

# Telematics Wire

Technology Driven | Futuristic Vehicle



**“Under MVA2019 we have given scope for technologies like AI/ML for transport and highways. This will help in monitoring of both passenger safety and vehicle health”**

**Shri Nitin Gadkari**

Minister of Road Transport & Highways &  
Minister of Micro, Small and Medium Enterprises  
Government of India

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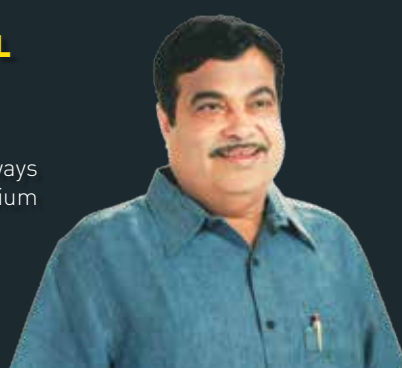
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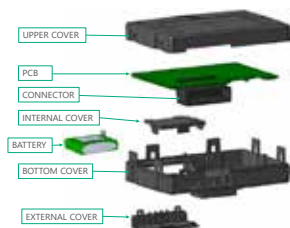


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## The journey has just begun

It has been more than two decades since vehicle telematics was introduced in India. The journey if not fast paced in terms of usage numbers, has definitely had many learnings from startups and enterprises venturing during this period. Of the telematics service providers (TSP) offering vehicle tracking products and services during 2000 to 2010, many of them may not be in existence today. But, they left precious learnings for the new upcoming enterprises. This helped in the formation of a matured and conducive ecosystem which had RoI for the user industry and commercial benefit for the telematics service providers' industry. Though since early days, it was established that there was benefit in use of vehicle telematics products for transport of oil/petroleum or hazmat or high-value consignments etc. Similarly, for state transport corporations and undertakings, they were aware of the usage benefit in improving services for commuters. Nirbhaya incident, and thereafter Gazette notification on AIS 140 (IS16833) in 2018, was a turning point for all the public passenger transport vehicles, which has been mandated to use tracking device with alert button.

The installation of tracking device by a TSP, which was in hundreds or thousands, in the first 12-14 years of the last two decades, has changed rapidly in the last 5 to 7 years and more so in the last two years, post notification of AIS140. Today, we have entities having sold tracking devices to the tune of multiple hundred thousands (several lakh units). Some TSP may soon be even talking of million device installation, if not already there.

It may appear that the vehicle telematics market space is maturing in India and now it is more about service enhancement and usage vertical specific customisation of services. But, the journey is far from over. The lead story in this issue by 'Chalo' is an indicator of how data analytics would be used to mine the data lakes of vehicle telematics, to improve the public transport services.

Looking at some of the usage where there could be traction in coming decade or so-

**Vehicle diagnostics and preventive maintenance-** It seems more like there is a need to connect the dots and vehicle diagnostics will be the next big thing. But the dots at times seems too many and placed too far apart, when we look at transport depots of STCs/STUs across the country or even captive maintenance units of large mining companies.

**Driver behaviour monitoring system-** Imagine a fleet operator with 3 to 5 trucks has a supervisor monitoring the alerts coming from sudden brake or harsh acceleration and also viewing the video feed associated with such instances. Based on the observation he is guiding the driver on a real time basis, even suggesting refreshment break. Though such a scenario for a large part of transport and fleet operators is difficult to imagine in India as of now. In future, if the system is put in place, it would lead to lowering of accidents and hence safer roads. High value consignment, hazmats, cash vans, school bus, ore mining and many other usage verticals can see commercial viability in coming years.

**In cab coaching-** It has been talked about for quite some time. As its benefits are more intangible and spread over long period of time, direct commercial intervention is sparse. But considering that video data analytics of the driver, coupled with real time data analytics of his driving habit (shifting of gears, speed during turns, harsh brakes, acceleration etc) can be analysed and small tips can be streamed to the driver, mobile based app or apps on infotainment panel for such service can become viable. These apps would need 4G/5G connectivity for analysing video data and guiding the driver on real time. Cost if spread over various large fleet operators and transport corporations, business viability of such service may become feasible.

**Enforcement-** As mentioned by BP Umashankar (pg 14) in this issue, vehicle tracking data would be used to monitor violation of route permit given to commercial vehicle. There could be many such services which could be monitored by faceless but vigilant telematics system based on data analytics.

From the telematics control unit (TCU) point of view there are few things which will be dependent on vehicle manufacturer, like intelligent/smart antennae, C-V2X/DSRC-V2X, wireless connectivity module and more which will enhance the usage possibility for improving services and overall public good.

No wonder, it's a long journey ahead for the automotive telematics industry.



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# HOW TO LIVE-TRACK A BUS ON A MAP

 **VINAYAK BHAVNANI**

CHALO

In the course of building Chalo over the last 6 years, I've met many people who felt that live tracking a bus on a map must be as simple as installing a GPS device on the bus and then turning on a live location stream. "Why is this such a big deal?" some have asked. One person even suggested that we should just give a smartphone to the bus driver and track the phone itself – Et Voilà!

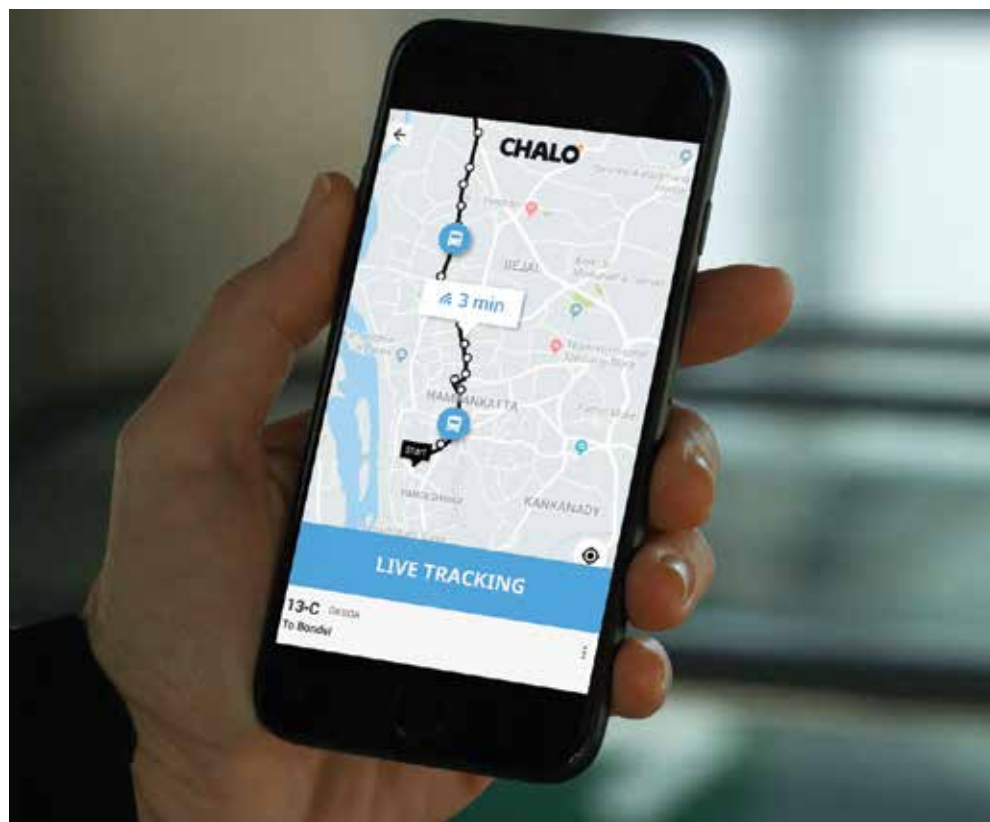
In theory, it ought to be that simple; but, as we discovered while building Chalo's live tracking service, reality was far from simple.

## Step 1: Route And Bus Stop Mapping

Before one can install the first GPS device to track a bus, there is basic foundational work to be done to digitise every bus route and every bus stop in the city.

In developing countries like India, urban centres and their populations have grown rapidly over the last few years. Public transport services like buses have been playing catch-up with the spreading urban sprawl. However, basic service information such as exact bus routes, stop lists, and schedules have been maintained manually with legacy paper-based processes. There has been little to no computerisation outside of the central offices of transport operators.

New bus stops have mushroomed up in newly built neighbourhoods, driven by local demand, and many often remain unmarked for years altogether. These unofficial bus stops are a hallmark of many of India's smaller cities. Bus routes



have also deviated slightly every few months as new roads have been built and old ones get congested. With a series of small deviations, the present-day bus routes are significantly different from those originally planned routes several years ago. Lastly, and most importantly, schedules, which are the make or break factor for any transport operator, have fallen in disarray with new stops, different routes, and ever-worsening traffic congestion.

Chalo's first step in introducing live

tracking in any city is to consolidate all this information and digitise it to reflect the real-world scenario. Exactly as one would expect, this is a completely manual exercise.

We deploy team members who trace every bus route laboriously through the city, mapping every turn and every bus stop along the way down to a metre of precision. Our tech team has built a dedicated route-mapping app to automate certain aspects of this process, such as polyline creation. Mapping this

information precisely is key to eventually delivering a high-quality live bus tracking service and accurate live arrival time information to passengers.

## Step 2: Installing GPS Devices

Once the route information is digitised, we install GPS devices on every bus. With our earliest GPS installations, we realised quickly that the standard devices used by fleet operators at the time would not suffice. It was common practice to use devices with lower location accuracy and a location update frequency of every 1-2 minutes. These devices operated on the older 2G telecom networks, and hence also suffered from latency issues. Operators chose these primarily to save on the initial cost of purchasing the devices, as well as on the ongoing maintenance and telecom charges.

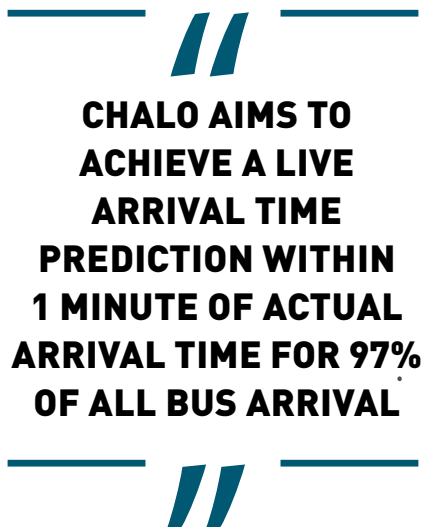
Meanwhile at Chalo, we had set ourselves an ambitious goal of delivering tracking accuracy of a few metres, and a live arrival time that's accurate to within seconds of the actual arrival time of the bus. However, if you receive the location of the bus once every 1-2 minutes, and that location itself is not accurate, all it takes is one missed location ping to suddenly be one bus stop behind on your live arrival time. That means that a user relying on Chalo will miss their bus!

We worked with partners to develop specifications tuned towards delivering accurate locations with very high frequency location updates – once every 5-10 seconds. We optimised device firmware to minimise telecom network latency, and reduced data packet sizes to improve network transmission time. Since 4G networks are still intermittent in our cities, we had to develop these improvements within the constraints of legacy 2G networks. We also purpose-built our own technology platform to process live location data packets in milliseconds.

## The Smartphone Experiment

We honestly did try tracking smartphones as well, but that simply didn't work out for reasons, which seem obvious in hindsight.

Firstly, the devices themselves are not purpose-built for such an activity. This is a highly processor-intensive and energy-intensive activity, and the smartphone device architecture has not been designed for 16 hours of continuous live location tracking. GPS chipsets in smartphones vary in accuracy and can take several seconds to establish a location accurate to within 3 metres, which makes them unsuitable for Chalo's live tracking purposes. Plus, smartphone operating systems have several other services running in parallel that compete for processor and network bandwidth and further drain energy. Lastly, as a portable external device, they are simply not as reliable as permanently



installed dedicated hardware is. They get damaged easily in the harsh operating environment of public transport; and budget smartphones are not dust-proof or weatherproof either.

Secondly and more importantly, a smartphone solution has a high reliance on human intervention that simply does not scale well. In our short-lived experiment of a few days, we encountered absurd problems such as the driver forgetting to charge the smartphone overnight, or, as it happened in one case, forgetting the phone itself at home. We spent several hours trying to figure out why the bus was stuck in a residential area and not moving at all!

Lastly, GPS devices come with their

own advantages. From simple things like ignition detection to accessories such as panic buttons, fuel sensors, RFID readers, camera connectivity, and more, they contribute rich data that significantly adds to Chalo's live tracking dataset and for building future applications.

There is no better hardware solution than a dedicated GPS device for delivering a highly sensitive consumer-grade live tracking service.

## Step 3: The Human Challenge

At the outset, we had certainly not anticipated that one of the greatest challenges to delivering live tracking to bus travellers would not be technological, but human.

With a GPS device on their bus, the driver and conductor suddenly feel watched. Even though our intention was not to track their performance, it is basic human nature that they should resent this, and especially because neither the transport operator nor Chalo had taken them into confidence and involved them in the execution of the project.

Incredulously, rats would eat up the wires of GPS devices every other day. Devices would malfunction inexplicably or be found damaged. In some extreme cases, they would go entirely missing. Things are always crystal clear in hindsight, and this was a hard-earned lesson for us.

We learnt that we must always involve the bus crew from the initial days of implementation and invest time in earning their confidence. Their initial resistance converts to enthusiasm once they see a demo of the Chalo App and how it benefits passengers on their bus. Our advertising agency pitched in to come up with a training communication theme of having a bus full of happy passengers, which helped deliver the message.

By involving them in the larger mission of the project, over time conductors and drivers have become key members in delivering a successful live tracking project. They are the first to reach out to inform Chalo whenever there is a deviation or a service disruption of any kind. They also help bus passengers download the Chalo App and demo it

for them. Ingeniously, some bus crew members have even learnt to use the Chalo App to track the bus just ahead and behind them, so they can maintain an even frequency on their route.

## Step 4: Mapping Buses To Their Routes

In most cities, the depot manager at the bus depot assigns a route to the bus driver and conductor. This is a manual process and a bus, along with its driver-conductor pair, could end up travelling on different routes through the day. The decision of which route to dispatch a bus on is dynamic, based on current conditions, and not pre-determined. It varies based on the buses available in the depot at any time, and is impacted by traffic conditions, road obstructions, breakdown of vehicles, and even more mundane factors such as staff attendance.

For Chalo, when a bus trip begins, it is critical to know the route that the bus is embarking on. Without this, we have no way of knowing its intended path, and hence no way of displaying the route on a map or calculating live arrival times.

In the early days in any city, we have team members stationed at such dispatching points who update our systems matching a bus to a specific route as it leaves the depot. They also train the depot staff on how to update Chalo's systems to show a bus correctly on the Chalo App. A bus appears live to passengers on the Chalo App only when it is mapped correctly to the route it is travelling on.

Over the first few weeks, our artificial intelligence-based live tracking engine uses predictive algorithms to learn the behaviour of the citywide bus network and start predicting the route of the next bus. We verify these predictions against the data reported by our dispatching teams. Once a high degree of accuracy is established, the system's automated predictions are used to map buses to their routes. Any deviations from the predicted route are re-calculated, and buses that cannot be mapped to known routes are immediately removed from the live app to avoid confusion.

We also track when a bus deviates from its route with a very high degree

of accuracy. This can happen for a variety of reasons like traffic accidents, road closures, road works, etc. Our live tracking engine predicts where the bus is likely to join back on its original route and keeps Chalo App users informed of the revised live arrival times accordingly. This information is also sent to our city operations team, who can publish alerts and service disruption information on the Chalo App to keep bus passengers updated in near real-time.

## Our Secret Sauce – Chalo's Live Tracking Tech Platform

We've touched upon some aspects of Chalo's live tracking technology stack already – the optimisations for sheer processing speed, machine learning algorithms for route predictions, and artificial intelligence-based live arrival time calculations. But, if you ask any member of our tech team, they will tell you that the key to the success of the Chalo App is down to one word – scale!

Over a standard 16 hours of service time, each bus can generate 11,520 live location updates. That's 170 million location updates a day for the 15,000 buses that Chalo currently live tracks across 23 cities. With each location update, live arrival times for every bus at every bus stop along its route are re-calculated. Using a simple assumption of 30 stops on average per route, that is a whopping 5 billion live arrival time calculations every day.


Chalo maintains an exceedingly high accuracy goal on these 7 billion arrival time calculations. We aim to achieve a live arrival time prediction within 1 minute of the actual arrival time for 97% of all bus arrivals.

Our micro-services based architecture ensures that any hiccups in one part of the platform do not affect any other part, and with principles such as fault tolerance and auto scaling, we have been able to achieve an uptime of 99.98%. It takes a large cloud-hosted infrastructure across all 3 of the world's top providers – Amazon, Google, and Microsoft – to achieve this scale, speed, and accuracy.

## The Journey So Far...

It has taken us 6 years to bring the time taken from initiating a GPS location ping from a bus to displaying it live on your phones down from 120 seconds to millisecond measurements. With each iteration, we still see lots of room for improvement.

More importantly, we have found new applications that overlap live tracking data with other live data streams to help passengers. By combining live tracking data along with live ticketing information, we have recently introduced the 'live passenger indicator' feature in some cities. Passengers can now see how crowded the bus is in real-time and choose to take a different less crowded bus. In usual times, this helps with comfort and convenience, as passengers can choose a bus with available sitting space. Moreover, in these times of COVID-19 precautions, it is an important aspect for safety and in our fight against the coronavirus menace.

It has been quite a journey so far, just putting a live bus on a map. At each stop along the way we have learnt something new – sometimes in solving a technological challenge, and sometimes a human one. We are looking forward to what the next few years will teach us now. 

### AUTHOR



#### Vinayak Bhavnani

Chief Technology Officer  
Chalo

Vinayak Bhavnani is responsible for the Product and Technology at Chalo. He has been a part of Chalo since its inception in 2014 and is passionate about using technology to make the everyday commute easier, simpler and convenient for the overwhelming majority of people in the country. At Chalo, Vinayak oversees development of all products and the entire technology platform, spanning live tracking, ticketing, payments, cards, and more.





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## **SHRI NITIN GADKARI**

**MINISTER OF ROAD TRANSPORT & HIGHWAYS &  
MINISTER OF MICRO, SMALL AND MEDIUM  
ENTERPRISES  
GOVERNMENT OF INDIA**

Ministry of Road Transport & Highways, under the leadership of Hon'ble Minister Shri Nitin Gadkari has been instrumental in issuing a landmark notification, IS 16833 (AIS 140) which will go a long way in safety of passengers in public transport vehicles in India. Under his leadership and vision, electric vehicles have received much needed support over the last 6 years and it reflects in the new expressways which will have dedicated lanes for electric vehicles and also suitable charging infrastructure. His push for ethanol/bio fuel will not only help save foreign exchange, but also enable the domestic agri sector. Mentioned here are some of the points on which Telematics Wire sought his views-

## **Making Indian Automotive Sector ATMANIRBHAR**

The automotive sector in India is considered as the backbone of the Indian manufacturing industry and also provides one of the highest employment opportunities. In this time of a global crisis, it is important that we adopt the strategy of being positive and for doing so, we have the vision statement as given by our Honourable Prime Minister of AATMA-NIRBHAR BHARAT.

We should see this problem as an opportunity that was never posed before us. This strategy calls for a mission to work towards developing technology at par with international standards and improve the work efficiency, and work-culture in our manufacturing industry. The key is to understand our strengths and leverage them in a manner that helps us tackle the constraints posed by the post-COVID world.

