Vehicles Communication with Fuel Station using Internet of Vehicles

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Abstract

With the swift growth of the Internet of Things is now recognized as the next generation of technology for autonomous vehicles. IoV-based communication has become more widespread. Fuel usage and demand have increased as the number of cars has increased. Long-distance travelers do not get any closer to filling stations. They are unsure of how much fuel they will need or the location of the closest fuel station. Another issue is that they cannot contact the fuel stations to obtain the necessary fuel. If they know their vehicle's mileage and have access to the nearby fueling stations, they can acquire the fuel they need for an efficient journey. There is currently no method in place to measure vehicle fuel usage accurately. While some fuel consumption systems are available, those systems cannot connect with the nearest public filling stations if the vehicle's fuel supply is depleted and the owner requires additional fuel to continue driving. We propose a comprehensive system encompassing Onboard Units (OBUs), Cloud technology, Fuel Monitoring Sensors, GSM Modules, GPS, and Roadside Units (RSUs) to tackle these issues. The system's primary objectives are to accurately measure vehicle fuel usage and facilitate communication with nearby fuel stations to acquire fuel efficiently. We work to deliver an integrated approach that permits precise fuel monitoring, identifies nearby gasoline stations, and streamlines communication to quickly achieve the fuel required by fusing a variety of technologies. The anticipated outcomes of this research encompass enhanced fuel management, cost savings, and improved travel experiences.

Keywords: GPS, GSM Module, Sensors, VANET, RSUs, Communication between Vehicles and Fuel Station.

Introduction

The IoT has improved people's lives by creating and inventing

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new technologies like tags, sensors, and cell phones. In the modern world, things are becoming increasingly automated. Sixty-four billion things will be online in 2025, with automobiles making up a chunk. (Mian et al., 2022). The IoT is a rapidly increasing platform that allows us to link all hardware modules (sensors, electronic devices, and so on) and combine them with software to create our unique device applications. IoT can connect various non-living objects to the Internet (Wang, Valerdi, Zhou, & Li, 2015).

These inanimate things can be linked together to exchange information with their local network in order to facilitate processes and improve human lives (Perwej, AbouGhaly, Kerim, & Harb, 2019). The Internet of Things (IoT) is a global network that links intelligent gadgets and enables interoperability. The Internet of Things (IoT) transforms into the Internet of Vehicles (IoV) when gleaming things become linked to it over the internet. The IoV is a more broad application of the IoT in smart transportation as a result. (Sadiku, Tembely, & Musa, 2018). The main issues that current transport systems must address are traffic congestion, safety, and pollution. Information and communication technology is becoming increasingly important to modern transportation networks. Automakers are creating in-vehicle sensors for various uses, including entertainment, traffic control, and safety. Governmental entities are putting in roadside infrastructures, such as sensors and cameras, to gather data on the weather and traffic. We address leveraging sensor technologies to create an environmentally friendly Intelligent Transportation System (ITS) and the potential benefits of placing multiple sensors in different ITS components for safety, traffic management, and entertainment applications. Finally, we go over some of the issues that must be resolved to make an environment for collaborative and fully functional ITS possible (Guerrero-Ibáñez, Zeadally, & Contreras-Castillo, 2018).

Fuel usage and demand have increased as the number of vehicles has increased. People do not get closer to fuel stations when traveling long distances. They have no idea how much fuel they will use or where to locate the nearest fuel station. Another issue is that they cannot contact the filling stations for fuel. They can obtain the fuel required for travel which is efficient if they know how much fuel they use and have access to nearby filling stations. The vehicle owner is unaware of the travel and cannot predict fuel use, particularly on lengthy and atypical routes. The owner is in serious trouble if the car uses all the petrol on an odd excursion. For the vehicle to continue moving, he needs additional fuel.

Distracting activities that occur while driving are becoming more prevalent. This is particularly true for young people, who rely more on their cars than individuals of other ages do to fulfill their own needs. To deal with this additional danger, this study suggests a cross-disciplinary safe-by-design (SbD) approach. It employs a variation of Young Novice Driver Scale (BYNDS) in German to collect data on the distracted driving patterns of young people. Following an analysis of the information's limitations, safety precautions are proposed for distracted driving among young drivers. Three recommendations are revealed by this new method for using DMS in future automobile generations (Jannusch, Shannon, Völler, Murphy, & Mullins, 2021). Tracking technologies allow us to maintain track of vehicles without needing the driver's intervention and give us the closest available fuel station position. Fuel is measured with the use of a flow sensor. An algorithm attached to the flow sensor in an Android application will assist the communication module in its job. The flow sensor generates signals and sends messages and location coordinates in various parameters. The Cloud, Fuel Monitoring Sensors, GSM Modules, and RSUs are all used in the system to make it work.

