMO .
We mainly opted for those simulators and tools because we think they can provide close to real emulation and allow us to focus on the algorithm at hand rather than other networks, signals, and traffic issues.
*Om*net veins is an open source framework utilized also in running vehicular network simulations.It is based on two well-established simulators: In OMNET++, an event-based network simulator, and also SUMO, a road traffic simulator.Main advantage of OMNET++ veins is that it can include LTE Framework model also for

cellular networking and also can help to simulate multiple block simulation using single work station.
OMNET++ is a modular, component-based C++ simulation library and framework, primarily for building network simulators. OMNeT++ can be used for free for non-commercial simulations like at academic institutions and for teaching. OMNET is an extended version of OMNET++ for commercial use.

5. RESULTS:

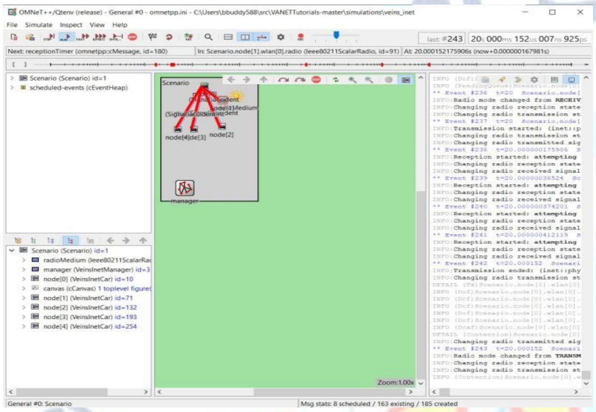


Fig:Simulation of 5 Vehicles in Omnet++

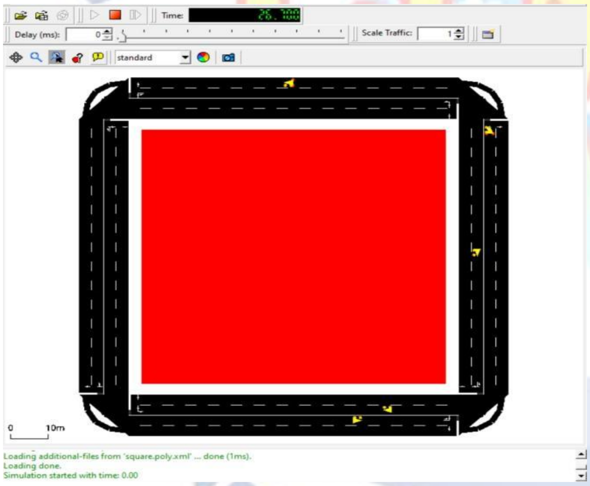


Fig:Simulation of 5 Vehicles in Sumo

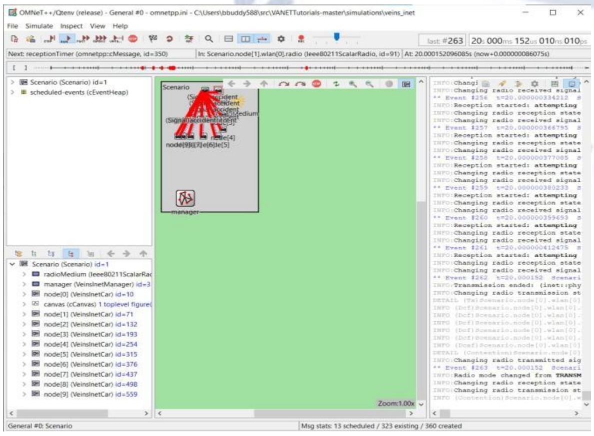


Fig:Simulation of 10 Vehicles in Omnet++

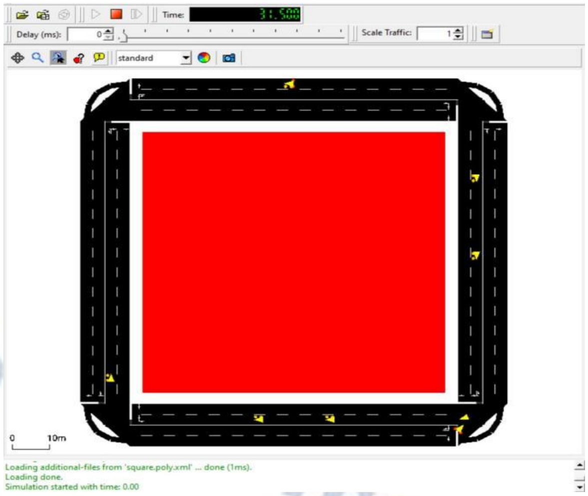


Fig:Simulation of 10 Vehicles in Sumo

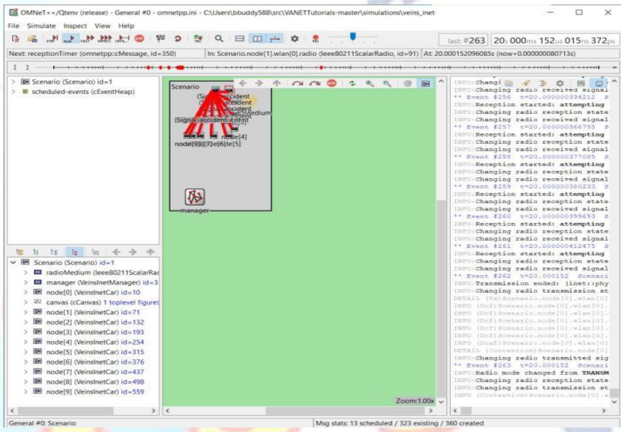


Fig:Simulation of 20 Vehicles in Omnet++

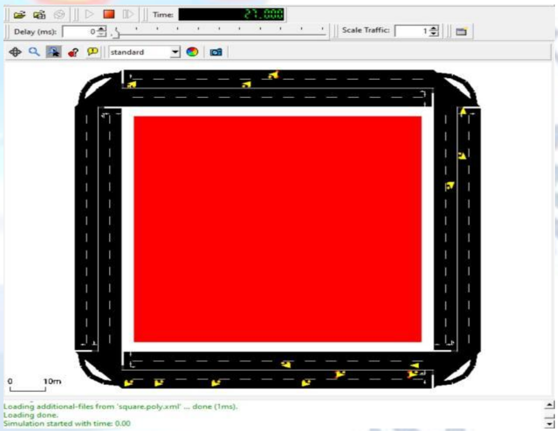


Fig:Simulation of 20 Vehicles in Sumo

After executing the omnet code the vehicles are entering into the network with the help of veins framework and the geographic location of each vehicle is monitored with help of the sumo simulator and the data transmitted to the omnet++ simulator by veins.
The Vehicle 1 is travelled along the edge 0 and edge 1 and edge 2 after the Vehicle 2 got accident at the time 20 sec then the vehicle pass the information to the remaining nodes then the every nodes sent relay response to the all nodes, after acknowledgement the

remaining nodes take diversion and pass through edge 1,edge 0 ,edge 3 without passing edge 2.

6. CONCLUSION

In this paper, we use IoV for communication by decreasing the traffic congestion and boosts road safety to improve the effectiveness of results.we describe that leverage Vehicle-to-Vehicle(V2V) and Vehicle-to-Infrastructure(V2I) communications with other vehicles, however, we can create privacy and security violations and safety. And our project is helps us to communicate with other vehicle to reach the destination in time.

The technological revolution of our age impacts all industries. Our desire for more intelligent and connected devices keeps growing. That's why the Internet of Things is now all around us. It empowers physical objects with the ability to communicate and interact with each other. Our cities are also becoming smarter and more connected. This will allow connected vehicles to slowly transform into autonomous ones, but none of this will be possible without a new advanced network. A key member that is among the reasons for such rapid growth in the use of IoT devices is the Internet of Vehicles (IoV). It allows vehicles to exchange information, efficiency and most importantly safety with others as well as with infrastructures using Vehicular Ad-Hoc Networks (VANETs), which originated from MANET or Mobile Ad-hoc Network.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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[1] Prinkle Sharma and Hong Liu [1] suggested "A Machine-Learning-Based Data-Centric Misbehavior Detection Model for Internet of Vehicles". This paper focuses on Data-centric misbehavior detection using Internet of Vehicles (IoV), machine learning (ML) for vehicular security.