We're presently the youngest country in the world with more than 65% of our population under the age group of 35 years. This means that we are at such an important place in history where we are blessed with the power and energy of the young minds. Our government has been investing its resources to boost R&D efforts in our premium institutes like IITs, IIMs, IIITs, AIIMS, etc. The repository of knowledge generated from these institutes can be used to work on innovations and simultaneously provide employment opportunities to the trained youth.

Some people turn opportunities into problems and some turn problems into opportunities. Without negativity, it is the time for the Indian economy to dedicatedly work towards excellence and can rest assured of all the possible support from our Government.

## **Guidance for EVs in India**

While we are working to improve the operating efficiencies of automobiles in India, it is important to give a concentrated effort towards alternative fuel technologies. Our mission and vision statement for alternative fuels is that we need import-substitute, cost-effective, indigenous, and pollution-free modes of transport. Alternative fuels will not only allow us to reduce our dependence on petroleum-based fuels but will play a crucial role in reducing transport-induced air pollution. We currently have an annual import burden of 7 lakh crores of petroleum and we aim to build a parallel economy of 2 lakh crores exclusively for the alternative fuels.

Our government has been leading multiple efforts for increased adoption of Electric Vehicles and we have got very positive results so far. We have observed that there is an increased awareness about EVs and willingness to go for such technologies. Electric mobility has enormous potential in India and we are currently working towards designing policies that will help us to shift buses to run on electric modes. We are giving equal emphasis on the cost and the financial viability of such technologies in case of mass-adoption. The Transport for London (TfL) model is a good example of revenue sharing bus systems between municipal authorities and the state governments.

For private vehicle usage, we are simultaneously working towards associated aspects such as increasing the number of charging stations and the availability of maintenance and repair units. This will help boost confidence in consumers and will have a positive impact on sales. The cost of EV is the major factor that determines consumer behaviour. I am of a strong belief that we do

not require any artificial push for the adoption of EVs in India. The EV technology itself is so good that the market will self-regulate and bring down the costs of EVs, where the best quality will be available at the lowest price.

## **Future of Green fuels and alternative mobility in India**

BioFuels has immense potential for mass adoption in India. Fuels like Bio-Ethanol, Bio-CNG / LNG, Bio-Diesel, etc. are some good examples where our Ministry is working in a dedicated manner. A fuel like Bio-Ethanol is a clean fuel and it can be produced from sugarcane, sugar, rice-grains, corn, etc. India is an excess producer of sugarcane, sugar and we also have excess food-grains like rice in our stock. We can utilise this for developing a full-fledged ethanol supply chain in India where states like Uttar Pradesh, Bihar, Maharashtra, Karnataka, and Tamil Nadu can play a vital role.

Simultaneously, we are working towards developing flex-engines that will provide an option to the consumer of running their vehicle on either 100% petrol or 100% bio-ethanol. This has the potential to bring a revolution in the Indian economy where we will shift to clean and green fuels while reducing our imports of oil. The best thing about this technology is that the increased revenue will directly go into the hands of our farmers and boost agricultural income.

Other fuels such as LNG and CNG are also vital for reducing air pollution, LNG particularly has higher efficiency than diesel and can be used in trucks and buses that travel for long distances. The cost of converting one diesel bus to LNG is nearly INR 10 to 12 lakhs but the consumers can recover this investment in a mere span of 2 years. We are working towards developing such financial models to boost conversions of existing diesel buses/trucks to LNG. While doing this we are giving equal emphasis on futuristic technologies such as Hydrogen Fuel Cells (HFC). We are supporting various R&D efforts on bringing down the cost of Hydrogen Fuel Cells and are in the process of developing a policy on this line.

## **Role of Information-Communication Technology (ICT) and AI in Road Transport and Highways sector**

Using the Motor Vehicle Amendment 2019, we have given scope for various technologies such as artificial intelligence and machine learning to be used in our road and transport sector. This will have a great impact on issues like passenger safety, monitoring and health of vehicles and various other aspects that will improve our operational efficiencies.

The use of e-tolls and FASTag alone has had a great impact on reducing waiting time on toll booths. This has a resultant in saving fuel, time, wear and tear of vehicles on national highways. Our existing VAHAN and PARIVAHAN portals have allowed us to integrate consumer and vehicle data onto a single platform. This has helped us in making well-informed decisions about the policies. We are also promoting the setting up of Multi-Modal Logistic Parks (MMLPs) that will help reduce the operational and logistics cost of businesses. Transport Sector is also the backbone of the logistics movement in India and the aim is to make this sector at par with international standards that will help ease of doing business in India while improving the quality of lives of people.. 🇮🇳



# PUBLIC TRANSPORT IN INDIA

## Background

Ministry of Road Transport & Highways, Govt of India issued a notification dated 28th November 2016 wherein Vehicle Location Tracking (VLT) Device and Emergency Buttons were mandated to be fitted in all public service vehicles including four wheeled or higher, passenger carrying vehicles w.e.f. 01st April, 2018. AIS 140 compliant device mandatory installation is the outcome of the Nirbhaya case in December 2012. This led to the set up of a committee headed by Justice Verma to increase and ensure women's safety in public transport and Nirbhaya fund for women's security was created. Eventually, Automotive Industry Standard -140 (AIS 140) drafted by BIS and DIMTS together was introduced.

Later on, Ministry reexamined this, and it again released a notification stating that the Central Government has exempted all public service vehicles which were registered up to 31st December 2018 (old vehicles) from the fitment of Vehicle Location Tracking Device (VLTD) and Emergency Buttons till the time as notified by State/UT Governments in their respective States/UTs. However, all public service vehicles registered on or after 01st January 2019 must be fitted with VLTD and Emergency Buttons. On 15th January, 2020 the MoRTH had sent a letter to all the Principal Secretaries/ Secretary of Transport and Transport Commissioners of all states and UTs with a scheme for implementing the AIS 140 Vehicle Tracking System (VTS) in the states and UTs.

We at Telematics Wire, have compiled the views of STCs/STUs decision makers on how and if the vehicle tracking system and OBD II have benefitted public transport.

### Shri B. P. Nigam

Chief General Manager (Retd.)  
Delhi Transport Corporation

#### Tracking Device for the Transport

Vehicle tracking has helped a lot not only in live tracking but also to keep watch on the history of the vehicle. It has also helped in monitoring the stoppage of vehicles at terminals as well as on bus stands. It helped in monitoring the speed, daily kilometer operation, no. of trips rendered, timing of trips operated of buses etc. It has helped in solving the road accidents no. of times.

#### Has the AIS 140 compliant device ensured passenger safety?

AIS 140 is specifically for the safety of passengers and specifically for women passengers during their journey. DTC is in the process of procuring AIS 140 compliance buses. No incident has occurred.

#### Any comment on the use of vehicle tracking device or OBD II

These are technology based tools for better monitoring of operation and maintenance of vehicles.

### Shri Chandrakant Pulkundwar

Joint Managing Director (III)  
Maharashtra State Road Development Corporation Ltd.

One of the most important uses of vehicle tracking system (VTS) for MSRDC, is in understanding the movement of vehicular assets on its roadway. One of the ways that the organisation has benefited from the use of VTS is with regard to road safety of commuters on the Mumbai Pune Expressway.

VTS is installed in all the concessionaire's vehicles which includes the emergency response units and ambulances. The VTS in addition to tracking the locations of such vehicles, also helps in understanding the movement patterns during emergencies and general patrolling. Such movement patterns superimposed with the crash data helps to optimize the placement of these vehicles which in turn reduces the emergency response times. Additionally, the data is also used to monitor the vehicle movement. This helps in verifying both the arrival of emergency vehicles and distance patrolled by response units. Such analysis based on the VTS data is a useful input in decision making to improve the safety of the roadways.

### Shri C. Natarajan

Deputy Transport Commissioner - I  
State Transport Authority, Tamil Nadu Government

Tamil Nadu State Corporation has not yet implemented AIS 140 VLTD in the buses. The vehicles are not diagnosed using OBD II till now.



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## Shri B. P. Umashankar

Additional Commissioner Transport (Admin)  
Transport Department, Karnataka

**On vehicle location tracking system (VLTS):** VLTS scheme has been introduced for safety of women & children. The scheme will be implemented in the state of Karnataka from Jan 2021. For this we have to set up a monitoring center. The funding of 60% for the project has come through Nirbhaya fund from the Government of India. Karnataka share is 40% of project cost. There are around 800,000 vehicles to be fitted with VLTS and emergency buttons. ISRO has been appointed as Project Management Consultant for this project in Karnataka.

**Key features:** It has a monitoring centre which is an Integrated Command and Control Centre in compliance with AIS - 140.

**Benefits for the public transport user:** First and foremost it will ensure the safety of passengers. In case of emergency he/she can send an alert signal to the command centre just by pressing Emergency Button.

The implementation strategy based on classification of different types of vehicle / plying for different Sectors / Purposes such agriculture, Goods Logistics, Sand, taxi, Buses, etc., makes the owner beneficial in some way or the other to escalate his business. Value mapping for transporters catering to different sectors.

**Benefit to state transport:** Traffic Inspector can enforce strictly the laws related to Motor Vehicles. With the route vehicles are plying, online validation of if it is doing on permitted route or not can be known. Comprehensive control on movement of commercial vehicles. The fines collected can be used for sustaining this project.

## Shri Anil Ramchandra Patankar

Chairman  
Brihanmumbai Electricity Supply and Transport, Maharashtra

### Benefits of Vehicle Tracking Device

It has helped Traffic Officers/Staff towards noticing any major accident or water logging or any traffic jam due to morcha, agitation etc and take necessary actions as to route diversions or any other changes accordingly.

The passengers can come to know about the expected arrival time of the bus & thus accordingly can take decisions.

### AIS 140 compliant device for ensured passenger safety?

Since, this particular device has not been installed on BEST buses, no comment can be made as to, ensuring safe travel for passengers or any incident where passenger raising alert & unforeseen mishap averted.

# Are you Connected?

 **BHUPESH KANYAL**

PANASONIC AUTOMOTIVE SYSTEMS INDIA

**C**onnected in today's world doesn't mean just being in contact. More than a connection, it is a pipeline of continuous data flow. From human connectivity to machine connectivity, the living spaces of people have changed a lot making the complex lifestyle apparently more simple and efficient. Humans always communicate and exchange information but nobody would have imagined that in future machines or devices would be communicating by themselves without human intervention. The journey of communication has been on an upward trajectory, from pictogram and scripts in the ancient time to telegraph, telephone, radio and television in the modern age. The world has come much closer, through newer modes of communication and with a faster exchange of information. Technology is enabling this change and believe me, this is not the end of technology advancement and honestly speaking this is not enough.

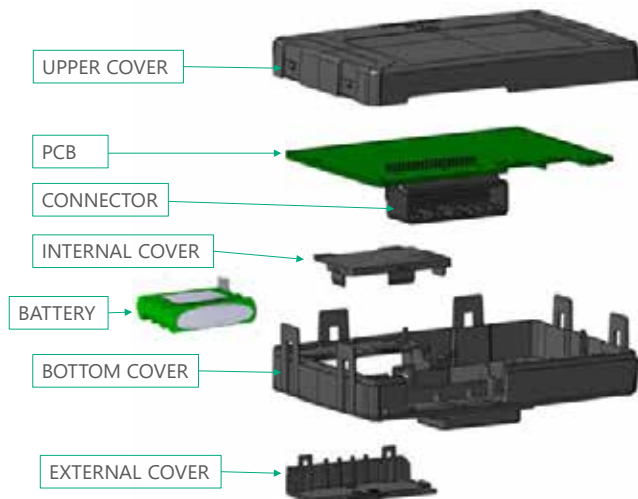
We are experiencing the same in one of the most advanced industry segments - "Automotive". Similar to the field of communication, automobiles are undergoing a huge and rapid transformation. Starting from the first three wheeled Motorwagen of "Carls Benz" using an internal combustion engine to the rise of a giant "Toyota" using advanced gasoline and hybrid solutions to the youngest and biggest automotive manufacturer by market capitalization "Tesla" riding high on electric vehicles. Today the amount of electronics penetration in modern vehicles is tremendous and thought provoking. Each vehicle has hundreds of devices/sensors generating thousands of data signals while moving on the road. Autonomous vehicles are the next big technological advancement in automotive industry where millions of data bytes will be generated each day.

Both, communications and automobiles are going through rapid advancements at higher speeds to achieve a common objective "BETTER CONNECTIVITY". When these two fields come together to offer a faster and safer transport it's called - Vehicle Telematics.

Now imagine a situation where father of a young girl asks his cloud assistant, "Where is Monica?" and the cloud assistant answers back:

Monica left office at 6:00pm. Started from her office with one person in the car. Had a stop at MG Road Coffee shop from 6:32pm to 7:12pm. Paid 1258 INR using her

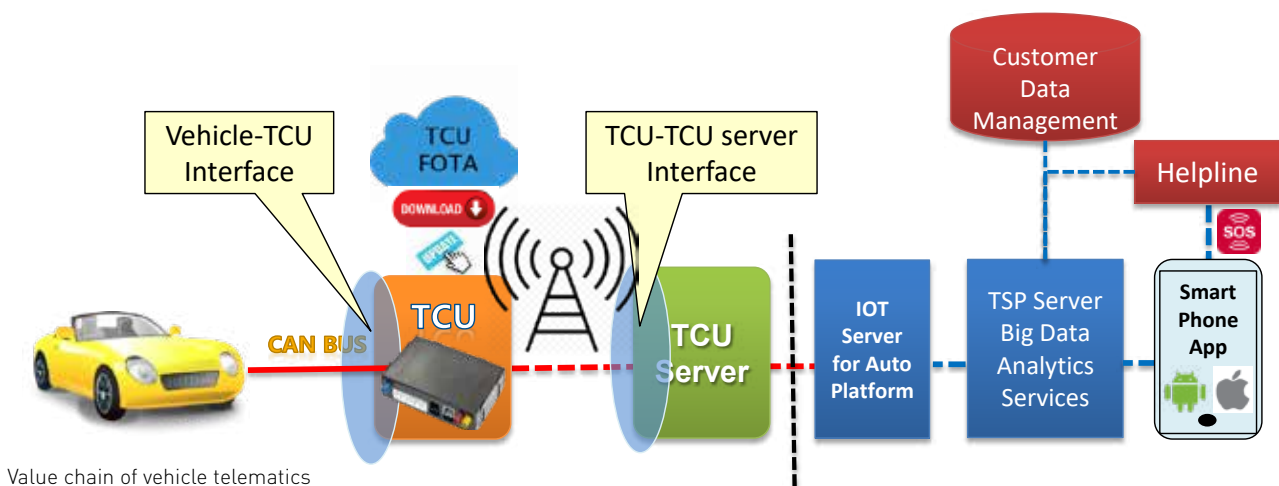




Exploded view of a Telematics Control Unit

telematics control units enabling their vehicles talk to them and feed with the unlimited data available on the local vehicle network system.

The Thousands of signals/messages resulting in generation of millions of data bytes while the vehicle is switched on and off the road, is the most vital information for an automobile manufacturer. Telematics Control Unit becomes the pivotal element in the value chain of vehicle Telematics to transport this data. The Wireless connectivity of the hardware (TCU) with the backend or servers to send data on real time is very important. The mobile network operators (MNO) play an equally important role in the overall value chain of vehicle telematics. The TCU, IOT platforms and mobile devices need a seamless to and fro connectivity to offer a real time and valuable information for the OEMs and end users. The advancing technology of wireless connectivity is helping vehicle telematics to send the data in a more stable, faster and secured way. This data helps car manufacturers in cutting down research and development expenses for designing future vehicles



Value chain of vehicle telematics

CC ending with 9004. Started from MG Road Coffee shop at 7:12pm alone and expected to arrive by 7:45pm. Currently near MIG market in North avenue. There is no traffic congestion on the way. Car speed is 48 KMs/hour, Tyre pressure is 34 psi and fuel level is 18 litres. Vehicle health is good. Routine maintenance service is due after 48 days or 3,600 KMs whichever is earlier. She is listening to song “see the world” by singer Peter Wan using car smart connection. If you need any more information, please feel free to ask me. Thank you.

Isn't that really amazing? How the information is gathered and stored in a well knitted framework. The moment you need it; it is available with all of the finest details by a click or voice command. (overriding the privacy point here with safety and security factor)

The ecosystem of a Vehicle Telematics is very complex with multiple stakeholders having overlapping or transitioning responsibilities. However, the 3 most important elements of vehicle telematics are “Hardware, Connectivity and Analytics. The data from vehicle is received, read, analysed, encrypted, stored and transmitted using most secured network in real time by the hardware “Telematics Control Unit” (TCU). We at Panasonic help major car manufacturers globally and locally with our advanced

and at the same time reducing warranty cost by improving design and material.

This data is no less than gold in the modern automotive industry. How much you are generating, how fast you are transmitting and how good you are analysing is the key in this new era of automotive business. □

#### AUTHOR



#### Bhupesh Kanyal

Group Chief & Country Head  
Panasonic Automotive Systems India  
A division of Panasonic India Private Limited

Bhupesh Kanyal leads the Panasonic Automotive Systems India (PASI) division catering primarily to the automobile industry. He is responsible for devising strategy for new and existing products/ services and driving sustainable growth for the company. PASI is a B2B Tier 1 supplier of electronic parts in the area of safety and comfort to all major OEMs in India. Some of the major customers for Panasonic in India are Maruti Suzuki, Toyota, Honda, Renault Nissan, Isuzu, Hero Motocorp and Honda Motorcycle and Scooters India.

# Vehicle Telematics – Key to After Sales Revenue

 **KUNAL PRUTHI**  
WIN AUTOMATION

Globally, automotive markets are becoming saturated especially in developed economies. Customer demands are fast-changing and these changes too vary with geographies. Adding to the woes of the slowdown is turbulence brought in by the COVID19 pandemic which has forced Automakers to think & come up with new business models. No matter if it's a well-established auto giant or an upcoming EV startup, just selling the new models is not sufficient for having a sustainable business because of the current economic conditions & tough competition. Here, the key lies in the opportunities unlocked by after-sales revenue streams.

Needless to highlight the count everyone is aware that there is a huge number of vehicles already on the roads and attention is required on how more value-added services can be provided to these existing users so that they can spend continuously on their vehicles instead of just pushing for fresh sales. This is where vehicle telematics plays a key role since it is an enabler for automakers to connect with all their on-road vehicles and capture data ranging from usage patterns, performance information, geo-location, etc. This data can help in providing services that can

increase the overall Customer Lifetime Value. Already many OEMs & third-party vendors are delivering content such as entertainment, maps, weather forecasts, traffic conditions, etc.

Although telematics as a technology is not new in the automotive segment but previously there were a lot of barriers like the cost of infrastructure and more importantly less demand for telematics enabled features. With the increased reach of the internet at reduced prices, there is a pull created by markets and such services are witnessing increased demand. Not only Automakers but other industries like media, insurance & banking are also trying to take leverage and reap some direct/indirect benefits of telematics enabled service offerings.