Major Contributions

The primary issue covered in this study was that previous studies only focus on fuel consumption and fuel monitoring; They fail to give a vehicle the ability to find the closest gasoline station and come into contact with it to get the needed fuel. The significant contributions of this paper are listed below:

1. Investigation of the recent technologies related to IoT, IoV, Vehicular Cloud and mobile applications.
2. The proposed work is performed in a simulation tool named SUMO.
3. The machines may be operated by a smartphone app, which also provides them the ability to locate and reach the closest gasoline station.

Literature Review

The literature contains relevant work on fuel monitoring, consumption, and location finding. Many of these studies (Abukhalil, AlMahafzah, Alksasbeh, & Alqaralleh, 2020) suggested employing OBD-II (Onboard Diagnosis-II) and Support Vector Machine Model to monitor fuel use. Particularly, works emphasize route optimization for minimizing fuel use. This study uses a navigation system to calculate the potential for reducing fuel use and CO_2 emissions by optimizing route selection based on the shortest total fuel consumption (rather than the conventional shortest time or distance). The navigation system, which can alert approaching vehicles in the street network, might have also considered real-time information concerning traffic interruption situations. Everything in Lund, Sweden, depends on a roadway network that contains an extensive database on traffic driving habits. (Syahputra, 2016) The prediction of vehicle fuel usage has been made using the ANFIS (Adaptive Neuro Fuzzy Inference System). This study considers the engine size, horsepower, weight, acceleration, and model. The input variables are "weight" and "year," with the anticipated output variable being fuel usage in MPG. The study's conclusions are presented in three dimensions, input-output diagrams and surface graphs for the ideal ANFIS model with two inputs for MPG prediction. The anticipated MPG increases as "Weight" increases and "Year" decreases on this monotonic, nonlinear surface. The fuel required to travel the same distance increases as the vehicle's weight.

For the Internet of Things VISCar, (Husni, 2017) created a smartphone app for Android that tracks fuel use. The four primary features of the VISCar are analysis of driving conduct, monitoring, notification, and location and route to the filling station. The connector, server, and user interface are the three subsystems that make up this system. The Raspberry Pi receives engine data from the automobile via OBDII, which is then used to communicate it using Bluetooth to the server where it is kept. A user may access data via a mobile application thanks to MQTT. The test results demonstrate that VISCar was created and applied successfully to monitor fuel consumption efficiency. A financial loss occurs due to a lack of accurate records of fuel filled and consumed.

To avoid this (Nandimath, Alekar, Joshi, Bhite, & Chaudhari, 2017) implemented an IoT-based fuel monitoring system. They employed a reed switch that works on the Hall Effect principle for fuel monitoring. When the agent fills the tank with fuel, the flow sensor is activated and remains active until the tank is empty, and the information about the fuel transaction is saved in the system's database. It also shows the current position of the agent's fuel-filling station. When the fuel runs out, it will compute the quantity of energy used and send you an alert on your phone. The data will be stored on the server if your phone is unavailable. There is a mix of IoT and ICT in this study.

Customers can use the system to protect them both. The approach described in this paper uses an intelligent Android application and the Internet of Things/Vehicles on Board Diagnostic System to

evaluate neighboring gas stations based on the price and quality of the vehicle's current fuel. (Carlevaro-Fita & Johnson, 2019).
An effective heuristic method was created to locate alternate gasoline stations (Tran, Nagy, Nguyen, & Wassan, 2018). Once the algorithm resolves the sub-problems and identifies some of the most probable station locations, it is limited to a set of promising candidates. Can this be fixed by finding the list of candidates, solving the relaxation model, and Afterwards switching around a few stations between the remainder of the stations and the candidate list? A parallel computing strategy is utilized for large-scale instances to effectively and swiftly handle several constrained problems simultaneously.

There are several applications for the IoT, including sensors for smart meters, remote locations with challenging access, and sensors for health applications. These linked component networks meet the requirements for self-driving cars, smart cities, and smart autos (Gelenbe, Nakıp, & Czachórski, 2022). By improving agility, mobility, efficiency, and effectiveness, the IoT, a wireless network that connects intelligent devices to the Internet, is crucial for modernizing human interaction (Kumar, Malik, & Ranga, 2022). The Internet of cars is a dispersed network that allows interaction between and among cars and other intelligent devices and infrastructures to exchange information and offer essential services. Although the IoV's extremely dynamic environment presents many opportunities, it also makes the network vulnerable to several security assaults (Mershad, Cheikhrouhou, & Ismail, 2021). Smart cities will be inextricably linked through the Internet of Vehicles (IoV) shortly. Vehicular ad hoc networks (VANETs) are being integrated into the IoV due to the expansion of the Internet of Things and quick communication. The technical and non-technical components of IoV must be standardized before being used on the road. The IoV, VANETs, and ITS trust management (TM) are the main topics of this study (intelligent transport system). To assure safety in-vehicle networks, trust has always been crucial. Over the years, several TM and evaluation techniques have been published, but relatively few in-depth studies serve as the basis for developing a "standard" for TM in IoV. By examining all the TM models available for vehicular networks, this paper seeks to assess all the approaches from past studies (Rehman, Hassan, Yew, Paputungan, & Tran, 2020).