[2] YANG Fangchun, WANG Shangguang, LI Jinglin, LIU Zhihan, SUN Qibo [2]suggested "An Overview of Internet of Vehicles". This paper focuses on an abstract network model of the IoV, discusses the technologies required to create the IoV.

[3] Zhuang W, Ye Q,Lyu F[3] suggested "Empowered future IoV with enhanced communication, computing, and caching". This work talks about bringing flexibility and better network management using SDN and network function virtualization (NFV) in IoV-related scenarios.

[4] Shaya A. Alshaya [4] suggested "Smart Internet of Vehicles Architecture based on Deep Learning for Occlusion Detection".

[5] Luis A. Curiel-Ramirez, Javier Izquierdo-Reyes, M. Rogelio Bustamante-Bello [5] suggested "A Simulation Approach of the Internet of Intelligent Vehicles for Closed Routes in Urban Environments". This work focuses on the use and development of technologies that allow the communication of vehicles is an area of research that has increased in recent years.

[6] Pedro Pablo Garrido Abenza, Manuel P. Malumbres[6] suggested "A Simulation Tool for EvaluatingVideo Streaming Architectures in Vehicular Network Scenarios". This work focuses on a simulation framework called Video Delivery Simulation Framework over Vehicular Networks (VDSF-VN) was introduced.

[7] Joshua Joy and Mario Gerla[7] suggested "Internet of Vehicles and Autonomous Connected Car - Privacy and Security Issues". This work focuses on absorbing information from the environment, from other cars (and from the driver) and feeding it to other cars and infrastructure to assist in safe navigation, pollution control and traffic management.

[8] El-Sayed H and Chaqfeh M.[8] suggested " Exploiting mobile edge computing for enhancing vehicular applications in smart cities". This work focuses on integrating mobile edge computing (MEC) in a vehicular environment with existing architecture to propose the next generation of ITS in smart cities.

[9] Sherazi H.H.R and Khan Z.A[9] suggested "A heterogeneous IoV architecture for data forwarding in vehicle to infrastructure communication". This work focuses on heterogeneous IoV architecture with a combination of multiple wireless interfaces exploiting the long WiFi and 4G/LTE installed on–board smart vehicles.

[10] Darwish T.S. and Bakar K.A.[10] suggested "Fog based intelligent transportation big data analytics in the Internet of vehicles environment: Motivations, architecture, challenges, and critical issues". This work focuses on an IoV environment based on Intelligent Transportation System (ITS) big data analytics.

[11] Xu X., Fang Z., Qi L., Zhang X.,[11] suggested "Traffic flow prediction driven resource reservation for multimedia iov with edge computing". This work focuses on multimedia collection in IoV environments.