In the entire telematics value chain, data content is the core around which revenue streams & business models can be planned. Majorly, data comes either from the vehicle's own systems or from any third party where media content is delivered over some communication network. Depending on the type of content broadly three major business models exist. The first one is Business-to-Consumer telematics which is adopted by automakers where they offer vehicle

owners subscriptions for different types of services like navigation, traffic updates, entertainment, information, etc. The second business model through which automakers can benefit is Business-to-Product telematics where vehicle data is used to generate vehicle health reports, fault predictions, vehicle servicing reminders, warranty support, etc which can help users in cutting maintenance-related costs. Third and most potential business model is Business-to-Business telematics wherein different industry segments like insurance, logistics, utilities, media, telecommunication, etc can partner with automakers and create a mutually beneficial revenue stream.

Looking at the current market situation, many Automakers are introducing Subscription or Pay-As-You-Drive pricing models which are new to the Indian market but are expected to become popular since not many customers especially the service class population are willing to shelve out heavy amounts from their pockets in one go. Also, with the increasing adoption of electric vehicles, there is a significant dependence on power utilities for charging the vehicle. In both cases, telematics can provide insights related to the characterization of user behavior which can be used in different ways. Similarly, the logistics industry is using telematics for improved management of their fleets.

Irrespective of current market dynamics & challenges, Automakers in collaboration with information technology service providers still have a lot of opportunities created by telematics which will not only improve their customer experience but will also enable them to tap new revenue streams which will help in achieving sustainability in the long run.. □

## AUTHOR



**Kunal Pruthi**

Business Development, WIN Automation

Kunal Pruthi is currently leading the Business Development team of "WIN Automation" for North & East India. WIN Automation is an initiative of Wipro Infrastructure Engineering, which caters to the full-service line of Industrial Automation needs of Indian & ASEAN manufacturing industries.

Other than Conventional Robotics applications like Welding, Handling, Inspection, etc Kunal is also helping his customers in their efforts towards building digitalization strategies for their setups. He played a significant role in developing & deploying India's first fleet of Self Driving Mobile Robots and Shuttles. He has also been involved in various ADAS & AV initiatives in India during his stint at The Hi-Tech Robotic Systemz Limited.

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# FIVE WAYS TO MANAGE FUEL CONSUMPTION IN THE VEHICLE FLEET

**TIM ALMAEV**

ESCORT MONITORING SYSTEMS

The success of any company's business with its fleet largely depends on how effectively fuel monitoring and management are organized within it. For all types of commercial vehicles and special equipment, fuel accounts for a significant part of costs. And if we do not monitor actual fuel consumption and reduce costs, the company will surely lose money and work with low efficiency.

According to our stats around 35% of total spendings of fleet owners go toward fuel purchase. In the transport, logistics, and road construction sectors, fuel expenditures can reach 45-50%. But often, the costs will not be justified if there is no supervision over fuel consumption. When a company does not have a clear understanding of how and where the fuel goes: the profitability of the business

drops. When there is no control, there is always the risk of overspending and even fuel theft. Without knowledge of actual fuel consumption, it is challenging to plan and evaluate a business's efficiency. Figure 1 represents the cost structure of an average vehicle fleet.

In this article, we will try to analyze existing ways of fuel consumption monitoring and help you understand which one is best for your fleet.

## 1. Monitoring without satellite systems

Oddly enough, some companies still do not use satellite tracking systems to track their vehicles and the drivers' work. In such companies, fuel accounting is done using outdated and not entirely effective methods.

For example, fleet managers can use the consumption rates stated in the motor

vehicle manufacturer's specification. But you should understand that these rates are average. And as time passes, a particular vehicle's actual fuel consumption may deviate significantly from the original values. It is also a practice in car fleets to determine fuel consumption using odometer data. But the mileage on the dashboard of a car always has its margin of error. After a time-lapse, the deviation from the actual distance traveled can reach 15-20%. Besides, dishonest drivers can correct mileage. Some vehicle fleets also use fuel receipts from petrol stations or data from fuel cards of petrol station operators when registering and writing off fuel. However, there is a high probability of counterfeiting and fraud in these cases if drivers conspire with petrol station staff.

It is also important to note that fuel control will only be truly effective if it is possible to compare data obtained using different methods. If a fleet management system does not rely on GPS monitoring, it will be difficult to verify other fuel consumption data's precision and understand the reasons for discrepancies. Besides, without satellite monitoring, it is unlikely to detect downtime at idling speed, the use of vehicles for personal needs, and direct fuel theft.

- Advantages: no
- Drawbacks: lack of reliable information on transport operations
- The efficiency of fuel consumption control: low
- Probability of fuel fraud: high

Where It can be used: any fleet where there is no possibility or interest to save on fuel with modern solutions.

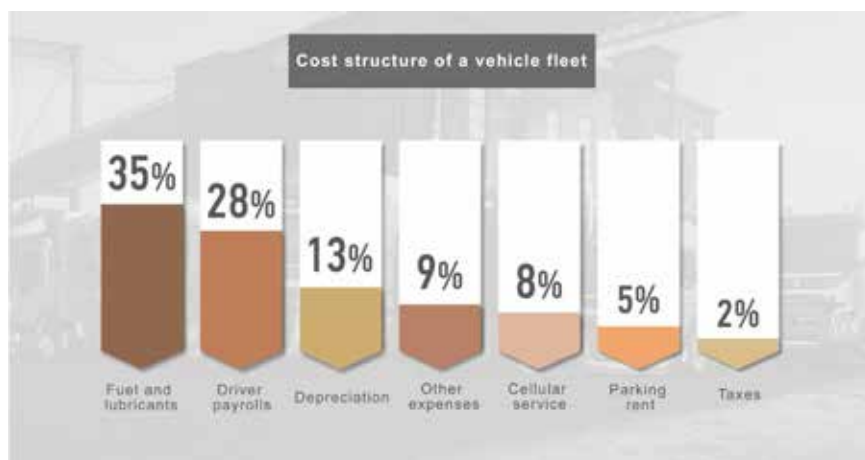


Fig. 1: Cost structure of an average vehicle fleet

## 2. Satellite tracking without additional telematics

The essential component of satellite monitoring is a professional GPS tracker installed in a vehicle and transmitting data about its operation to the fleet management system. Along with coordinates and speed, the tracker records the vehicle's mileage. The satellite mileage data is much more accurate than the data from the built-in odometer. With the help of these data, it is possible to calculate actual fuel consumption more accurately and identify mileage additions by drivers with a high probability.

Simultaneously, based on the information transmitted by the tracker, the system can track routes, geo-fence visits, adherence to planned schedules, and vehicle speeds. That makes it possible to identify the reasons for fuel overruns, which may include: personal use of transport, long idle times, careless and uneconomical driving.

However, with the help of a tracker and without additional solutions, you will not be able to find out how fuel consumption changed on the road, when and where refueling and draining operations took place, or whether there were attempts to steal.

- Advantages: accurate information on basic parameters, including mileage
- Drawbacks: Fuel manipulation cannot be detected
- The efficiency of fuel consumption control: low
- Probability of fuel theft: high
- Where can be used: any transport equipped with trackers and connected to a satellite monitoring system

## 3. Satellite monitoring using the CAN bus

The essence of this method of fuel control is to connect a GPS tracker to the vehicle's CAN bus to obtain data that is recorded by an in-built stock fuel level sensor. Today, all modern cars have a CAN interface. It ensures the exchange of information between different sensors, the onboard system, and additional external devices connected to the vehicle. There are three options to configure the tracker's communication with the onboard network: direct, via contactless readers, and via a CAN-LOG adapter. It

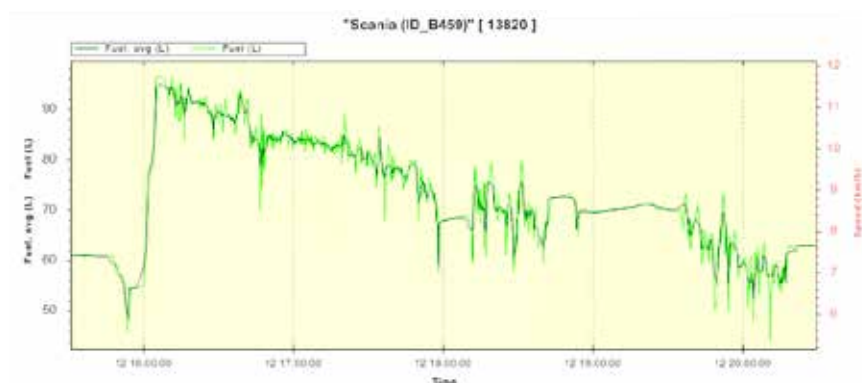


Fig. 2: Fuel level graph based on the data from a stock fuel level sensor

will be possible to transmit readings to the monitoring system if the vehicle has an open data transfer protocol.

This method's advantage is that it is relatively inexpensive, as it does not require additional telematic sensors or installation work. By connecting the tracker to the CAN bus, it is also possible to obtain information about other parameters of the vehicle's operation: engine speed, motor hours, oil pressure, axle load, and further readings.

But in concern with fuel monitoring, the information obtained from the CAN bus is still not very accurate. As the accuracy of the standard fuel level sensors is 10-15%. That may not be so critical for passenger car fleets. But when it comes to monitoring vehicles that consume large amounts of fuel (trucks, buses), this error is essential. Figure 2 depicts a fuel level graph based on the data from an in-built stock fuel level sensor.

Also, conventional sensors do not do an excellent job of determining the exact time, location, and volume of fuel fillings. The monitoring program is likely to have strange fluctuations in the fuel schedule, false information about drains, "dead zones" (5-10% of the top and bottom tank volume). Thus, in commercial vehicles, the untraceable fuel volume may reach 100 liters or more. Naturally, the risk of fuel theft is relatively high here. Figure 3 compares fuel data recorded on one vehicle using the standard fuel sensor (red) and the Escort fuel level sensor (blue).

However, obtaining fuel data via a CAN bus is often the best way to monitor vehicles that are difficult or unprofitable to equip with additional sensors (methods 4, 5). That is particularly true for passenger cars, where the design features of the tank sometimes do not allow for the installation of third-party equipment, and the 15% error is not so critical.



Fig. 3: Fuel level graph comparing the readings from a standard fuel sensor (red) and the Escort fuel level sensor (blue)

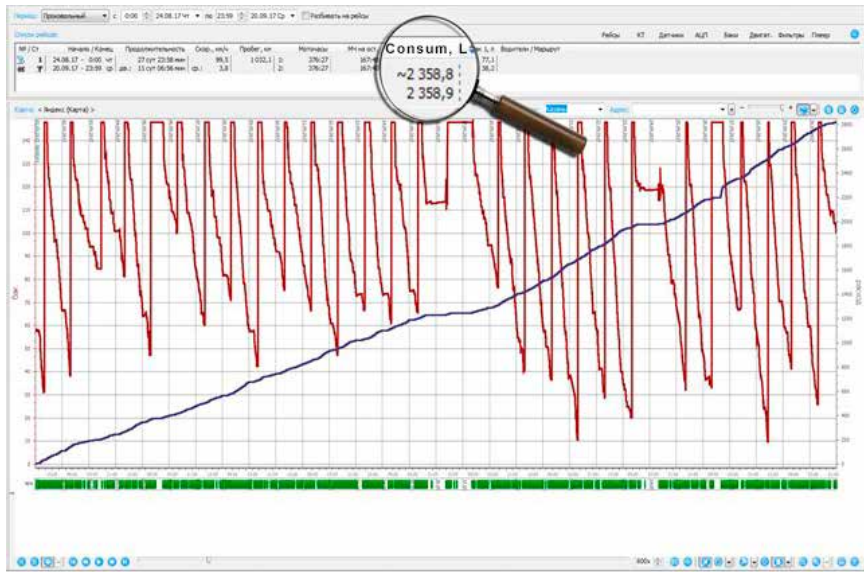


Fig. 4: Comparison between the reading from a fuel flowmeter (blue graph) and a capacitive fuel level sensor (red graph)

- Advantages: ease of installation, possibility to obtain other onboard readings
- Disadvantages: high uncertainty in measuring fuel levels, difficulty in identifying drainages
- The efficiency of fuel consumption control: average
- Probability of fuel theft: high
- Where can be used: vehicles with tanks not adapted to the installation of third-party sensors.

#### 4. Satellite monitoring with fuel flowmeters

Flow meters are telematics sensors installed on the fuel line of the vehicle's engine system and determine the volume of incoming fuel. Many models of this equipment can also determine engine runtime and the temperature of fuel and lubricants. The information recorded by the flow meters is sent to a GPS tracker, which transmits the readings to the fleet management system.

The readings from the fuel consumption sensors are highly accurate at 97-99%. That gives fleet managers a real picture of the fuel consumption of their vehicles, and they can accurately calculate fuel consumption rates, assess efficiency, and plan costs.

However, this method may not be suitable for everyone. First, buying and installing a fuel flow meter is more expensive than all other methods.

Flowmeters are prone to contamination and need to be cleaned periodically. If they are not cleaned, the fuel system of the car may fail. To monitor fuel in the supply line and in the return line, two meters, or a more expensive differential sensor, must be installed. With the help of this equipment, it is difficult for the system to monitor fuel fillings and drains quickly.

Figure 4 compares the readings recorded on one vehicle by a fuel flowmeter (blue graph) and a capacitive fuel level sensor (red diagram). The difference in data accuracy does not exceed 100 ml. But the flowmeter does not make it possible to understand when the fuel was refueled and drained.

In many cases, flow meters, despite their cost and several limitations, are still the best solution for satellite-based fuel consumption monitoring. Mainly for select vehicles when the shape of the tank

does not allow the installation of capacitive fuel level sensors (Method 5). In addition to fuel readings, the flowmeters can detect motor hours and record various fuel system parameters. In the case of special machinery, this information is vital.

- Advantages: high accuracy, motor-hours control, and additional parameters
- Disadvantages: high installation and maintenance costs, no traceability of fuel drains from the tank
- The efficiency of fuel consumption control: average
- Probability of fuel theft: average
- Where can be used: special equipment with tanks that are not adapted to the installation of remote control units

#### 5. Satellite monitoring with a fuel level sensor

Unlike the flowmeter, the fuel level sensor does not detect the flow of fuel entering the engine but monitors its volume in the vehicle's tank. It is installed directly in the fuel tank and transmits data on fuel level fluctuations to the satellite monitoring system. When cutting-in such a sensor, it is crucial to perform a professional sensor calibration and the tank calibration.

The accuracy of the fuel level sensor is as accurate as of the flowmeter. The error here does not exceed 1-3%. At the same time, such a sensor makes it possible:

- to record fuel fillings and drains
- determine false and incomplete refueling
- recognize micro drains
- Identify the facts of draining from the diesel return pipe.

Figure 5 shows how a fuel level sensor can be used to track changes in fuel volume in the tank, clearly linked to time and place. The refueling and drains information also

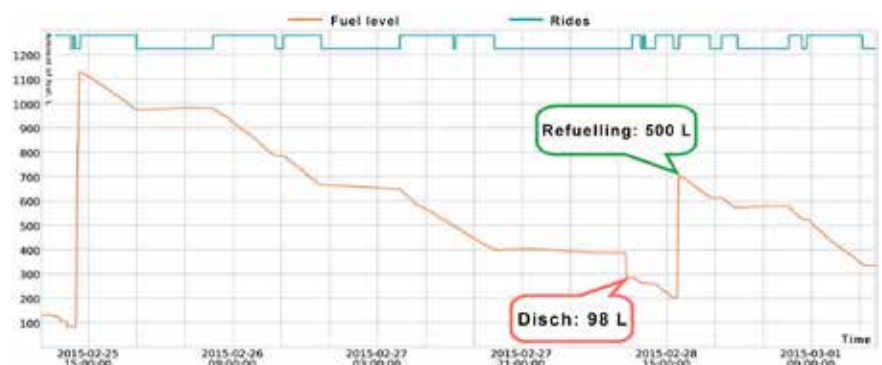


Fig. 5: Fuel level graph indicating a fuel drain and refuelling



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Fuel monitoring method	Efficiency	Margin of error	Data (parameters) collected	Fuel theft risks	Installation details
General data on mileage, gas station receipts and fuel cards	Low	15-20%	<ul style="list-style-type: none"> <li>Mileage</li> <li>Fuel receipts</li> </ul>	High	Not required
Only GPS monitoring	Low	--	<ul style="list-style-type: none"> <li>Mileage</li> <li>Route tracking</li> <li>Geo-zone monitoring</li> </ul>	High	<ul style="list-style-type: none"> <li>Simple to set up</li> <li>Installation and configuration of the device</li> <li>Subscription to the monitoring platform</li> </ul>
CAN bus	Medium	up to 15%	<ul style="list-style-type: none"> <li>Monitoring fuel volume in the tank</li> <li>Other parameters available via the CAN bus</li> </ul>	High	<ul style="list-style-type: none"> <li>Simple installation</li> <li>Direct connection to the on-board system</li> </ul>
Flowmeter	Medium	1-3%	<ul style="list-style-type: none"> <li>Fuel consumption</li> <li>Engine hours and temperature</li> </ul>	Medium	<ul style="list-style-type: none"> <li>Difficult to install</li> <li>Installation on the fuel pipes</li> <li>No need for calibration</li> <li>Regular maintenance</li> </ul>
Fuel level sensor	High	1-3%	<ul style="list-style-type: none"> <li>Fuel consumption in the tank</li> <li>Refuelings and drains</li> </ul>	Low	<ul style="list-style-type: none"> <li>Medium difficulty of installation</li> <li>Requires drilling a hole in the tank</li> <li>Obligatory sensor and tank calibration</li> </ul>

Table 1: Main features of each fuel monitoring method

helps to identify the facts of fuel drains from the engine system's return line.

Along with high accuracy, the fuel level sensor is the most reliable tool for detecting and stopping fuel theft. But this equipment is not suitable for everyone because of the design of vehicle tanks. For example, on special equipment, tanks often have non-standard shapes with bends. You may have to install two sensors, or you may still have to resort to a different control option. Extended shaped tanks can be found on trucks. In this case, two sensors will also have to be installed to avoid errors due to fluctuations in the fuel level at an angle. On passenger cars, the tanks can be very shallow. The sensor measuring tube can theoretically be cut to any height. But if it is less than 10 centimeters, the fuel data will be incorrect.

But for cars on which tanks can be fitted with such a sensor, this method of control will be most efficient.

- Advantages: high accuracy, ability to track all fluctuations of the fuel
- Disadvantages: complicated installation on non-standard tanks
- The efficiency of fuel consumption control: high
- Probability of fuel theft: low
- Where it can be used: any type of vehicle with tanks that allow the installation of a sensor with a measuring tube.

## Conclusions

Vehicle fleets that have an interest in fuel control cannot omit modern telematics solutions. The M2M market offers a wide range of equipment and systems to implement the control methods described. The choice of the option depends on

the type of transport and the specifics of the vehicle fleet. The main thing is to find a way to save on fuel, return on the costs of implementing the solutions, and further benefit with minimal maintenance costs. Table 1 summarizes the main features of fuel monitoring methods reviewed in this article.

For reliability and ease of maintenance, we advise you to pay attention to fuel sensors equipped with BLE (Bluetooth Low Energy) wireless technology. When installing such sensors, there is no need to lay wires to ensure communication with GPS trackers. Therefore, the stable operation cannot be impacted either by the risks of breakage, wear and tear or deliberate damage to the cables. Setting up telematics BLE sensors is quick and easy using a mobile application. Due to their low power consumption, they can operate for up to 7 years on just one battery. 📡

## AUTHOR



### Tim Almaev

Fuel Monitoring Professional, Escort Monitoring Systems

Many companies with a large fleet of vehicles face some form of theft: drivers can drain the fuel, tamper with fuel cards, and do side jobs.