There is an emerging class of ad hoc networks where the mobile nodes are automobiles. An example of a mobile ad hoc network is vehicle-to-roadside communication (VRC), also known as vehicular ad hoc network (VAN), which aims to provide communications between automobiles and a nearby roadside base station as well as between cars and other adjacent vehicles (also known as inter-vehicle communication or IVC). Numerous IEEE 802.11 standards, the 802.20 Mobile Broadband for Wireless Access standard, and the 802.16e Mobile WiMAX standard have all been proposed as communication technologies for the next generation of sentient cars (Isaac, Camara, Zeadally, & Marquez, 2008).

Today's automobiles are gradually incorporating the Internet of Things, enabling them to provide information to drivers and passengers everywhere. However, as the number of connected vehicles keeps increasing, new requirements for vehicular networks, such as information transfer that is seamless, secure, reliable, and scalable among cars, people, and roadside infrastructures, are emerging (Contreras-Castillo, Zeadally, & Guerrero-Ibañez, 2017).

Modern vehicles are predicted to be able to communicate through diverse radio access technologies and exchange vast amounts of data with their surroundings as a result of the quick development of automotive telematics. By significantly expanding the network size and carrying out both real-time and long-term information processing, the outdated Vehicular Ad-Hoc Networks (VANETs), which promise an intelligent and efficient future for the transportation system, are establishing the Internet of Vehicles (IoV). "Big Data" alludes to the enormous amounts and incredible data types vehicles create and consume (Xu et al., 2017).

Due to the rapid urbanization of contemporary cities, urgent issues with transportation, healthcare, energy, and civic infrastructure require creative solutions. The Internet of Things (IoT), which creates a massive worldwide network of physically connected devices outfitted with electronics, software, sensors, and network connectivity, is one of the most promising enabling technologies for resolving these problems. One may argue that IoT is developing into the cornerstone for the next wave of smart cities because of its capacity to use environmentally friendly information and communication technologies. The rapid development of IoT is affecting several technological and scientific application domains (Alavi, Jiao, Buttlar, & Lajnef, 2018).

The automobile industry and academia have recently paid much attention to the Internet of Vehicles. Vehicle technologies, which have many parts, including sensors and onboard units (OBUs), are advancing quickly. These sensors provide a lot of data that may be used to inform and speed up decision-making (e.g., navigating through traffic and obstacles). Automotive makers are improving vehicles' communication abilities to increase their sensing range. However, current cellular connection technologies like 4G and dedicated short-range communication (DSRC) cannot accommodate the massive volume of data created by various fully connected vehicle scenarios. Using millimeter-wave (mmWave) technology, terabit data transfer rates between vehicles may be possible. As a result, we give a thorough analysis of the recent research that has been published, and we discuss how mmWave communications might be used in vehicle communications. We examine relevant topics, i.e., sensing-aware MAC protocol, handover algorithms, link blockage, and beam width size adaptation, focusing on the MAC and physical layers. Finally, we outline future research objectives and constraints while highlighting various applications for intelligent transportation (Dutta, Elhoseny, Dahiya, & Shankar, 2020).

This research illustrates how an intelligent e-fuel station is designed and implemented utilizing IoT technology (Bolla, Jijesh, Palle, & Penna, 2020). Using RFID technology, the system can determine the station's fuel level, transfer data to a cloud server, and deduct the amount of gasoline supplied from a user-based card. Only the administrator has access to this cloud server. Fuel will be sent from the central station to that station if the fuel level is low. In today's society, everything is getting more and more mechanized.

Proposed Framework

The Vehicular Ad-hoc Network is the basis for the network model presented here. It is a sort of Mobile Ad-hoc Network (MANET) that enables the communication between surrounding cars and the neighborhood's infrastructure. Moving vehicles help to build the network. Rapid topology changes are restricted in the vehicular ad-hoc network because of node movement, a multi-store wireless network. Research, standardization, and development in vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication are becoming more and more feasible as more modern cars with the features of computer technology and wireless connectivity.