As a result, the company's losses are fuel overruns, premature vehicle wear and tear, and reduced work quality. Tim Almaev of the Escort Group will explain what methods can eradicate discipline breaches and reduce fuel consumption. Impossible to optimize the fleet without proper monitoring tools, so let's get to know them!

# How is Telematics Revolutionizing the Automotive Industry?

**NAVEEN JOSEPH RAO**

CONTINENTAL AUTOMOTIVE INDIA

For ages, automobiles were considered just as a transportation device, but with the introduction to telematics and connected car technologies, automobiles have transformed into “computers on wheels”. The automotive industry has seen a significant increase in the usage of telematics systems in the last few years. Vehicles are now evolving as intelligent, automated devices that can do more than just being a mere means to commute.

## How Telematics Work?

Telematics combines telecommunications and vehicle informatics, allowing vehicles to communicate with the outside world. Simply put, a telematics system contains a tracking device that will enable it to send and receive data. The device also collects vehicle-specific data and transmits it via GPRS (General Packet Radio Service), 4G mobile data, and cellular network or satellite communication to a centralized server.

## Connectivity in cars and the automotive industry

The role of telematics in the automotive industry is vital. As per the report by ReportLinker, it is expected that the global automotive telematics industry will grow to USD 182,191 million at a CAGR of 15.44 percent by the end of 2025. The automotive industry is increasingly adopting more telematics technologies in the vehicle to monitor the performance, vehicle diagnostics, and meet the demands of users for wireless connectivity.



Connected vehicles exchange safety-critical information between the infrastructure and nearby cars, reducing the number of accidents and casualties. One such example is eHorizon, which assists the vehicle to see around the corner and beyond sensor vision. eHorizon also processes the data collected from the entire vehicle fleet with the aid of artificial intelligence and other technologies, which again increases the reliability of the predictions. This data is saved in cloud servers, making it accessible in real-time to all involved stakeholders.

Standard features of telematics include collision notification, emergency assistance,

local search, vehicle diagnostics, among others. However, the role of telematics is further modifying as it is blending with other automotive technologies.

## New Trends in connectivity

**High-Performance Computers:** The time we live in is rapidly moving towards automotive electronics for newer innovations and more remarkable developments. Understandably, the future will demand higher scalability and upgradability for the same. Therefore, the automotive industry is moving towards High-Performance Computers (HPC). HPC not only acts as an application server



for traditional vehicle functionalities but is also an essential element of the vehicle as a part of the Internet of Everything (IoT). It also opens up the possibilities to integrate applications and services Over-The-Air (OTA). Just like a smartphone, the vehicle's functions become updatable and upgradable throughout its lifetime.

**V2X Communication:** The amalgamation of advanced telematics and connectivity has enabled technologies like V2X that can connect a vehicle to any IoT device. The 5G hybrid V2X platform has originated from NAD (Network Access Device). The platform can be integrated into both a 4.5G and a 5G version, developed explicitly for scalability and flexibility. The vehicle manufacturers can use the platform without substantial customization efforts across global markets. In the end, it will help to reduce the number of variants, resulting in cost reduction for the vehicle manufacturer.

Road safety and seamless connectivity have always been the point of discussion when it has come to avoiding fatal accidents on the road. With the advent of 5G high-performance cellular connectivity, benefits need to be derived and experienced over time.

Recently 5G cellular networks are available in the market, which has helped reduce the performance gap between V2N (vehicle to the network) and V2V (vehicle to vehicle). 5G, in combination with V2V, facilitates a seamless communication experience from long range to short range. One can track for short-range, immediate warnings, and long-range traffic alerts. Still, safety risks can be tracked from longer distances allowing the vehicle and the driver to be notified in a timelier manner. Thus, enabling safer, more comfortable human-level reaction times rather than having to trigger a rapid decision to either brake

or swerve. This kind of V2X- enhanced Advanced Driver Assistance System (ADAS) takes out stress but keeps the driver in the loop in a more relaxed way, which improves the user experience on another level.

Another recent development to this type of seamless connectivity is the Collective Perception Message (CPM), which is particularly relevant for the smart intersections of smart cities. Once we enter CPM, vehicle networking reaches a whole new level of seamlessness. CPM is a new V2X message, anticipated to be standardized within the next year. It allows vehicles to share information about objects, such as vehicles, pedestrians, and cyclists, with other vehicles that might not see them from the other vehicle's perspective. One vehicle could, therefore, provide information that could help improve safety for the other vehicle. The following feature not only allows in providing safety but also helps in maintaining the vehicles in position.

**Cellular Vehicle to Everything:** The mobile industry body 3GPP standardized a set of technologies specifically designed to enable a smooth and efficient communication process between the vehicle systems and the roadside infrastructure known as Cellular Vehicle to Everything. These systems can support and provide ultimate driving safety in improving road safety and building better and more efficient use of transportation, networks, and infrastructure.

One perfect example of how C-V2X works are - Co-operative driving. Co-operative driving enables vehicles to use the C-V2X to work together to make the best use of the available road space and minimize the disruption caused by lane changes and sudden braking. C-V2X can be used to convey intent to other

road users. For example, once a vehicle has overtaken another vehicle, the most efficient way to re-enter a slower lane during periods of dense or heavy traffic is for the vehicle in front of it to accelerate slightly, and for the following car to slow down slightly to make sufficient space for the merging car. The same process can also be used to smooth a vehicle's entry onto a busy motorway.

For Queue warning, roadside infrastructure can also use C-V2X to warn vehicles of queues or road works ahead of them to slow down smoothly and avoid hard braking. More broadly speaking, the roadside infrastructure can use C-V2X to help vehicles maintain a consistent and continuous speed while assisting in reducing the number of so-called phantom traffic jams caused by the ripple effect caused by sudden braking and lane changes on motorways.

Telematics has opened up avenues for cockpits of the future—for instance, cockpit high- performance computer that integrates cockpit functions like clusters, cameras, and infotainment into a single unit. Thus, offering a holistic Human-Machine Interface. The driver can dynamically distribute content across multiple displays and place the information where they need to see it. The displays are enabled with touch, gesture recognition, voice recognition, and haptic feedback that allows the driver to stay focused on the road and makes driving safe, easy, and reliable. It provides a flexible user interface personalized for the user. Telematics plays a crucial role in ensuring the data is readily accessible on the cloud and available for the user.

## Conclusion

Telematics is one of the many building blocks for developing the future and raising the bar for autonomous vehicles. The technology has been beneficial in providing vehicle comfort, safety, and security. With the introduction of technologies like Cellular Vehicle to Everything (C-V2X) and 5G, the path to autonomous vehicles has become easier. The need for Telematics in connected vehicles is rising across the world and can transform the way we imagine vehicles. □

## AUTHOR



**Naveen Joseph Rao** is the Head of Connected Car Networking business unit and Customer Centre - India & ASEAN OEMs.

Rao has over two decades of experience in the automotive industry, joined Continental in 2006 as Deputy Manager - Engineering. Prior to joining Continental, he was working as Senior Engineer Development - Hydraulics at BOSCH.

# THE ADVENT OF VEHICLE TELEMATICS FOR AUTO INSURANCE TECH

**AKHIL A ZEEB**  
CAVLI WIRELESS, INC.



Long before IoT or the Internet of Things became a buzzword, Telematics as a sector has been steadily growing with large, medium & small players all happily co-existing alongside each other. This particular sector has evolved to become very regional with strong capable solution providers dominating or striving in their respective markets be it Asia Pacific, Europe or Americas with minimal cross over. If we are to pick names, the list can be really long and it could deviate our attention from the topic in hand. Telematics can be defined as a technology that needs to be put in place on the locomotive and at the network access & cloud which can handle information about the driver/vehicle back to a command

centre, where it is monitored in real-time. Erratic driving or mechanical failure with the vehicle could mean the difference between life and death and as a result, demand for telematics solutions is only growing. The market is estimated to be worth a whopping \$233.34 billion by 2022.

Every car that has an in-built telematics system relies on the surrounding network infrastructure. It could be 2G in areas where LTE penetration is not strong or 4G LTE-M in urban areas or even a back up public Wi-Fi in certain regions. The advent of 5G is expected to be a game-changer for the industry and is expected to re-define the expectations from V2X technologies already in development & adoption. Subscriber Index Module or a SIM card as we all call it, is at the heart of any connected

car or telematics solution. A particular advancement within the network access technology is the shift towards eSIM or embedded SIM technology which needs to be tightly integrated to the connectivity hardware. eSIM-based LPWAN (Low Powered Wide Area Network) connectivity is now replacing legacy networks like 2G & 3G for vehicle telematics. New age networks like LTE-M & NB IoT are taking over the reins with

Official data shows that as of 2020, there has been no significant decrease in the number of auto accidents when compared to data from 2010; although the original aim was to reduce this number by 50%. Insurance premiums are only rising, partly led by the increase in auto component costs. In the past, a fender bender meant a simple visit to the body shop. Today, it is a much more complicated process, requiring the replacement of several expensive sensors. Local laws have only compounded the financial aspect further. The state of Michigan in the United States, for instance, requires that all drivers on the road have unlimited coverage for personal injury – and this is to be a part of their auto insurance policy. This has resulted in auto insurance premiums soaring through the roof. The need to regulate premiums and claims has resulted in the insurance sector turning to technology to help put a sustainable roadmap in place for being humane, just and rational at the same time when it comes to processing claims or setting payment brackets.

So it makes sense to insurance companies, individual vehicle owners, and fleet management companies to have a usage-based insurance model. Root Insurance (an auto insurance company operating in Europe) has been personalising their offerings since 2018, based on the inputs from vehicle telematics solutions providers regarding the number of kilometres driven.

Hitachi forecasts that at the rate technology is progressing, a connected car will be uploading 25 GB of data onto a cloud every hour by 2025. Given that there will be 116 million connected cars by then in the United States, according to projections, we are talking about at least 25 billion terabytes of data per year. That is a lot of data, and predictive modeling will become the need of the hour to process this driver and vehicle data and that is when Machine Learning and Artificial Intelligence will become a staple element of the ecosystem.

It is no secret that auto insurance providers are always looking actively into lowering their costs. A good driver who takes good care of their car is the model customer; and only with telematics can they know if the service schedules have been adhered to on time. Telematics also relays information back

on whether a particular driver accelerates and/or brakes suddenly a lot (indicating that he/she is a rash driver), at what speeds he/she makes turns, whether or not he/she uses turn signals, and much more. Such data could designate the vehicle user as a 'safe driver' or 'unsafe driver', helping auto insurance companies make better business decisions and also lower premiums for safe drivers. Driving patterns that include regular traffic violations can only be arrived at if the data from the civic body or police records is also made available to the insurance company. Similarly, many other external data points like speed limit violations, parking tickets and other fines can also be factored to build the profile of a 'driver'.

Has the current vehicle onboard diagnostics solutions in the market evolved to truly aid the Insurance provider with actionable insights? The telematics industry though growing is not innovating at the required levels. If one were to ask the question of whether the current vehicle onboard diagnostics solutions in the market have evolved to truly aid the insurance provider with actionable insights, the answer would be not really. The telematics industry has been hit by one major roadblock – lack of seamless connectivity. For instance, this could turn out to be very critical when the vehicle is trying to access crucial weather/road diversion data. There could be a blizzard in the next town, but a driver on a mountain highway might lose connectivity en route. Depending on the destination, weather information for the selected route can be displayed to the driver and multi-network access can ensure that even if one network is weak a different network aids to stay smart connected. eSIM or embedded



SIM technology that facilitates multi-network access and management is seeing great adoption, especially in logistics & transportation use cases. As technology improves, it will become cheaper to uplink telematics systems to satellites in areas not served by conventional mobile data networks. But until then, the rate of innovation in the field leaves much to be desired. Industry experts say what is on offer right now in the market in terms of user experience is sub-optimal and there is huge scope for improvement.

In urban areas, this will prove to be less of a problem. Vehicle telematics will be integrated with the Internet-of-Things so that the garage door would open automatically when the car approaches and the airconditioning and the lights turned on inside the residence. Narrowband Internet of Things, or NB-IoT, that is based on cellular LPWAN (which relies

on LTE-M) has the potential to massively transform the telematics landscape. The opposite also holds true – if the car is driven out in the middle of the night when a single resident is still in the house, this points to the possibility of vehicle theft. It can mean a lot to the auto insurance provider if law enforcement is alerted immediately and the stolen vehicle recovered. Adequate controls can be put in place for homes with more than one resident.

With most of the world now covered by LTE-M, eSIM-based IoT connectivity solutions will ensure that telematics providers get to forget the hassles of IoT connectivity and focus more on innovating their product/service offerings. Telecoms around the world are aggressively deploying LTE-M to supplement legacy networks like 2G and facilitate the next wave of telematics solutions which will be on CAT 1/4 and LTE-M technologies.

As the world inches closer towards 5G, the day is not very far off when we see the V2X segment achieve exponential adoption with all automotive OEMs requiring to come together on a common platform to facilitate absolute interconnectivity. Overall, global consulting giant McKinsey believes that a massive \$1.5 trillion could be unlocked in value from telematics data by 2030. Let's hope the industry and the underlying technology lives up to the expectations. □

## AUTHOR



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Co-founder | Cavli Wireless, Inc.

Akhil is enthusiastic about new ideas, innovation, and technology. He is passionate about entrepreneurship, where people work in teams to build new products of their dreams. Like Jack Dorsey famously said, "Make every detail perfect and limit the number of details to

perfect," he believes in perfection and simplicity. He also believes that life should be a steep learning curve.



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# Advanced algorithms and approaches for vehicle telematics

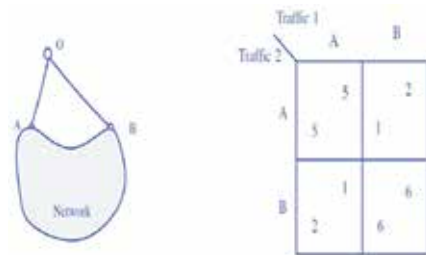
 **SHAMIL MIRKHANOV**  
NAVIXY

Modern telematics platforms utilize various advanced algorithms to address common tasks such as vehicle routing, face recognition, driver behavior identification, eco-driving, and vehicle classification. Here we consider only a few such algorithms and describe the cases where they either might or have been used.

## Algorithms and cases

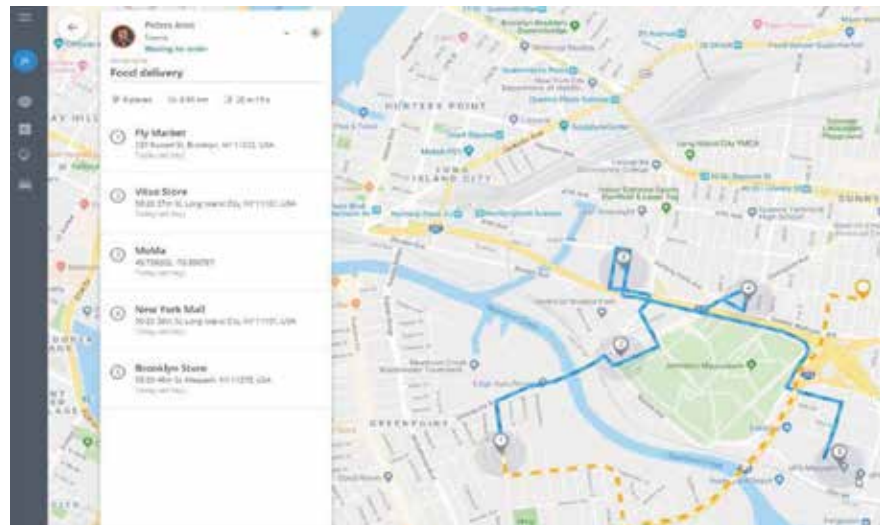
To begin with, let's consider some approaches to vehicle routing. The possibility to determine, modify, and optimize possible routes is a crucial feature for any telematics platform.

One approach to vehicle routing could be provided by game theory. A potential of game theory in the building and analysis of behavioral models could be successfully utilized to address logistics and fleet management problems.



Assume that node O is connected to the rest of the network through connection points A and B, where A is a little closer than B. However, both connection points get easily congested, therefore sending both streams via the same connection point would result in an extra delay. Favorable outcomes in this game would be for the two players to "coordinate" and send their traffic through different connection points.

On practical case one have to deal with a decent amount of fleets and need to optimize the route for each of them.



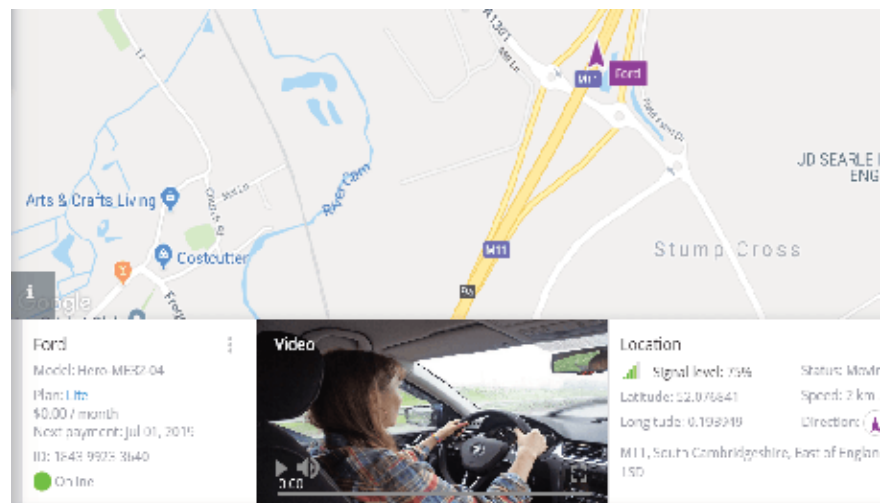
It is a really challenging task to deal with and there are various smart algorithms, methods, and programming paradigms being used and developed to provide some practical solutions.

Navixy utilize smart algorithms combined with advanced features of constraint programming and multi-purpose meta-heuristic techniques to account for everyday fleet management needs and addressing VRP in a highly

efficient and customer-beneficial way. By simply clicking on the route optimization button, a dispatcher will instantly get the optimal sequence of locations to visit on the map. One-click and all the points line up in the most effective route.

Another example is face recognition routine in MDVR systems.

Facial recognition performs capturing and analysis with further comparison of specific face patterns based on the facial





details of a particular person, and contains three steps:

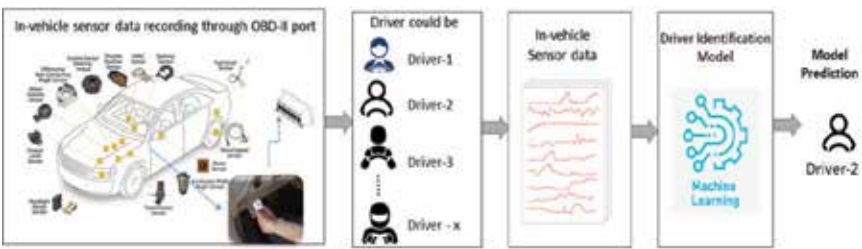
- 1) detection process detects and locates human face on image or videos;
- 2) relying to the face features, capture process does analog to digital conversion, transforming actual face to digital information;
- 3) matching process checking if two faces belong to same human;

There are several ways of Face Recognition implementation, including MDVR functionality enabling by different telematics platforms, currently available on the market.

For instance, Howen’s online video monitoring system provides fleet owners the opportunity to control driver behavior behind the wheel and ensure cargo safety in real-time.

Another approach to controlling driver behavior is utilizing Fuzzy logic. Due to its ability to deal with uncertainty, fuzzy logic could successfully be utilized in many real-world applications, and telematics is not an exception. Some research outputs [S. Ghaemi et al, 2010] managed to demonstrate a hierarchical fuzzy system for humans in a driver-vehicle-environment system to model takeover by different drivers.

Fuzzy logic provides fruitful features to telematics, but it should be pointed out that such solutions are not alternative-less. For instance, an innovative telematics platform may utilize other advanced algorithms and solutions, allowing efficient driver behavior control.



The model developed by the authors is based on freely available vehicle telematics data being collected from the OBD-II interface of vehicles. The actual problem is formulated as a time-series prediction task, where the model is trained on sequential data obtained from an in-vehicle sensor. The approach proposed by the author’s claims to maintain its accuracy above the acceptable value, 88%, while other models’ accuracy goes below 40%.

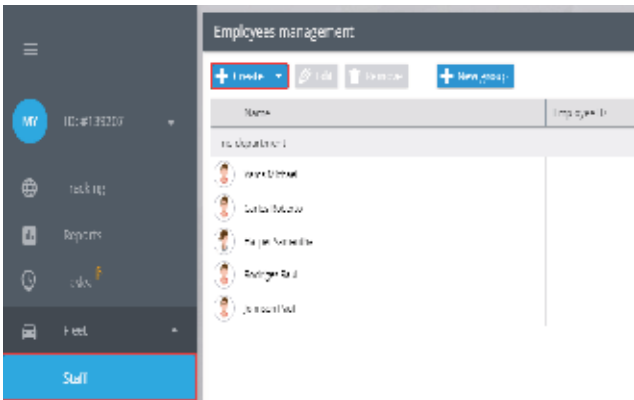
Machine learning implementation could also be rather challenging, due to requirements on proper choice of algorithm, often lack clarity between training and test set, features engineering importance, and requirements on problem definition. Therefore, in some cases, it could be useful to employ other solutions.



Machine learning methods demonstrated reliable results in many applications, including pattern recognition (face detection), unusual patterns detection (sensors), and predictive analytics (stock/exchange rates and prices).

Taking into account current progress in general connectivity, IoT, and IoV, machine learning could actually utilize both real-time and historical data for insightful analytics. As such, machine learning methods could be employed in predictive maintenance, driver behavior analysis, insurance telematics, driver identification, ADAS systems, and autonomous vehicles.


To provide an example, let’s consider a Driver Identification system framework, described in [A. Girma et al, 2019].



The above-mentioned case of driver identification could be alternatively replaced by the advanced functionality of the telematics platform. Such driver ID functionality will be extremely useful for companies and enterprises where several drivers share the same vehicle. This function will make one aware of who is driving the vehicle at any given moment.

Provided examples are just a thin slice out of a large cohort of available algorithms and approaches addressing telematics and transportation tasks. However, even such small selection quite desperately shows how rapidly modern computing and technological approaches diffusing into telematics. □

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**Shamil Mirkhanov, MSc, MBA, PhD.**  
Technology Distribution Expert at Navixy



# Vehicle Telematics Technology- Anritsu Response

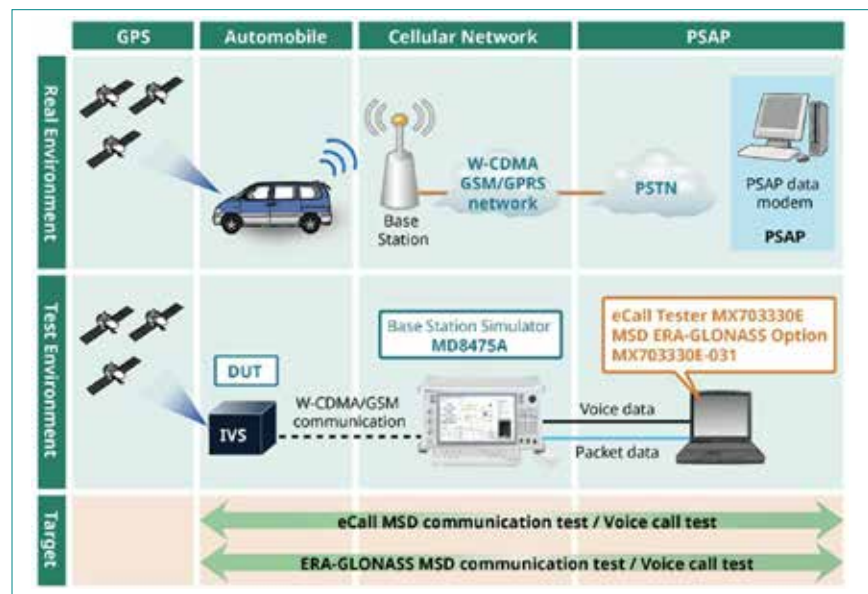
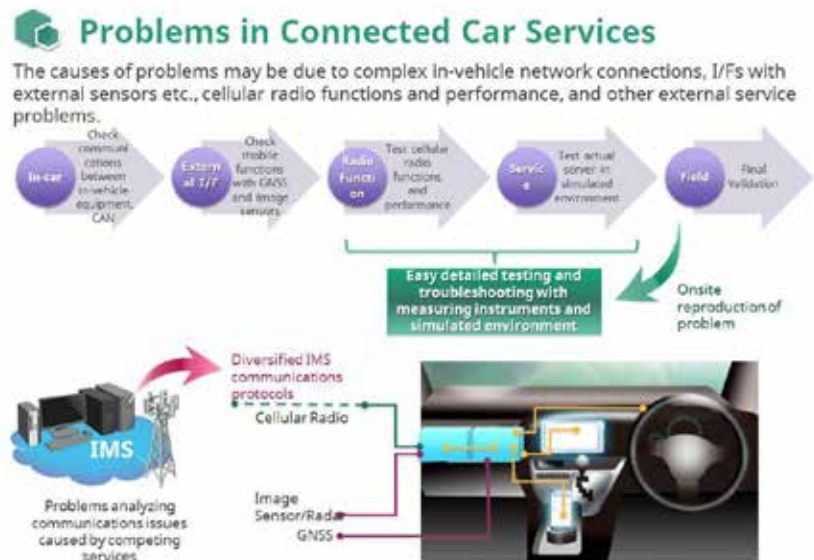
**MADHUKAR TRIPATHI**  
ANRITSU INDIA PVT LTD

According to Counterpoint Technology Market Research Ltd., the number of connected cars with built-in connectivity expected to ship between 2018 and 2022 will reach 125 million units. Connected technology brings new functions and performance to vehicles and forms a key base for delivering new services and business. For example, connected technology has a major impact on remote monitoring of vehicle status as well as on function updates using wireless communications (OTA updates) to provide new services. Additionally, roll-out of commercial 5G services will drastically strengthen connectivity.

On the other hand, incorporation of various wireless communications technologies, including 5G, increases the complexity of the communications environment as well as the likelihood of radio interference. Increasing the number of network-connected onboard systems also greatly increases the risk of hacking threats to safety. Automobile manufacturers are facing new cybersecurity problems, making support for both rapid threat response and specialist communications technologies more important than ever before.

Implementing intelligent transport systems using vehicle to vehicle/people/roadside network (V2X) services, etc., will, for example, help assure the safety and security of people and property by providing emergency responders to an automobile accident with easy access to the latest regional maps and visual data via video streaming services and web data. The communications technologies and protocols related to wireless communications supporting the 'connected car' cover many fields and are increasing in complexity as represented by the appearance of new automobile wireless standards, such as eCall.

Telematics system development engineers developing and evaluating these



wireless communications technologies are suffering from increasing daily workloads which slows deployment and time to market.

## Issues in Connected Car Wireless Communications Tests

Telematics service technologies using the

latest advances in cellular communications are being developed worldwide with a central focus on the 'connected car'.

Telematics is based on using cellular protocols supporting data exchange and calls between in-vehicle wireless equipment and terminals, as well as IP networks offering various services.

Evaluation of telematics systems is based on laboratory simulation of actual communications networks.

## Laboratory Simulation of Cellular Protocols and IP Networks for Evaluating Telematics Systems

Development and evaluation of telematics systems requires implementing every possible laboratory test prior to full-scale field testing, as well as troubleshooting issues to maximize efficiency and cut wasted time at later field testing. This helps improve the quality of telematics systems as well as reduce overall costs.

These goals are achieved by configuring various cellular protocol environments in the laboratory to evaluate the telematics system at each development stage. The cellular protocol evaluation environment configuration uses a so-called signalling tester to reproduce and measure various communications conditions between the wireless base station and wireless terminal, but the following issues must be solved to implement a cellular protocol and IP network evaluation environment in the laboratory.

### Issue 1. Creating Test Scenarios

Generally, the laboratory cellular protocol evaluation environment is created using test scenarios provided by the wireless measuring instrument vendor. The scenarios are programmed manually (in a programming language) to run the tests. However, test scenario creation is difficult and requires specialist knowledge of cellular protocols.

### Issue 2. Verifying Connection with Service Server using IP Network Connection Test

Evaluating the telematics system onboard wireless and dashboard equipment, such as the TCU, before full-scale commercial release requires a test environment as close as possible to the actual operating environment. Consequently, in addition to the cellular protocols, there is a strong requirement for quality verification tests in line with actual service and use cases, including IP network connections to test servers and actual servers.

Solving these issues increases the efficiency of telematics system development and evaluation and helps cut workloads.

## Mandatory eCall, ERA-GLONASS

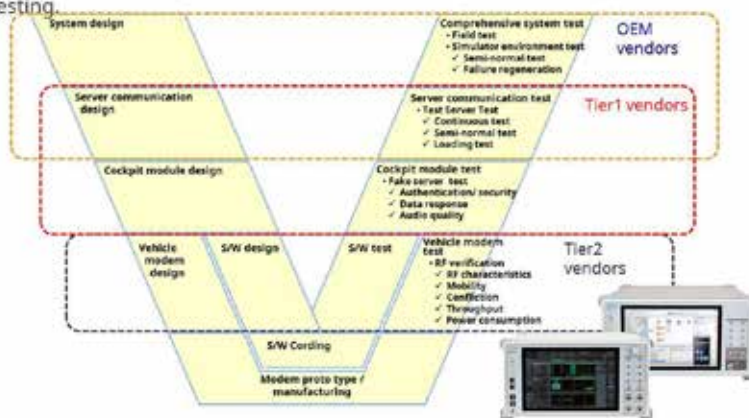
Typical telematics services like eCall and ERA-GLONASS use communications services to help protect life and property, making assured communications a key issue. These services offer rapid response assistance at auto accidents by using cellular networks; in Europe, all new vehicles sold from April 2018 will be fitted with eCall communications equipment while ERA-GLONASS will be fitted to all new vehicles sold in Russia from January 2017.

accordance with the Russian government ERA-GLONASS standard. Evaluation and certification of eCall and ERA-GLONASS communications modules and system operation requires configuration of a cellular protocol evaluation environment following these dedicated test cases and is a key part of each development stage.

The Signalling Tester MD8475A supports the ETSI eCall EN 16454 conformance standard and the Russian emergency response system ERA-GLONASS GOST R 55530 standard. Measurement of both

### Ideal solutions for Telematics system development

To provide high quality telematics service, appropriate verification and performance check must be done at each development phase. And Anritsu solution provides the best test environment for every development phases with its unique technologies for wireless device testing and mobile application testing.



## eCall, ERA-GLONASS Communications Cellular Protocol Evaluation Environment Configuration

Evaluation of eCall communications modules and vehicles with installed equipment requires testing using the ETSI (European Telecommunications Standards Institute) test case, which requires test data that can be handled by the test case. Similarly, evaluation of ERA-GLONASS communications modules and vehicle installations requires GOST R 55530 certification testing in

these systems can be automated, helping cut the time required for user measurement. Moreover, the MD8475A supports pre-testing according to the ERA-GLONASS standard under the same test environment as used by certification standards organizations as mandated for Russian government approved testing bodies. Evaluation is implemented using these eCall and ERA-GLONASS test cases, which return OK or NG evaluation results based on the standards and helps prevent increasing evaluation costs at subsequent regression testing. □

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Madhukar Tripathi is working with Anritsu India Pvt Ltd as Head- Optical Business and Marketing. He holds M. Sc. Electronics from Dr. RML Awadh University & have more than 20 years' experience in Test and Measurement (T&M) industry. His major experience is in telecom T&M alongwith Data Acquisition, NV, Analytical, Environmental instrument for some time.



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- Bounding Box
- 3D & 2D Point Cloud
- Semantic
- Eye Labeling

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Naveen Munjal did his schooling from Lawrence School Sanawar, and MBA in International Marketing from Huron University, UK. He has worked across various sectors – starting his Automotive journey working at Land Rover in Solihull, UK; prior to joining his family business in early 90s. In 2008, he was instrumental in founding SMEV (Society of Manufacturers of Electric Vehicles).

# EV SECTOR MAY SEE DISRUPTIONS IN COMING YEARS

Telematics Wire spoke to a pioneer of electric mobility in India, Naveen Munjal. A freewheeling chat which covers various issues from COVID-19 crisis to enabling the EV ecosystem through PGO spokesperson to what should a startup in EV do.

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## How have you managed the crisis of COVID-19?

Crisis is not new to any industry. Let me go back to 2009 to 2013 crisis. During that time we had around 200 dealers across the country. Volumes had crashed completely. To overcome it, we came up with a plan to extend our services to across the board electric vehicle. We told our dealers to start servicing competition vehicles also. We started supplying spares for all the vehicles including our competition to our dealers. We started a campaign- "If you got an electric vehicle and your dealership/ service centre is closed, it does not matter, come to us." The dealers started propagating it in their neighbourhoods. This resulted in stabilising the confidence amongst the customers. Secondly, we achieved the primary objective to keep the industry alive. Third and an important factor was the dealers who had little to no revenue at that point of time; started generating revenue from the vehicles they were servicing.

The market began to recover in 2013. Then came the announcement of NEMMP policy (National Electric Mobility Mission) which talked about putting 6-7 million electric vehicles on road by 2020. It said that the government spends INR140 billion leading to savings of forex in fossil fuel purchase of around INR 400 billion in the process. This is just savings in oil, when dollar about \$68 or \$70. In 2015, government launched FAME I, a good initiative, which pushed electric mobility. Though it was supposed to be 2 years it lasted for 4 years.

In 2019 FAME II was released. But thereafter this year we have COVID pandemic where the whole market collapsed. There was uncertainty in the market in the beginning of the COVID-19 during mid March. Shedding the negatives of uncertainty, we started working actively with our dealers, with our staff and employees with positivity. We discussed

things which we need to do. First thing we did, we started training up our dealers on how to handle digital and social media. So far the whole digital and social online sales, e-commerce sales had a conflict with dealers. For them it was either online or offline sales. We said that okay let's blend the two together. We started training up the dealers on how to handle online sales, how to create and update the web pages, how to create social media presence and how to push their products through these to reach customers. To the customer we started telling them, that look, if you order a vehicle, we deliver them at your home. This created a lot of positivity in the environment. Customers started responding, dealers started booking sales and our staff got very involved. We started promotion in early April and we said to our customers that there is a certain booking amount which is non refundable, if you book a vehicle, we deliver the vehicle to you when the lockdown opens up. Whole bunch of people booked the vehicle, but a very large number of people who had filled enquiry form, did not book the vehicle. They did not put down payment etc. We wanted to understand what is holding them back and why they are not buying the vehicle. We started doing online webinars with potential customers, we did several webinars with thousands of customers. Webinars which were divided by language, divided by region and more. We would have our senior team in webinar, from CEO to R&D head, to finance head, to sales head, to marketing and everybody. We wanted to understand what is it that is holding them back? What are the issues- product limitations, quality, range whatever? One of the factors that came out during the webinar from potential customers was- "We have never tried electric vehicle. If we have not had a test ride then how could we spend so much."

The next promotion we came out with, we said we deliver the vehicle at your home, you make the full payment, you keep the

vehicle for 3 days, if you don't like it, you can return it within 3 days, there is no amount deducted, there is no depreciation, nothing. We will give you exactly the same amount as you paid us. Out of the thousands of vehicles which were sold in the process, we had only one return.

Hence, even with COVID-19 at its peak, we were pushing ahead in a positive manner. Whatever online sales we did last year, this year during COVID-19 time we have done 9x to 10x of that till late July or early August.

## So can we say COVID-19 gave an opportunity for Hero Electric to re-engineer its marketing and sales channel?

In a way I would say yes. Even though at this point of time we are training dealers etc. but the magnitude of training that we did during COVID-19 lockdown months, is very different. Necessity is the mother of all invention and it proved true for us too, we re-engineered our marketing and sales channel. We had no option, we had to keep the dealer network alive, we had to keep our supply chain alive, we had to keep our company alive and the only way we could do it, was by innovation and using these tools.

## Would the marketing and promotion continue on the same lines after COVID?

We are going to keep innovating. We will keep on improvising on what we are doing. Today, many companies have started doing the same thing, so we have to move ahead to the next level. It's the constant change. We are in process of continuous changes and amendments. The objective is that the customer should benefit and new customer should start experiencing electric. We also found that over 40% of our customers are repeat customers or referral customers.

Awareness about electric vehicle across



the country is less. Number of electric vehicles on road which you see is less. Our market is still small, but nevertheless we have to keep on improvising. We have to constantly keep on getting the customer in the dealership or make them look at our website. It is important to make them try out our vehicle. We have very few cases, where once they try our electric vehicle, they go to another vehicle, simply because the experience is so good. There is no vibration in our electric vehicle and it's convenient to use.

### **What have you done to overcome the current limitations in charging infrastructure?**

In many places you don't have charging infrastructure. You could be living in an apartment in Mumbai, Gurgaon, Noida, Pune or Bangalore, but you do not have charging point on the ground floor where you are parking your vehicle. To make it easy for our customers, we made battery swappable.

Across the product range, we have 5 platforms and 11 vehicles on top of it. All 11 of them have portable battery, that was a primary thing. Secondly we made all the batteries uniform. We do not have different form factors of batteries. It is easy for us to maintain at our plant level and inventory level. It's easy for the dealership to maintain and it's easy for the customer in B2B and B2C. For B2B where they have a fleet of vehicles, the same battery goes into the multiple vehicles; for example, they have 10 vehicles, with 20 batteries. Hence 10 batteries are on charging, doesn't matter which vehicles come back, one has to just take out the battery and plug it into the vehicle.

On the charging front we have made it easy to charge, like one can plug in vehicle anywhere like the way one charges mobile phones. Further we are creating charging infrastructure. We started as an experiment in some cities in the south, and we have already installed over 700 charging stations as of now. These are very simple charging stations, and deployed in arterial roads and close neighbourhood of the dealership within 5-7 kilometres radius. When you buy a vehicle, the dealer will give you a list of charging points in the 5 kilometres to 10 kilometres neighbourhood. Now, what happened with this, sales went up multiple folds. But people using charging points/

infrastructure was minimal. It was about comfort in the back of the mind.

Our target is, in the next two years we should have 20000 such charging stations. Even though they are not going to be used and there is little revenue from them, it's more of a convenience and comfort factor for the customer.