The use of VANETs to provide internet connectivity to vehicle nodes is also possible. Figure 1 depicts the architecture in which vehicles are integrated with an onboard unit, a specific electronic gadget (OBU). It is equipped with a wireless communication system. Data can be transferred to nearby vehicles and infrastructures, i.e., cellular infrastructures, roadside infrastructures based on short-range communications (OBUs), etc. Cars in the proposed architecture can communicate with one another in two different ways: (V2V) Vehicle to Vehicle (based on a vehicular cloud) and (V2I) Vehicle to Infrastructure

(based on a vehicular cloud). We can communicate directly between vehicles using this approach without an RSU. Another communication is between the car and the infrastructure in which RSU is employed. When immediate information is required, RSUs can be of assistance. Vehicles can communicate with one another using V2V and V2I. The picture also depicts a variety of communication strategies:

Figure 1: V2V and V2I Communication

We can communicate directly between vehicles using this approach without an RSU. Another communication is between the car and the infrastructure where RSU is employed. When immediate information is required, RSUs can be of assistance. Vehicles can communicate with one another using V2V and V2I. The picture also depicts a variety of communication strategies.

Figure 2 depicts the technique by which a vehicle locates the nearest fuel station using GPS when it runs out of fuel. The message is subsequently transmitted to the RSU; if is no RSU nearby, it is transmitted via the V2V communication architecture to other vehicles. Other vehicles send messages to RSU and from RSU to the Cloud. Then it is delivered to a fuel station for communication purposes. The discussed communication strategy mixes V2V and V2I communication to ensure messages are distributed to vehicles and infrastructure. Figure 3 shows how a vehicle can use roadside infrastructure to communicate with the closest fuel station. The main steps of the suggested study framework and working technique are shown in Figure 4 and are further described below. The following list of steps outlines the working mechanism:

a) Each car is given a unique ID on a cloud server, and data about the coordinates of the location where the vehicle is out of gasoline is kept for each ID.

b) When a vehicle runs out of gasoline, a flow sensor that monitors fuel use turns on automatically.

c) To continue its journey, a vehicle uses the GPS sensor to find the closest fuel station.

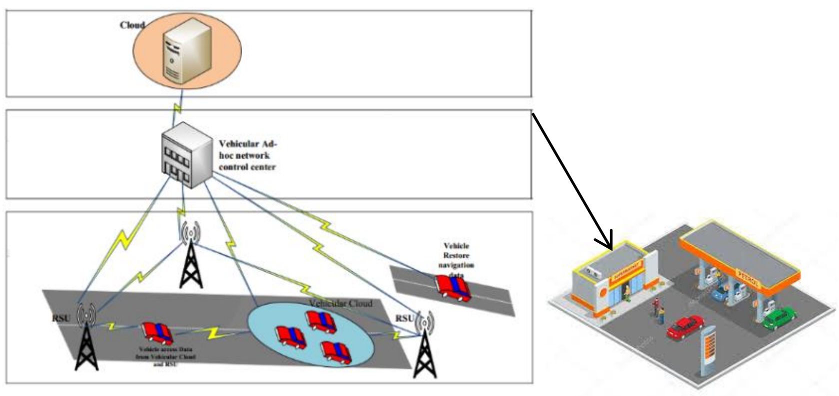


Figure 2: Communication among Vehicles and Fuel Station

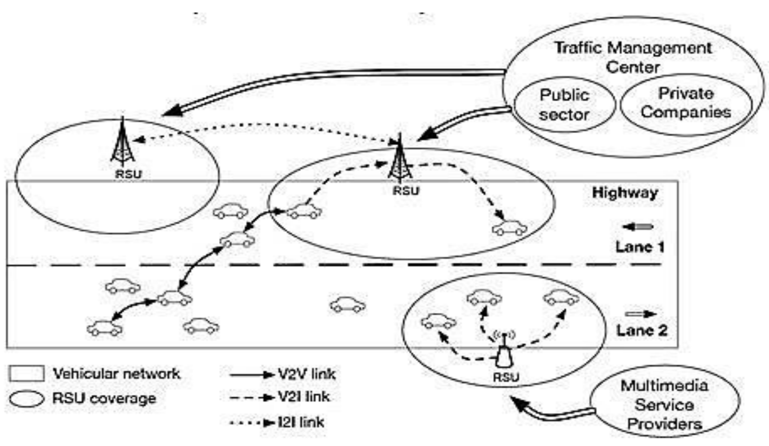


Figure 3: Layout of Communication

d) With the help of (OBU), a message is produced. The news delivered by the (OBU) is subsequently relayed to the RSU, which forwards it to the nearest fuel station. If a vehicle cannot locate an RSU within a reasonable distance, a message is sent to

Figure 1 Proposed Framework

the vehicle cloud, and the car precedes it to the RSU and from there to the nearest fuel station.

e) The closest fuel station is located using the Global Positioning System. If it is currently out of fuel, a message is sent to another fuel station nearby, asking it to contact the connected fuel station on the vehicle's behalf.

f) If (VANET) is not functioning effectively at the time, communication is carried out via the vehicle cloud.

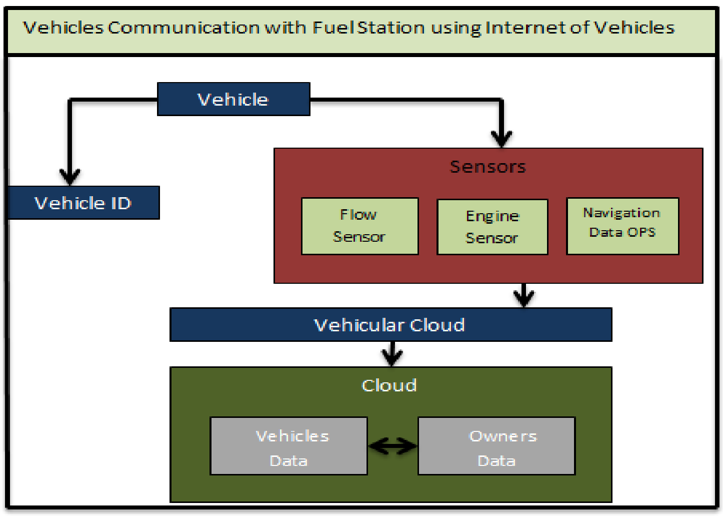


Figure 4: Proposed Framework

Implementation and Results Evaluation

The algorithms to assess the filling station and also transmit the closest available fuel stations are included in this section. The algorithms solve the following problems:

- Algorithm to determine whether a vehicle's fuel is running low
- Algorithm to transfer a packet (P) from a vehicle (V) to a Road Side Unit (D)

Dispatched the package to RSU

The algorithm depicts how a vehicle (V) dispatches a packet (P) to the RSU (D). The algorithm determines the path for delivering a fuel message to the recipient, including the vehicle's location coordinates. It is saved on the cloud server until the next time it is transmitted. The algorithm works based on the premise that if D is within V's range, V sends a message directly to D and is terminated. If D is outside V's coverage area, it indicates the path between D and it, whereas V finds D's nearest neighbors. After dropping it off at a neighbor's, V will deliver P to D.

Fuel Status of Vehicle

The algorithm displays the fuel level in the vehicle. One liter of fuel has been chosen as the predefined level. The algorithm is built on the premise that when the fuel level drops below or equal to 1 liter, the automobile will run out of petrol, and an alarm will sound. It then uses GPS to determine its location, sets that location's longitude and latitude, logs onto a WiFi, 3G, or 4G network, and sends a message to the server to request a connection with the fuel station.

Algorithm 1: Algorithm to transmit a packet (P) from a vehicle (V) to a Road Side Unit (D)

Result: Transmission of Packet (P) from Vehicle (V) to RSU (D)
Vehicle V (Source);
RSU D (Destination);
Packet P (Fuel Message);
if D is within the V range, then
 V sends directly to D;
 Go to an end;
else
 V defines the total path between itself and D;
 V determined the set of Vn of neighbors that are nearer from it to D;
if Vn= 0, then
 Go to delay routine;
else
 V sends P to K neighbors in Vn;
 V drops P;
 end
end

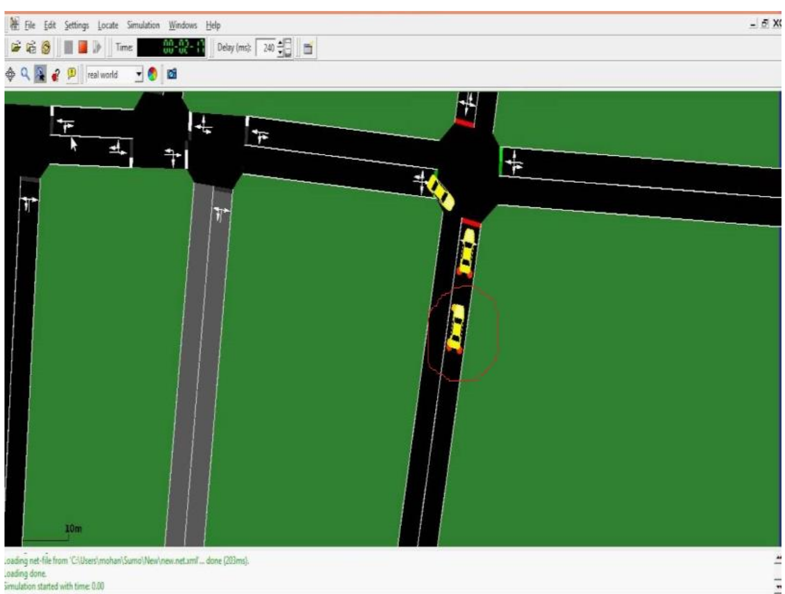
Algorithm 2: Status of vehicle Fuel Run out