The next thing we did, that using our service network we spread the word that it's a vehicle with LOW problems but not NO problems. It means that you will have issues and you will have problems. You will need battery change and a lot of things will happen, just as we have in automotive sector. We created this concept called PGO (Preferred Garage Owners). These are the roadside mechanics, where you take your two wheeler to fix your "panchar" (flat tyre) and other basic problems. Even though they can do it, they would say, "Sir humko nahin fix karna aata; ye electric hai; aap dealership pay jaiye", (Sir, I cannot fix it. This is electric vehicle, please visit authorised service centre). But you are far away from the dealership, what do you do? So we trained about 6000 roadside mechanics in fixing an electric vehicle. They become spokesperson for the company. Now, if a customer goes to them, and asks him what do they think of electric vehicle, they would give them a fair opinion that it's a very convenient vehicle. So we are creating positivity about electric mobility in ecosystem also.

### **Do you think something more needs to be done to improve the EV ecosystem?**

Charging system for electric two wheeler is not complicated. It would certainly help, if government mandates, for example installing low cost (INR 100 to 200) charging ports in every public building, public and residential complexes. This would create comfort of confidence amongst users, that if I go there, need be, I can simply plug and charge my vehicle for a nominal cost. This is what number of governments around the world have done, created a basic charging infrastructure and let the people use them. In fact in many places, it is free charging. What we need is basic charging infrastructure but dense.

### **Can basic charging infra or battery swapping kiosk, replicate the success of PCOs in 1990s?**

Replacing batteries as a service, in a current model could be a little tough. Customers may say that my battery is new or the battery I am getting is old. Even if we overlook this, the biggest problem at this point is of 'density'. You don't want to ride 5 or 10 kms to swap your batteries. This model may work for B2B because you are doing a particular run and then you go back to that station before they take goods and again go. It is a deployable model, if you look at E-ricks because they go in short circuit. But, when you look at consumer vehicle, you don't have a dense swapping infrastructure.

The opportunities are numerous, for example, in Tier 3 and rural markets, even if they do not have electricity, service providers can come with a battery bank and replace the batteries. Or charge the batteries using small generator in the back of the van. Going forward we can use solar panels to charge EV. There is a lot which can be done and there are a lot of things which will innovate.

With regards to charging points, you do not want a queue of cars standing out there, that's inconvenient and the customer is not used to it.

### **Do you think EV sales volume will start picking up in next 2 to 3 years or it is going to be 7 to 10 years?**

I certainly don't see this going as far as 7 to 10 years. I think it is going to be much before that. When we look at this industry, there are lots of tailwind and there is also headwind. There are resistances too. It is in the government agenda to push the electric mobility or clean mobility. For this they come up with the various policies- FAME I in 2015 and then FAME II in 2019. Delhi government has come out with their own policies and numerous other states are looking at their own EV policy. That's because everybody understands the importance of having clean mobility.

Though there is substantial policy push, we need to see if they are all working in the right direction or not. An important factor is of demand creation, unless you have demand, it is not going to work. That is the case for any sector. When you see our domestic market, now EV products are available in the range from INR 40000 to 80000, which is in the same price point that 100cc engine vehicles are being sold.

Performance may still not be there, but in terms of your price, performance parity was there already and is increasing year and year. ICs will continue to become more expensive as more and more emission norms get slapped on them. Petrol/diesel as we have already seen will remain expensive. On top of all this, we need clean and fresh air, which we all experienced briefly during Covid19 lockdown.

### **What are your views on batteries in EV?**

For us, the performance of vehicle has been the key. We moved from lead acid to lithium ion batteries which are far better and have longer life. We give 3 year warranty on our battery, but the batteries come back for the replacement after 4, 5 or 6 years. Beyond this we are looking at batteries for their stationary application like battery energy storage. Thereafter it can be disposed of after 10-12 years of its usage.

### **What's your view about localisation of components?**

Two wheeler will certainly form the bottom of the pyramid, they will form the volume basis. This will make ground for the component companies to invest. For many years we have been working on localisation, because with increasing volume you cannot rely on imports all the time. You need to have the local supply chain, which is right next to you. This can help manage inventory levels and production volumes better.

The problem is that no good Tier 1 company is willing to look at electric mobility, because the volumes are so low.

### **What are the challenges with EV industry as on date?**

The fundamental issue, no matter what production volume that you are doing, effort required to produce a hundred thousand, or a few million vehicles is same. In India the market is only about hundred and fifty thousand units. This number is divided amongst the manufacturer and amongst manufacturer's various models. In such a situation, for any good Tier 1 supplier, the volume is too low.

But in the last couple of years, Tier1 companies have realised the potential of our market and have started now looking at this segment.

Large part of localisation is already done.

But, there are still parts like motors, battery cells etc., where we need some good players to chip in. Local assembly of batteries are already in place. Though these are good moves towards self reliance, these things are also based on volumes. It has to make the commercial sense to every body. It has to make commercial sense for us and to Tier 1 suppliers. If we tell the Tier 1 guys to make the parts for us, the price goes up by 30%, because the volumes are not there. But we started the process a number of years back and large part of our vehicle is already localised. We are moving in the right direction in terms of localisation.

### **Do you see new emerging technologies like vehicle telematics benefiting the EV segment?**

This is a very important sector. We have been working for a number of years on telematics and we got numerous partners, with whom we work in telematics. What we have done in e-mobility, we have given our customers the option for vehicle telematics, about a couple of years back. This is similar to 5-6 years back when we introduced lithium batteries against lead and gave customers a choice between lithium and lead. It took us a while, before we converted entirely from lead to lithium in our offering. In the process we also trained our dealer and service network.

Same thing we are doing with telematics as well, we introduced telematics in the entire range of vehicles, but as an option. We offer four levels of telematics to customers, they can choose from a very basic one to an advanced one. Many customers would not accept SIM card inside their vehicle for which they have to pay recurring monthly service charge. Most of them were interested in ride from place A to B rather than feature. B2B segment were more keen on advanced vehicle telematics features which has geofencing and has things like if you open up the glove box it sends an alarm to your phone. Connectivity is going to be the change over next few years.

### **We see many startups coming in the space of EV, particularly in two wheeler and e-rickshaw. What suggestions you have for young entrepreneurs venturing in this segment?**

This is a new sector, and it will take time to

evolve. We have already seen in the last 3 years, when we increased prices, when we moved from lead acid into lithium. We have moved from highly dependent on subsidies, to no dependence on subsidies and yet we are seeing growth in this sector. This tells that the market is evolving and is on its path of disruption. It will begin in slow pace and then go up like a hockey stick curve. So any company which is coming in, they have to understand what the customer wants. There are startups going completely the other way, which is purely aspirational but not practical. This doesn't work.

The offering has to be a blend of technology, practicality, usage, cost and aspiration, and if the customer does not see all of these, he/she is not going to buy. Convenience is important, portable batteries we believe is very important factor and that's something which has worked very well for us. So anybody coming in this sector which is going to evolve substantially over the next couple of years, needs to have a clear vision, this is the marathon not a sprint. Don't come in throwing all money at it in a short span of time, going for huge advertising etc. Because you have got to sustain for a long period. The second factor is when you start innovating a product, when you are launching a product, do not invest too much in trying to come up with 'the perfect product'. There is no perfect product, its works in progress always. Launch at the time when you think it's good for the customer and then keep on innovating, keep on taking constant feedback from the customer and keep on constantly improving the product.

One thing which effectively we do is, once a customer buys a vehicle, for next 18 months we call them at least 3 to 4 times to find out about his journey, how he is experiencing, what are the issues that he may be having and even the bad or negative feedback about our product, and we constantly keep improving based on this. Lot of companies shy away from talking to customers, because you don't know what you are going to get. Yet we say, throw at us what you have. We figure it out based on practical views on what is possible or what is not.

Opportunities are going to be abundant, time yourself itself wisely and then be in it for the long run no matter what happens. ☑

# Cyber Security, Digital Twin and Trusted Mobility – By SecureThings

 **AMAR BHOSALE, SANYAM AGARWAL**  
SECURETHINGS

## Discover Digital Twin.

The point of convergence between the physical and virtual world is called Digital Twin Technology.

The concept was first introduced by NASA in 2002 where it was referred to as the Mirrored Spaces Model. These were full-scale mock-ups of early space capsules, used on the ground to mirror and diagnose problems in orbit, which eventually evolved to fully digital simulations.

Both the concept and technology behind Digital Twin however has gained momentum in the past couple of years and are revolutionizing the manufacturing industry while rapidly moving into almost every industry that has even basic technological capabilities. So what can digital twin technology do for you? Why should you be even reading about it, that too from SecureThings - a brand that's all about automotive cybersecurity?

Digital Twin Tech is the next big thing in most of the business sectors. To give an example, in the automotive sector, digital twins can be used for creating the virtual model of a connected vehicle. It can capture the behavioral and operational data of the vehicle and help in analyzing the overall vehicle performance as well as the connected features. It also enables OEMs in delivering a truly customized after-sales service to customers.

Not only in the automobile sector, but digital twin technology is gaining popularity in manufacturing, retail, healthcare, and even in developing smart cities.

The key factor for the success of a digital twin is uninterrupted and real-time exchange of data or update packages for

firmware or software updates, between the actual product and virtual model.

## Digital Twin & Cyber Security

As digital twins increasingly become more accessible and operational, many organizations are turning to this technology to improve productivity, thwart downtime, and monitor forthcoming setbacks on the real system. Of course, the benefits of using digital twin technology are many, but a side-effect is that with greater connectivity comes greater vulnerabilities and greater risk of attacks.

To create a digital twin, the physical asset is built with one or more sensors that collect real-time data and operational status. This is sent via a cloud-based system before being analyzed, using machine learning algorithms in cases where there are more complicated variables. Based on the relayed information, changes identified are then replicated in the twin.

For instance, in a connected vehicle, a digital twin will be programmed to flag any maintenance or service issue that arises from periodic usage or an accident. A digital twin will alert the OEMs service platform via Cloud about say an engine part change. The OEMs can then update the vehicle owner about it as well as a parts vendor and be successful in delivering a great customer service experience.

The above process can work flawlessly if the data sent via the cloud is trustworthy and not tampered.

However, if a cyber-criminal was to hack into the vehicle and send malicious content via the cloud to the digital twin, then the experience would be quite

different. While this being just an example, the important part is that the intention of a cyberattack might not be to disrupt your customer service ratings.

Thus not just Data but Trusted Data is critical for digital twin technology to work.

Organizations must therefore seriously consider the security implications of a digital twin and take a new approach to security. As vehicle complexities are increasing with every new prototype introduced and now with autonomous vehicles hitting the roads, cybersecurity is becoming more of a requisite, not just an option. These modern vehicles are 'data banks on wheels' which are easy targets for nefarious hackers. Protecting this data, ensuring its integrity has become a high priority.

## SecureThings & Digital Twin Technology for Automobiles

The Digital revolution isn't a technology outcome, but a business outcome that is enabled by technology and driven by security. As digital twin technology becomes popular, sheer volumes of data are being collected, transmitted, and processed from products, assets, and processes — and being conveyed back and forth to the digital twin. The question to be asked is, how much of the Data from this \$1.4 Trillion market is secure and trusted?

As pioneers in Automotive Cybersecurity, SecureThings believe that 'security' must be embedded within the existing telemetry sensors technology or 4G/5G connectivity to ensure digital trust throughout the entire lifecycle of a product.



## Our Products & Services

Our data-driven secure digital twin platform for the automotive industry provides trusted data and this platform can be used by any existing services like fleet management, predictive maintenance, or analytics. The platform can support many solutions answering pressing customer problems, including:

- Modern cars are loaded with many features, which of these are most of the least used?
- A virtual twin can bring up driver preferences and behavioral patterns to avoid retailers and OEMs losing revenue.
- Critical parts of a vehicle can be monitored via a twin and breakdowns can be predicted.

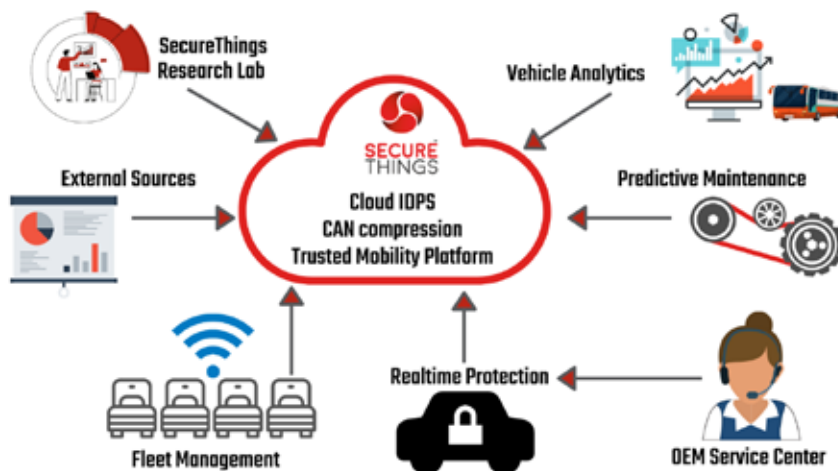
How to embedding security within the digital twin technology is a solution SecureThings can provide with innovative, researched-based products and services.

SecureThings Cloud IDS solution can monitor the fleet vehicle data and quickly identify and correct any anomalies that may occur. Considering vehicle security our IDPS solution is powered by machine Learning and Statistics based algorithms. The algorithm is capable of identifying malicious data by correlating various component behavior within a vehicle.

SecureThings CAN Data compression is developed based upon Statistical algorithms. The model parameters are used to encode the data and send it to the cloud. The encoded batch is received by the decoding module in the cloud and reconstructed to its original format with no loss. The algorithm provides very high-level compression.

Trusted Mobility Platform SecureThings trusted mobility platform ensures that vehicle to cloud communication is protected from eavesdroppers or man-in-the-middle attacks using innovative protection solutions. This security measure can ensure false data identification and data correction and gives the ability to curate 'real' data from the 'fake' one. Our cloud-based monitoring solution allows the following:

- Provide data reliability to use within the Fleet Management services
- A trusted mobility platform enables data integrity between the real and virtual vehicles
- Analytics platform to provide intelligent insights and trends (pre-



empt threats)

- Cloud-based analytics solution that can be deployed in a Security Operations Center (SOC) for live monitoring and data correlation

## Benefits of Digital Twins Cybersecurity

A secure digital twin of an asset or system has several benefits:

1. Pre-empting asset maintenance needs, thereby reducing costs
2. Reducing asset downtime
3. Improving plant efficiency
4. Optimizing process times
5. Reducing time to market

Benefits of using SecureThings Digital Twin solutions:

- By operationalizing security- and privacy-by-design, security can become a critical enabler of trust in the operation of products and assets using digital twins.
- Data is the new currency in the world of connectivity to be able to provide innovative, cutting edge features. From a business perspective monetizing such anonymized data is the best way to leverage secure digital twin technology.
- The secure digital twin will become the full driver of communication and collaboration across the organization's entire digital thread — a framework

to unify and orchestrate data across a product's life cycle — only if the right security technologies and policies are applied and maintained to preserve digital trust.

- Only in an authenticated and trusted ecosystem can participants collaborate and safely operate products, assets, and processes through digital twins.

For organizations that want to secure and ensure the success of their digital transformation, the SecureThings team can provide an opportunity to have safe inclusion of the whole ecosystem and supply chain for positive business outcomes.

SecureThings has been recognized as one of the Top 20 Most Promising Automotive Technology Solution Providers by CIO Review in 2019. Our focus is to provide guidance and technology to secure connected vehicles to build end-to-end security for the automotive industry.

SecureThings is strategically located, with a presence in Silicon Valley, USA, and India Automotive hub, Pune. Thus providing the Silicon Valley Innovation and India Scale advantage to our esteem customers. US and India are both large Automotive markets besides helping us strategically in covering major automotive ecosystems across the globe with around the clock support. □

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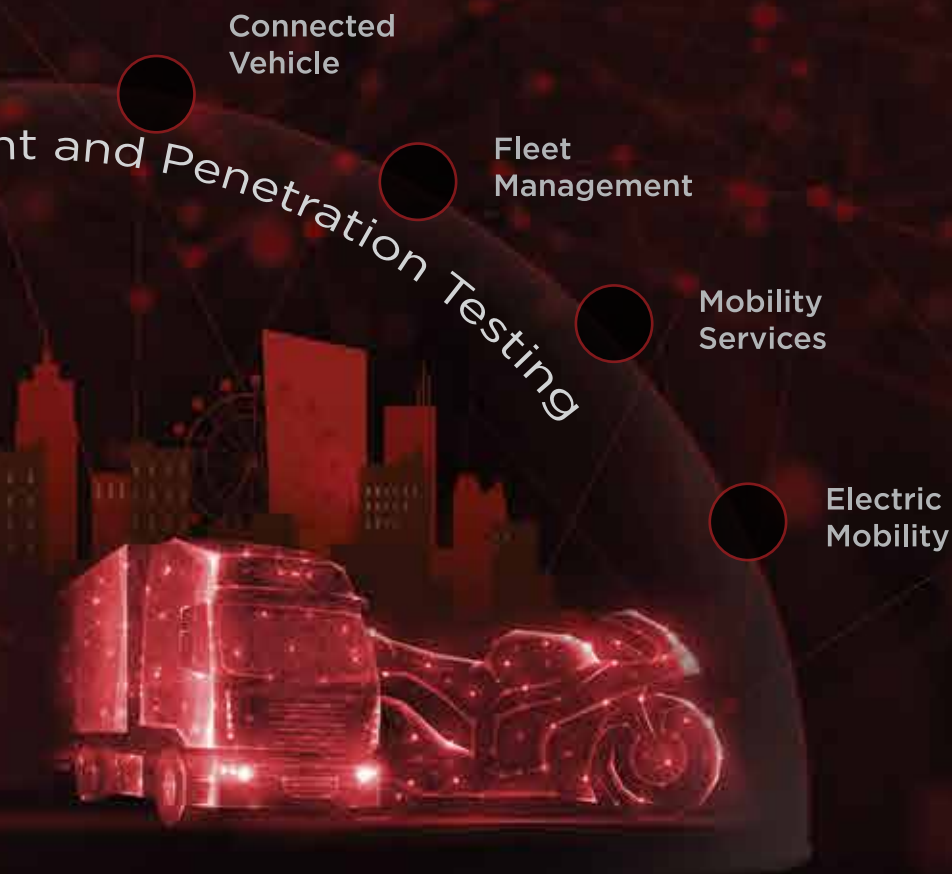
Connected Services Cloud Security

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- Advanced Network Protection for Connected Vehicles (IP, Cellular)
- AI based Comprehensive Vehicle Network Intrusion Detection & Prevention System (CAN, Eth
- Advanced ECU Protection (Telematics, Infotainment, Gateway etc.)
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# Automotive Manufacturers Cyber Security



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- Highly Secure OTA Update for Efficient and Cost Effective Deployment
- Cloud based Secure Digital Twin Platform for Trusted Mobility
- ISO 26262 (Cyber Security Provisions) & ISO 21434 Compliance
- Security Assessment & Penetration Testing for Entire Vehicle and Ecosystem

**TOP 100 TECH Solutions Provider 2019 by CIOReviewIndia**



# VEHICLE TELEMATICS FOR MASS TRANSPORTATION

**JEETENDRA SHARMA**

MASSTRANS TECHNOLOGIIES PRIVATE LIMITED

The Mass Transportation sector is constantly looking at innovative solutions to bring in increased efficiency and make the operations passenger-friendly, modern and safe. The adoption of Telematics in the mass transportation sector has opened up a whole range of new possibilities for improving access to transportation-related information, enhancing the safety of transportation, and improving

transportation system monitoring and management.