Data: Values from SUMO
Result: Status of vehicle fuel run out
While the vehicle is running, do
if the fuel level ≤ 1, then
 STATUS = run out occur;
 GET GPS locations;

```
        Location = current location (lat, lang);
        CONNECTION with the available network, i.e., WiFi/3G/4G:
        transmit MESSAGE to the server;
        CONNECTION with fuel station;
else
        STATUS = no runout occurs;
       end
end
```

An Android application is developed that is installed on RSUs to assess and implement the concept in the real world. Before transmitting these data packets to the cloud server storage, the application enables a vehicle to obtain its coordinates and choose the closest reachable gas station. Additionally, it receives information from the cloud server database to be sent to the nearest open fuel station. Because Firebase is a real-time database with a NoSQL structure that can evaluate data quickly, it is used as cloud storage. Each vehicle has a unique identity saved on Firebase cloud storage to identify each car across the network for upcoming statistics and data analysis.

Figure 5: Vehicle Communication Simulation



Simulation Environment

- We used the SUMO tool to mimic the suggested method.
- We obtained an open street map of Mall Road in Lahore,

Pakistan, from OSM to simulate vehicular traffic.

- The SUMO imports the OSM data.
- Limited vehicles have been given the power to transmit the message, barring an approachable environment.
- The coordinates and communication messages from the car to the fuel station are produced using SUMO. Gained output (.xml).
- The nearest fuel station's stored coordinates in the Cloud match these coordinates.
- After Simulation of Urban Mobility (SUMO) generates output, the (.xml) file is encoded using Distinguished Encoding Rule (DER) Standards before being sent to the Roadside Units (RSU's), the gasoline station, and other cars as well. From there, the file is sent to the Cloud.
- The fuel message is packaged with the XML file and transmitted to the Cloud to reach the closest fuel station and other vehicles if the fuel station is out of reach.
- It takes 2-3 seconds to send data to the Google Firebase cloud storage.
- If there isn't a fuel station close by for a car that has run out of fuel, data is also provided through vehicle-to-vehicle communication to the other vehicles displayed on the Open Street Map (OSM).

Response Time and Data Storage

Figure 6 depicts the amount of time for a communication message to go across the Cloud and shows the time it takes for the cloud server to respond.

Upload and Response Time on Average

A millisecond (ms) represents data uploading to or downloading from the Cloud and the typical response time.

Compression and Sharing of Fuel Message

It uses the Distinguished Encoding Rule (DER). Canonical (XML) encoding rules and (XER) are examples of Extensible Markup Language (XML) encoding rules that provide information in textual form and affect message compression. Nokalva Abstract Syntax Notation One/C++ was employed. Abstract Syntax Notation One is a compression standard that is timely and simple to share with the Cloud and automobiles. The message has been encoded using many encoding techniques, including (BER), (CER), and (DER). Figures 8 and 9 display the dimensions of the message that should be transmitted between the vehicles, the fuel station, and the Cloud.

Table 1
Output from SUMO in XML form

Time	ID	x	Y	Angle	Type	Speed	POS	Lane	Slope
0	0	5391.23	6518.36	239.64	DEFAULT_VEHTYPE	0	5.1	477974809#0_0	0
1	0	5389.99	6518.36	239.64	DEFAULT_VEHTYPE	1.44	6.54	237974098#0_0	0
1	1	7648.8	5160.16	56.43	DEFAULT_VEHTYPE	0	5.1	889186809#0_0	0
2	0	5386.55	4696.62	239.64	DEFAULT_VEHTYPE	3.98	10.52	237974098#0_0	0
2	1	7650.19	64696.74	328.97	DEFAULT_VEHTYPE	1.67	6.77	24313309#0_0	0
2	2	5776.66	5165.65	239.64	DEFAULT_VEHTYPE	0	5.1	477974098#0_0	0
3	0	5381.53	4700.54	56.43	DEFAULT_VEHTYPE	5.82	16.43	488918648#0_0	0
3	1	5673.22	5688.71	56.43	DEFAULT_VEHTYPE	3.63	10.42	363274098#0_0	0
3	2	5775.35	7553.62	239.78	DEFAULT_VEHTYPE	2.54	7.64	88916865#0_0	0
3	3	5134.7	6497.47	328.97	DEFAULT_VEHTYPE	0	5.1	20901853#0_0	0
4	0	5374.54	6518.36	149.45	DEFAULT_VEHTYPE	8.09	24.43	23489532#0_0	0
4	1	7657.61	6518.36	59.57	DEFAULT_VEHTYPE	5.27	15.68	23489539#0_0	0
4	2	5773.06	6518.36	263.6	DEFAULT_VEHTYPE	4.43	12.08	88918541#0_0	0
4	3	5133.31	6518.36	239.86	DEFAULT_VEHTYPE	1.63	6.73	57974098#0_0	0
4	0	5796.63	6518.36	149.35	DEFAULT_VEHTYPE	0	5.1	904404809#0_0	0
5	1	5366.05	6518.36	263.6	DEFAULT_VEHTYPE	9.82	34.52	49848098#0_0	0
5	2	7664.55	6518.36	62.93	DEFAULT_VEHTYPE	7.86	23.54	12387623#0_0	0
5	3	5130.9	6518.36	238.75	DEFAULT_VEHTYPE	6.43	18.51	90000123#0_0	0
5	4	7673.31	6518.36	56.43	DEFAULT_VEHTYPE	3.64	10.37	23987632#0_0	0
5	5	2312.22	6518.36	149.45	DEFAULT_VEHTYPE	1.86	6.96	34223665#0_0	0
5	0	9081.43	6518.36	238.75	DEFAULT_VEHTYPE	0	5.1	124431124#0_0	0
6	1	5355.38	6518.36	238.97	DEFAULT_VEHTYPE	12.34	46.59	96495867#0_0	0
6	2	6362.92	6518.36	328.97	DEFAULT_VEHTYPE	10.12	33.66	54586863#0_0	0
6	3	5125.21	6518.36	238.75	DEFAULT_VEHTYPE	7.89	26.4	66534593#0_0	0
6	0	6497.24	6518.36	45.66	DEFAULT_VEHTYPE	5.83	16.2	78657443#0_0	0