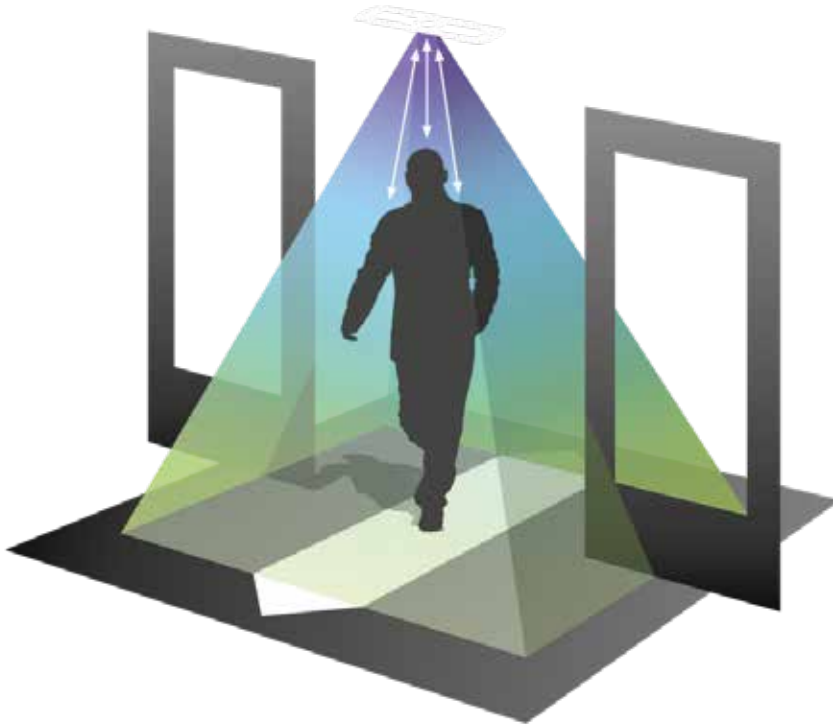
A complex transportation network deserves a simple and sophisticated communication system for the passengers travelling. **The Intelligent Transportation System (ITS)** is multifunctional and helps drivers and passengers throughout the journey. Designed to aid private and public transport organizations in the railway, metro and bus transport sector, this smart transportation system functions to ensure



convenience to commuters. The solution of transportation management system includes an onboard coach processing unit, passenger information system, GPRS / GSM, video surveillance (CCTV)

## Intelligent Transport System





and GPS based internal and external vehicle displays for passengers. A back-end dashboard and hardware integrated solution ensures an all-round solution for easy transit. This serves as a centralized live feed to vehicle drivers, and has an option for Vehicle tracking and Health Diagnostics.

The core of the ITS is a Single Control Unit (SCU) with a Bus Driver Console (BDC). The Passenger Information System (PIS) includes basic informative sign boards with smart features. The automation helps by saving time of fleet owners and eliminating confusion for passengers. It informs and guides passengers through current and approaching stops throughout the journey along with other important information such as safety information and advertisements. The LED display boards can be viewed at night as well as in daylight and are GPS enabled. The Display Ability includes scrolling text, random text, numeric, date & time, and animated text – with multilingual capabilities. The LED display boards are weather proof, highly durable and have a low energy consumption. These can be easily installed on the inside and the outside of buses, trains, and metros.

CCTV Surveillance System in Buses (as per IS16833 & UBS II) includes Internet Protocol Camera (IPC) that is compact in size and light weight. It automatically controls shutter speed, white balance, contrast, brightness, saturation and other parameters, which has excellent performance in colour reproduction. It offers a reliable HD surveillance solution for various vehicles. The main features include 1920x1080 resolution and supports WDR and white balance. The gain control image is easy to store and deal with IP66 (without audio) and IP65 (with audio). The IPC is anti-vibration and vandal resistant.

The Intelligent Transport System serves as a centralized live feed to the vehicle drivers and the central control station to enable a safer transport process. It aids decision making in real time through various analytic sensed and transmitted to the personnel in charge.

Passenger count is valuable data for public transport companies. Based on current and updated passenger numbers, transport companies keep track of transport demand and can react flexibly. **Automatic Passenger Counting (APC)**

System is based on a sophisticated sensor technology for accurate passenger counting. The sensors for Automatic Passenger Counting work according to the time-of-flight (TOF) principle. This means that the propagation time of invisible infrared light is measured. The sensors emit the light, and objects in their field of vision reflect it back to the sensor. The sensors base their measurement of the distance to the objects on the light propagation time (time of flight). This yields informative 3D images which can be evaluated reliably and fully automatically. TOF technology enables extremely accurate measurements of persons as well as baggage and objects. Time-of-flight sensors are developed for permanent and long-term use in public transport. Environmental influences like changing lighting conditions, temperature variations and humidity in buses or trains do not affect the light propagation time. Public transport companies benefit from precise and sturdy high-tech sensors that operate efficiently and reliably. This technology is the leading technology in Automatic Passenger Counting which provides multiple benefits:

- Reliable determination of passenger load - Connection to the on-board computer allows further real-time processing of the data collected. This means a wide range of options for improved planning, optimisation and evaluation of the entire traffic network for transport companies.
- Passenger counting for optimum vehicle frequency - The combination of historical data and real-time calculations makes passenger flows more transparent. Accordingly, vehicle frequency can be optimally planned and flexibly adjusted throughout the network using the data from Automatic Passenger Counting.
- Flexible adjustment of vehicle capacity - Long-term passenger counting allows public transport companies to optimally adjust their vehicle capacities to transport volume. Are articulated buses or minibuses necessary? How many metro/train units must be deployed, and on which line? In this way, transport providers can adapt even on short notice and



adjust capacities to meet the actual demand.

- Vehicle equipment in line with passenger requirements - Thanks to advanced and sophisticated technology, Automatic Passenger Counting provides more data than just passenger quantities. The sensor system reliably distinguishes between baggage and transportation-related objects such as wheelchairs, bicycles and strollers. This enables more reliable determination of the space required in the vehicle as well as the implementation of wheelchair access ramps as required.
- Efficient optimization of routes - The data from Automatic Passenger Counting form the ideal basis for efficient route optimization. The passenger numbers from each vehicle can be aggregated easily. This helps public transport companies recognize transport demand in good time and virtually simulate adaptations on the network level.
- Revenue determination - Modern systems for passenger counting work around the clock and are cost-efficient and highly accurate. Adults, children, wheelchairs, strollers and bicycles: The 3D sensors collect differentiated data on the transport performance of a public transport company in line with international standards,

providing the basis for accurate revenue determination based on said performance.

Vehicle Telematics has a new vehicle safety paradigm which introduces an image recognition camera that detects lanes and vehicles on the road. **Advanced Driver Assistance System (ADAS)** is used to detect complex situations in front of the vehicle and provide early warning, such as lane departure warning and collision warning in real time to reduce the driving risks.

- Lane Departure Warning System (LDW) uses a computer vision algorithm to provide reliable lane detecting performance in various road conditions. LDW recognizes different types of lane markings such as solid, dots, double markings as well as different colors: white, yellow, and blue. The application alerts the driver with sound and visual warnings when the vehicle departs from its lane unintentionally or provides early warning when the vehicle goes within a preset distance of lane marks.
- Forward Collision Warning System (FCW) uses a monocular vision camera installed on the windshield and a color image sensor with a robust algorithm developed for various driving conditions. The system recognizes vehicle and non-

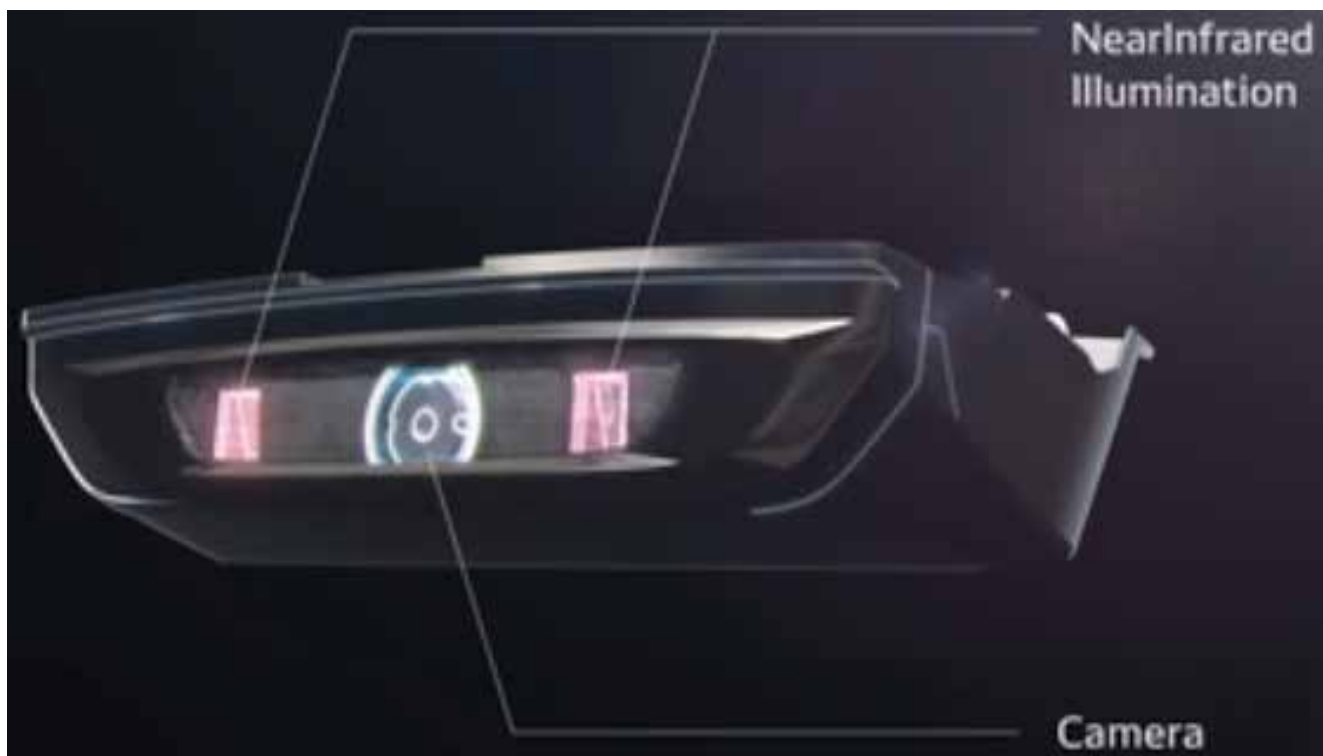
vehicle images through the algorithm and calculates distances and relative speed for Time To Collision (TTC). It alerts the driver with sound and visual warnings when the host vehicle is approaching a vehicle ahead too quickly or where a potential collision exists.

- Forward Proximity Warning (FPW) notifies the driver when there is a vehicle existing in the detection range.
- Pedestrian Collision Warning (PCW) provides the driver with a warning in critical situations when there is a pedestrian existing in front of the vehicle's pathway.
- Front Vehicle Start Alarm (FVSA) notifies the driver if the front vehicle starts to move forward from 0 speed (complete stopped status) and the host vehicle is not moving within 2 seconds.

**Driver Fatigue/Status Monitoring System** is a driving auxiliary warning system that is based on machine vision technology to detect driver abnormal driving status. It can help detect and alarm various conditions including fatigue, distraction, smoking and making a phone while driving. The System supports IPC resolution 720P & 1080P and 940 supplement light. It is IP54 water proof and has a dust proof design. The System includes driver calling detection alarm, driver smoking detection alarm, driver fatigue driving alarm and driver abnormal alarm (when there is no driver or driver does not sit at the right place).

With lesser area available for parking, drivers need to have an advanced guidance system for parking the vehicle in reverse gear. **Reverse Parking Assistance System (RPAS)** helps cover that 'blind spot' by avoiding accidents. Smaller spaces for parking come with dangers of obstacles behind the vehicle – columns, barriers, people standing, or even bushes and hedges. This reverse parking system uses computer processors which are connected to the vehicle's sonar warning system feature, backup camera, and two additional forward sensors on the front side fenders. The system provides a feeling of safety for both the driver and the passenger.





**Tyre Pressure Monitoring System (TPMS)** is an electronic system in your vehicle that monitors the tyre air pressure and alerts you when it falls low. Direct TPMS uses a sensor mounted in the wheel to measure air pressure in each tyre, whereas the Indirect TPMS works with your vehicle's Antilock Braking System's (ABS) wheel speed sensors. It notifies you when your vehicle's tyre pressure is low or is going flat.



A Universal TPMS is suitable for all kinds of vehicles. It provides tyre pressure & temperature and battery information. The TPMS sensors work both on a Display, or in an App. The units of pressure that are generally displayed can be switched between kPa/bar/psi. For bus/trucks, the TPMS can be programmed for up to 27 tyres. TPMS can also be embossed in the rear-view mirror of the vehicle.

**Planning and Scheduling System** is a comprehensive, integrated, intelligent information system for designing

transportation network and optimal construction of timetables ensuring efficient transportation and passenger-friendly, modern transport system. Optimization tools based on advanced mathematical methods allow achieving the best result at every stage of the process. Optimization enables significant cost reduction and keeping the cost at the lowest possible level.

The System is designed to smoothly, safely and efficiently work in a distributed environment by mapping the carrier's organizational structure. The central license server manages user access to application servers and databases. The database server manages the data ensuring constant access to the data for all users and at the same time secures the

consistency of the record and the security of information.

The idea of introducing modern mobile technology to transport serves eliminating impractical paper way bills and other documents (such as a paper timetables or crew rosters) and replacing them with manual verification and editing carried out using automatic means and intelligent operation of the IT system. The System features mobile touch devices (smartphones and tablets) including an intuitive application integrated with the dispatching system, and therefore many unnecessary manual administrative tasks performed so far by drivers can be either eliminated or automated. □

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Jeetendra Sharma is a globally experienced Product Marketing and Management professional with over 28 years of experience across 16 countries. Previously connected with Kimberly-Clark Professional Asia Pacific, he has worked across a range of B2B segments, including Automotive and Aerospace.

# OMNICOMM LLS 5: How OMNICOMM developed the industry's first adaptive fuel-level sensor

 **MOHIT MEHROTRA**

OMNICOMM INDIA

OMNICOMM has been developing fuel-level control and vehicle monitoring technologies for more than 20 years. We were first to offer fuel-level sensors with solid-state capacitive technology and invented the digital data transmission protocol that became the de facto industry standard, becoming the market leader in sales volume and equipment quality. OMNICOMM's unique technology continuously monitors fuel levels in applications including generator-sets, pumps, tanks, off-highway vehicles and commercial and passenger services.

To ensure continuing leadership, we strategically update our sensors with more functions, better precision and higher robustness. The new adaptive OMNICOMM LLS 5 fuel-level sensor guarantees 99.5% accuracy in all conditions, ahead of any competition.

Most capacitive fuel-level sensors have an inherent defect that customers have accepted in the absence of alternatives. During installation, sensors must be calibrated to specific fuel properties and environmental conditions. However, fuel properties depend on highly dynamic factors, from the chemical composition of additives to ambient temperature. Recalibrating sensors every time you fill up your vehicle at a new gas station is clearly impractical. So, all capacitive sensors have an average measurement error of 3%, rising to 10% or even 30% in non-standard situations.

In practice, the fuel sensor might "think" the tank is filled when it is actually only 97% full.

According to research, one in three fuel stations sells 5% less fuel than you have paid for. This represents a significant money drain for an average transport company. Fuel costs constitute up to 30-40% of operational spend, and if you own 50 vehicles, fuel underfilling might cost up to 900,000 INR per year.



Margins for transportation businesses are extremely low at 5% or less, sometimes even dropping below zero. Having imprecise fuel sensors is preferable to having no sensors.

## From Minimum Viable Product (MVP) to pilot production

To solve this problem, we wanted to develop an intelligent fuel-level sensor that could be recalibrated automatically on the move. The development project was launched in 2015, reaching MVP stage in two years.

In 2017, we started field testing sensors capable of measuring fuel levels, analyzing fuel properties, and reporting results to the vehicle monitoring system through a navigation terminal. These sensors were easily able to detect changes both in fuel type (gasoline, diesel, biodiesel, etc) and chemical composition of the fuel (different additives, higher-grade gas diluted with lower-grade gas or even water, summer/winter blends).

To obtain extensive field test data, we invited our partners to use the first batch of sensors for 6 months instead of standard OMNICOMM sensors.


Using OMNICOMM Online fuel and fleet management system, we were able to track each prototype fuel sensor and monitor its operation under an actual workload. We observed how the sensors successfully recalibrated to match the fuel, based on its permittivity. With definitive proof of concept, we proceeded to official testing.

## Inside OMNICOMM LLS 5

Unlike common capacitive sensors that contain a single measuring tube, OMNICOMM LLS 5 sensors contain two tubes that memorize 'empty' and 'full' values. The primary tube measures the parameters of the current fuel, while the reference tube stores information about the initial calibration fuel. The sensor analyzes the difference between the properties of the current and the reference fuel and auto-adjusts proportionally, compensating for any measurement error.

Measurements are powered by OMNICOMM FuelScan® algorithm engine stored in the sensor's microcontroller memory, which decides if recalibration is required.

Unlike other commercially available fuel sensors, OMNICOMM LLS 5 operates with unprecedented 99.5% accuracy at all times—meaning a measurement error of 0.5% or less, regardless of fuel type. A solid cast metal casing offers IP69K-rated dust and moisture protection.

Get in touch with OMNICOMM India to find out more about LLS 5 sensors and OMNICOMM Online fuel and fleet management platform. 

## AUTHOR



**Mohit Mehrotra**  
Managing Director,  
OMNICOMM India  
discusses the history  
and significance of  
the OMNICOMM LLS  
5 fuel level sensor

# OMNICOMM

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99.5%



## OMNICOMM LLS 5

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For every business that operates a fleet of vehicles – whether trucks, locomotives or ships – where having a handle on fuel costs is critical.

For every industry that faces unexpected fuel shortages, causing expensive and even life-threatening power interruptions: hospitals, construction sites, manufacturing facilities, bank branches and data centers.

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Unlike common capacitive sensors that contain a single measuring tube, OMNICOMM LLS 5 sensors contain two tubes that memorize 'empty' and 'full' values. The primary tube measures the parameters of the current fuel, while the reference tube stores information about the initial calibration fuel.

The sensor analyzes the difference between the properties of the current and the reference fuel and auto-adjusts proportionally, compensating for any measurement error. Unique FuelScan® technology guarantees unprecedented accuracy of 99.5% in all conditions.



# SECURITY CONSIDERATIONS FOR TELEMATICS SYSTEMS

 RAVINDRA BARLINGAY

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## Vehicle Telematics & Surface Attacks

Telematics systems provide value-added features like remote diagnostics, crash response, and stolen car recovery over a long-range wireless link. These telematic systems connect in-vehicle networks with external communication centres via remote endpoints connectors.

The introduction of the vehicle to vehicle and vehicle to infrastructure communication within the autonomous cars will broaden the possible attack surface. In recent years, the amount of attacks on in-vehicle networks has been began to grow dynamically.

The in-vehicle network may be a system for transferring data among different electronic control units (ECUs) of the vehicle via a serial data bus. As of today vehicles contain more than 70 ECUs, effective communication processes are required among them to succeed in their full functionality. The modern vehicle consists of over 100M lines of code, operating these ECU's that manipulate all functionalities and everything from brakes, wipers, braking, and steering etc.