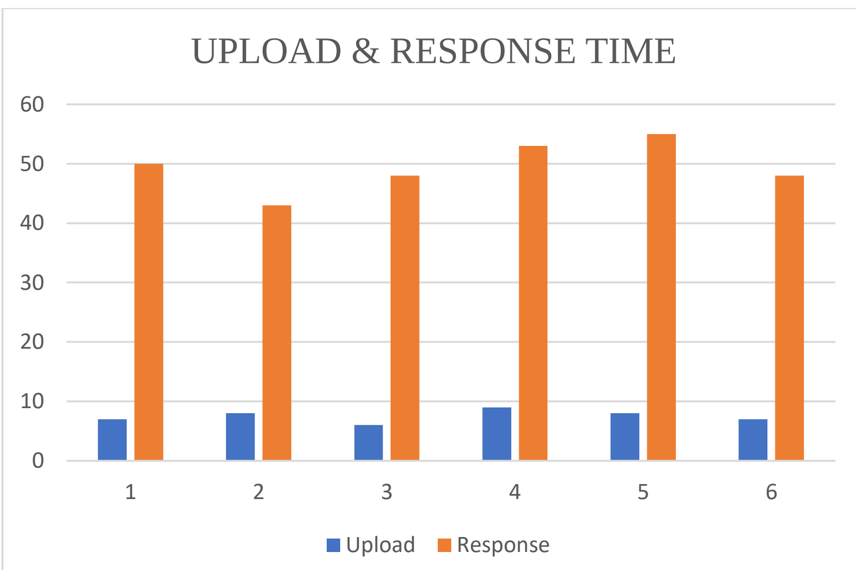


Figure 2: Graph of Message Upload and Response Time

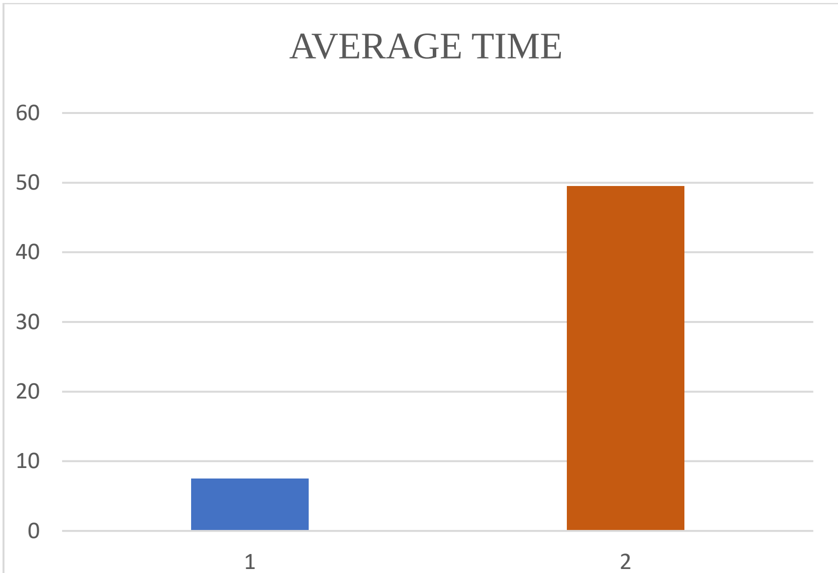


Figure 3: Average Upload and Average Response Time

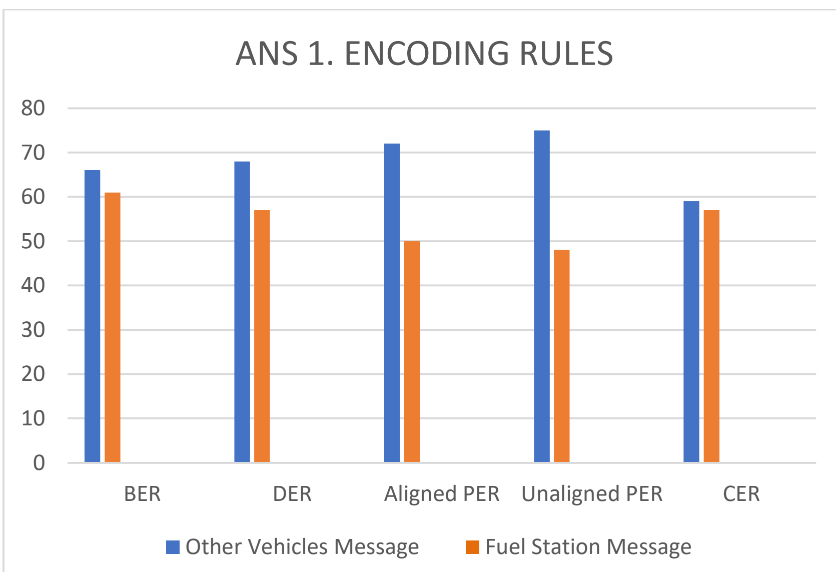


Figure 4: ANS.1 Encoding Scheme Time

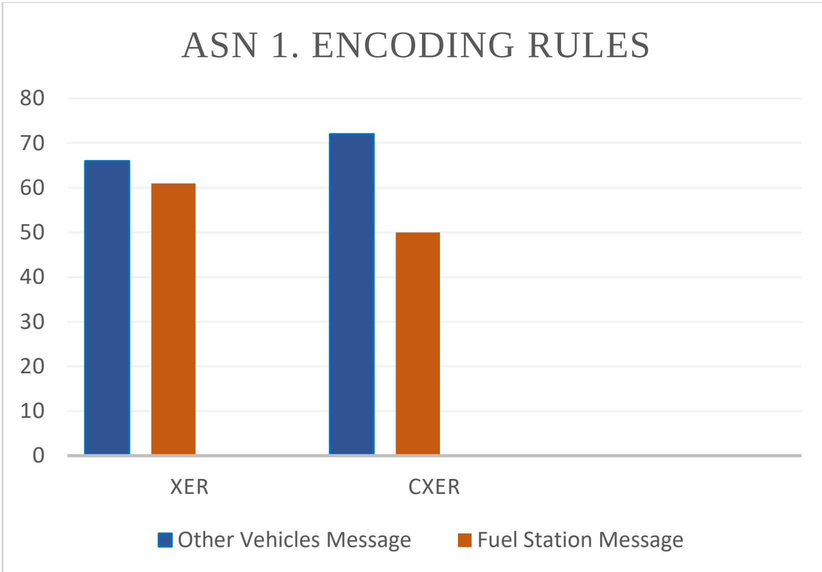


Figure 5: ANS.1 Encoding Scheme Time

Conclusion

Vehicles are becoming more innovative and sophisticated due to network devices added to them as technology advances daily. Today's Internet is called a global village because it has its atmosphere and system. Currently, vehicles are one of them as well. Managing congested traffic is currently a critical issue that must be tackled. I can enhance safety and communication. In the Internet of Vehicles, this research could be pretty significant (IoV). When traveling a long distance, passengers often worry about running out of fuel, especially if they are unaware of where fuel stations are located. When a car runs out of fuel, it can use this method to find the closest fuel station nearby and communicate with it to obtain the necessary fuel.

Research Limitations

This study can help a car find and contact the closest fuel station. It cannot be evaluated based on statistics because the sample size is insufficient for statistical measurement.

Future Work

It can be used in the future to address the issue of running out of fuel in real-time circumstances.

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