These ECUs interact in simple networks called controller area networks (CANs) that allow them to speak at high speeds. As vehicles adopt more and more technological applications and implemented connectivity functions to the external world, threats on electronic functionalities are rising exponentially.

With the arrival of the smartphone revolution and increased miniaturization, there has been a development of devices that attach to the on-board diagnostic (OBD-II) port that's present in all modern cars. This port has traditionally been employed by engineers to download diagnostic

data and run tests, but there's a market emerging to permit car owners to access an equivalent data via their mobile device or maybe over the web. These OBD-II ports provide access to the CAN bus, potentially allowing direct manipulation of CAN traffic within the vehicle.

Various automotive serial protocols are used inside vehicles like Controller Area Network (CAN), Local Interconnect Network (LIN) and FlexRay. CAN bus is that the most used in-vehicle network protocol to support exchange of auto parameters between Electronic Control Units (ECUs). This protocol lacks security mechanisms and is therefore susceptible to various attacks. Furthermore, connectivity of vehicles has made the CAN bus not only vulnerable from within the vehicle but also from outside.

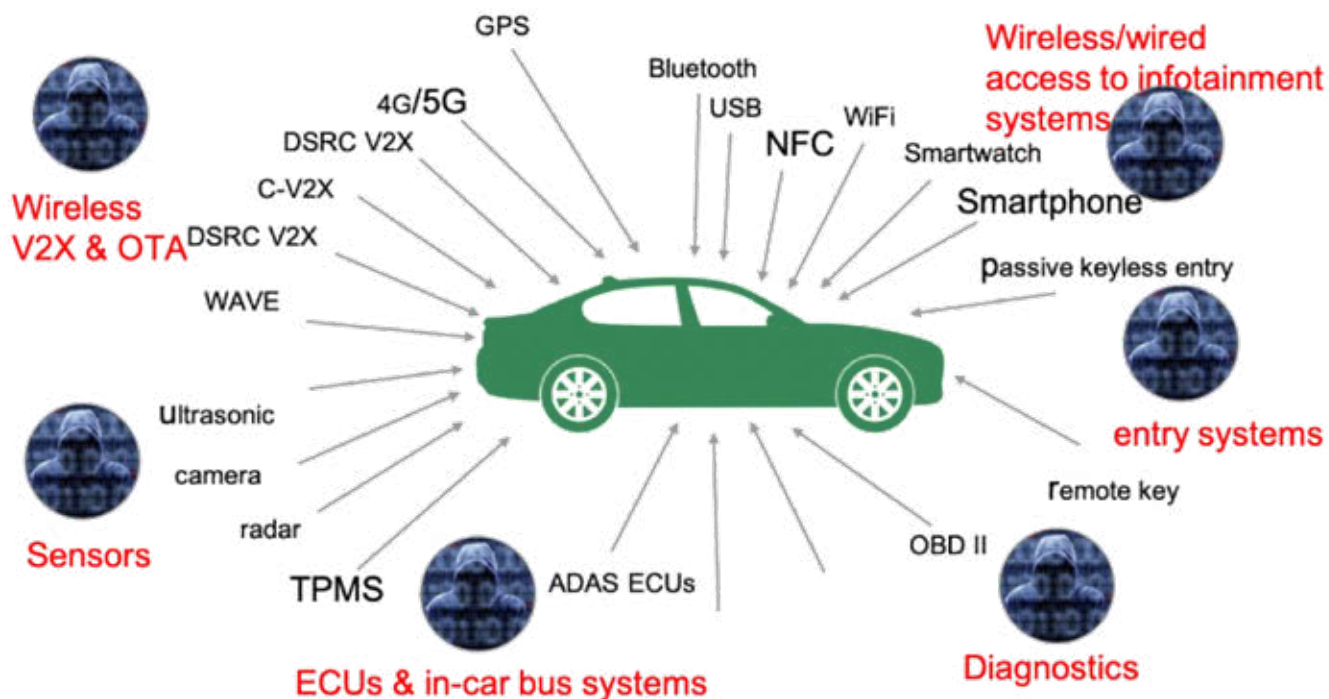
In-vehicle network security are often suffer from the degree of access protection considering the three aspects; remote endpoints, segmented network domains, and the location of critical ECUs. Any unprotected access points without a properly designed and installed gateway may leave a significant security gap for hackers to attack the in-vehicle network and thus threaten passenger safety.

The telematics system generates a huge amount of knowledge, it's important to know how the info is handled and guarded. Expansive and multi-tiered, these systems are a mixture of physical hardware and software which will be complemented by an ever-expanding list of third-party integration options like Bluetooth beacons, temperature, tire pressure sensors, collision avoidance systems and in-vehicle cameras.

With numerous components involved, protecting telematics data requires a



**CAN bus is most used in-vehicle network protocol to support exchange of auto parameters between Electronic Control Units (ECUs). This protocol lacks security mechanisms and is therefore susceptible to various attacks**



Direct and indirect attack vectors of connected vehicles  
(Image Source: DEKRA Digital GmbH)

comprehensive, proactive approach dedicated to following best practices and also ensuring security at every stage.

## Security Considerations

Safety-critical attacks against today's vehicles require two general stages. The primary stage includes the injection of malicious data from outside using either remote or onboard access endpoints. The second stage requires to realize control over some ECUs or hack their functionality.

The degree of vulnerability is strongly influenced by the function of the hacked ECUs. Logical and physical segmentation methods should be applied to isolate controllers, safety-critical modules and network domains from external connection points to stop unauthorized access.

The way to build security confidence and safely exposing a telematics system to threats is by performing penetration tests, which are sanctioned hacking attempts performed either in house or by a corporation specializing in computer security.

During a penetration test, attempts are made to seek out vulnerabilities in hardware and software to seem into complete aspects:

1. Implement secure data transfer
2. Digitally sign updates
3. Enable hardware code protection
4. Assume your code is public so you are doing not believe secrets
5. Use cryptographically strong hashing algorithms that can't be reverse engineered
6. Individualize security critical data
7. Use different keys for various roles
8. Monitor metadata to detect hacks
9. Perform third-party auditing
10. Limit server access
11. Apply secure design practices
12. Implement support for software/firmware updates
13. Verify and test

## Conclusion

Technology within vehicles will still evolve. From the controller area network, to the telematics gateway, to the backend services, and to the users themselves, security measures need to

be implemented at every layer of the technology stack in order that the danger to driver safety and data is minimized.

The current infrastructure at both the cloud level and therefore the internal vehicle network has been demonstrably broken by researchers, and if active effort isn't taken by automakers and telematics services providers alike to make sure a holistically secure ecosystem, more devious breaks of those systems could create massive problems for consumers within the future.□

## AUTHOR



### Ravindra Barlingay

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# VEHICLE TELEMATICS IN COMMERCIAL VEHICLES IN INDIA

 **SHRINGA MURALI**

N.S. RAMA RAO BODY WORKS

**N**. S. Rama Rao Body Works has been in the business of heavy vehicle body fabrication since 1963. In NSR's 57 years of operation, we have made over 30,000 tankers and gained a reputation for our focus on quality and strict adherence to industry standards. Our primary products are Top and Bottom Loading Tankers and Mobile Fuel Dispensers. NSR has worked with all the major oil companies such as HPCL, BPCL, IOCL and Essar, manufacturing high quality vehicles as per the industry specifications. We are also considered the Industry expert on Bottom Loading Tankers and are on the PESO board among 5 Heavy Vehicle Fabricators from all over India.

In the previous decades, all that was required from a tanker was to move product from Point A to Point B. However, one thing we noticed repeatedly in our interactions with our customers was that the knowledge gap of the time between dispatch and return of their vehicle was massive. Fleet owners had no idea what was happening in between during the actual operations of their vehicle. A need to keep track of their fleet at all times, optimise fuel consumption, reduce pilferage and ensure driver safety has led to the mainstreaming of vehicle telematics solutions in fleet operations.

In the consumer vehicle market, vehicle telematics are mostly necessary for communication, navigation and safety of the traveller. For a fleet or heavy vehicle owner, the need varies. Their requirements are mostly for tracking driver routes and product levels, improving travel safety and increasing profit margins. At NSR, to help our customers improve oversight into their tankers' operations, we have installed GPS systems in our fuel tankers. They combine a GPS receiver and a GSM device and the data is communicated to the user through the web or an app. Sensors are used to track fuel levels to give additional information to the owner.

Our GPS systems are tracking vehicle location in real time, so that a vehicle owner can pinpoint

the location of their tanker at any point of time. This way, they are able to monitor their drivers to ensure that they are following assigned routes and not taking unplanned detours. They can also get live traffic reports so road congestions can be avoided, and route replay so that previous travel data can be analysed. They are able to give a comprehensive view into driver activity and vehicle health.

In the heavy vehicle industry, telematics has helped vastly improve fleet safety. Driver behaviour such as sudden braking, travel speed and sudden acceleration can be observed. As per research findings, over a period of just 3 years, a fleet management company managed to reduce accident rates by almost 59% after GPS implementation. What is of paramount importance is continuous assessment of this data and acting on this data through driver training and monitoring.

Another major use of GPS systems is to track vehicles if they get stolen. Real-time tracking can show exactly where the tanker is at any point of time, and alerts are continuously sent to be able to accurately locate it. In fact, ever since GPS systems have been becoming part of vehicles, the number of reported vehicle thefts has dropped drastically. Also, when a vehicle is installed with GPS, it acts as a deterrent for the driver to make illegal or unauthorised trips.

One of the largest problems being tackled, thanks to GPS technology, is product pilferage. In countries like India, a major source of loss for tanker owners is theft of fuel. Usually, this fuel is stolen for personal use by the driver or for unauthorised vehicles or locations. We are helping our customers by improving their supervision of the vehicle's fuel consumption. Besides this, there is a need to ensure the safety of the product being transported. We are in the process of introducing a special GPS locking system that can only be opened upon entering an OTP, so that access to the product is limited, will ensure that the owner has absolute control over the process. We supplement this with our own tankers'



**We are in the process of introducing a special GPS locking system that can only be opened upon entering an OTP, so that access to the product is limited, will ensure that the owner has absolute control over the process**



single locking system, ensuring absolute protection of the product.

Apart from the ability to track the fuel consumption of the tanker, any suspicious or lengthy stops can be recorded, with the owner immediately alerted. This can happen via SMS, Email or our app so they can act immediately on the information. Heavy Vehicle idling is a major source of fuel consumption. Research has shown that long haul trucks on average are idle for 6 hours a day. Extrapolating this over a year, assuming that a 19 tonner consumes 1.5L/hr when idle, it imputes an expenditure of almost Rs 2,40,000 a year on just vehicle idling. Not only is this an unnecessary added cost for the tanker owner it is an increase in the emission of polluting gases. On top of all this, a truck idling for an hour is equivalent to it being driven for 11 kms, and there is also the added consumption of engine oil. This is an increase in operational costs, and by analysing driver behaviour in real time and passively, fleet managers can ensure idling time is controlled.

By being able to analyse traffic along the driving route and other data such as driving speed and driver behaviour, it is possible to optimize the best path for the vehicle to take, the best time to travel, and predict refuelling times and number of stops to take. All of these capabilities lead to increased efficiency in operations and improved profitability, by reducing vehicle idling times, decreasing the chance of getting caught in traffic congestions, etc.

Our sensors can also send alerts if the battery is getting low, if there are fuel dips, if the sensors are damaged and for various other scenarios. By anticipating these hassles and preparing for them, fleet owners are able to allay their fears to a major extent about operations management.

While all this data collection is incredibly important and is practically currency in this age of information, it is also important to handle it properly. In the context of fleet management, this spatiotemporal data must be queried and analysed to be able to present information to the fleet owners in a lucid manner, and so that it is not simply an overload of information.

We have been able to provide the best system for our customers, such that billions of datapoints are extracted and presented usefully to help our customers. Our GPS systems can be accessed by Email and app, with a one-time payment followed by an annual subscription. This value addition to our tankers help our customers with risk management, improved profitability and operational oversight. We will soon be introducing Geofencing capability in our tankers, so that when the vehicle exceeds a

certain set speed or goes outside a predetermined radius, a system alert will be sent through the app or SMS. Fleet managers can immediately contact the operator and act proactively to mitigate any transgressions.

In India there is a need for telematics for fleet management for reducing pilferage, improving driver oversight, maximising operating efficiency and prolonging vehicle life. This can be done by gleaning as much information about the vehicle during its operation. GPS systems and vehicle telematics can do this and are the future of the industry. The exponential increase in information acts as a competitive advantage to any fleet owner, with the prospect of superior efficiency in the supply chain, improvement in safety and longevity of the fleet and increased profitability.

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**There is a need for telematics for fleet management for reducing pilferage, improving driver oversight, maximising operating efficiency and prolonging vehicle life**

### AUTHOR



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Shringa Murali graduated from Stanford University in 2011 with

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# Chinese Vehicle Manufacturers Technological Expansion to Foreign Markets

 **THOMAS PIERINGER**  
CONMOSYS TECHNOLOGY

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**A**s a logical consequence of saturation, the two-digit growth of China's car market as a whole has been slowing down reaching a peak in the recent corona crisis that has left a scare on vehicle manufacturers face. It was a new reality that kicked-in China's automotive industry almost a decade ago where customers started to carefully compare cars and start to negotiate discounts. Along with that change came a new growing consciousness among Chinese consumers for domestic brands not only from a price but also from a design point of view that carved the way for Chinese vehicle manufactures to rise stronger against their foreign competitors. That rise has brought up a constant growing league of Chinese car brands that is not only hungry to conquer market share from international car brands at their home markets but to challenge them on the international stage too.

With the rise of technology from EV, to connectivity towards autonomous driving with all its associated technologies, on- and off-board components, embedded services and the wide range of required partners for cloud-, platform, mobile network, content and many others the opportunities of a technological advancing nation like China to challenge their established competitors in foreign markets is rising.

However, while market entrance barriers to the western countries are high and difficult to master for Chinese car brands, the expansion into countries

with less strict market entrance barriers seems to be a realistic move. More than this, while the sales of globally established companies has become less attractive in various developing countries, Chinese brands are given a window to take over production facilities and conquer these markets with attractive prices and a solid stack of technology in their cars. In the recent history, not only SAIC purchased factories from foreign car OEMs in Thailand, but also Great Wall Motors acquired a vehicle manufacturing facility in India just at the dusk of the corona crisis to produce vehicles locally and avoid the high import tax for CKD cars.

The homologation and standards in foreign markets is a particular minefield when it comes to connected services that requires data security, data storage and data transfer not only for vehicle- but particularly for sensitive customer data. Meanwhile various countries from India to South America, China and Russia established along the role model of the European Union a similar version of what is known in Europe under the term of GDPR (General Data Protection Regulation). For many Chinese vehicle companies but also Chinese Tier 1 suppliers shipping components for the connected cars are facing the same challenge and often uncertainty when it comes to data regulations. Even if experienced suppliers provide guidance on what data can be stored, where and how long data can be kept until they must be deleted, there is no guarantee for car OEMs to avoid that hefty fines that

companies like Google were facing in the European Union.

However, the global market does not only offer risks and obstacles to Chinese car OEMs, it offers a lot of opportunities and a chance to grow beyond China's boarder. It gives Chinese OEMs a stage to show what they are capable in terms of new technology such as connected car features on the on- and offboard side of the car. One of the major differentiator of recent times, and one of the factors that drives a younger generation of consumers is the availability of customer friendly connected services, a good integration of smartphone along with useful services such as in-trunk delivery, over the air software updates / upgrades, voice controlled interior and remote services that can be operated from a cell phone anywhere anytime. Due to the early adopters of technology in the Chinese markets, the international OEMs have long identified China to try and test new in-car technologies before it hits the global market. However, tight competition, cost pressure and low profit margins in foreign markets forcing foreign car OEMs to limit their offerings of connected services in the volume segments, leaving customers with a rather low-level experience of connectivity and open the door to potential Chinese models with a rather differentiated Infotainment package for a low price. This particular move includes without limitation a huge potential to Chinese car OEMs and balancing the risk of entering the market with a less strong brand name and though become a

successful player as we have seen from the ASEAN countries. Thailand, Indonesia, Philippines and particularly India with one of the most promising economies in terms of automotive growth world-wide are those markets that became the most recent hotspot for Chinese brands to expand into. The best example is South Asia, that has long been dominated by Japanese brands such as Toyota that offer in terms of connected services besides navigation is rather limited and by far not as innovative as those of rising Chinese brands such as Geely and SAIC. What is more, SAIC's internet vehicle SUV Hector with services such as Over the air software updates, entertainment package and AI voice-controlled features found such a fast acceptance among customers, gaining fast market share and challenge the established brands.

Besides Chinese owned MG brand who already successfully selling the ZS EV in five different European countries lead by the UK, we have seen other attempts

of Chinese car OEMs trying to enter the European or US market which were either withdrawn or restricted due to various economic and political circumstances. However, if well-established Chinese car brands such as Geely, BYD and JAC's EV and others can use the advantage of their EV brands to break into the European market followed by other rising stars of the Chinese automotive industry

offering a customer oriented portfolio of in-car connectivity and well-functioning autonomous driving assistant features that meet the needs of US and European customers, there is no doubt that the next three to five years will bring a new dawn of Chinese car OEMs challenging established car manufacturers at their home markets in Europe, the US and beyond. □

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Consulting foreign enterprises to access the Chinese market / improve product offering for their automotive related technology in connected & autonomous vehicles, support to build-up/improve R&D capability (IT, Software, Hardware) business set-up, network to partners and potential customers.

Previous positions in the last 10 years: Chief Engineer with Great Wall Motors for connected vehicles, and different positions with VW Group and Audi China on IT and vehicle connectivity as well as AC Nielsen on data analytics.

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# THE ROLE OF IOT TECHNOLOGY IN IMPROVING THE EFFECTIVENESS OF GPS-BASED TRACKING SYSTEMS

**EKIM SARIBARDAK**  
REWIRE SECURITY

The Internet of Things, or IoT, is widely considered as a technological milestone and has become one of the most influential innovations of the 21st century. From simple everyday objects to sophisticated machinery, IoT has connected many devices to the Internet on an unprecedented level, giving us a glimpse of the future with endless possibilities. If someone came up with an idea of a “smart frying pan” 30 years ago, people would probably laugh at the very idea, but today, we have smart frying pans that can be accessed remotely over the Internet, along with almost every kitchen appliance that you can think of.

The Internet of Things is a revolutionary technology because it can be applied to anything and it doesn't even have to be a smart device or a machine. With the increasing accessibility of the Internet all over the world, connected smart devices such as mobile devices have become more popular than ever. Naturally, this resulted in significantly

reduced costs as well as rapid development in many IoT subsystems such as industrial manufacturing and GPS-based IoT applications.

## What is the role of IoT in vehicle tracking?

A vast network of connected devices and enhanced data exchange capabilities provide the perfect platform for businesses to implement their GPS-based tracking and management systems with IoT. Vehicle tracking systems mainly operate on GPS and RFID technologies and use OBD-II ports to acquire information about the vehicle's condition. The compatibility of these systems with the IoT applications paved the way for tech companies to create tailor-made solutions for daily challenges of business operations.

Tracking the movements of a vehicle fleet, rerouting service personnel to customers in need, providing accurate ETAs for shipments and dispatching vehicles more efficiently are among the



**The Internet of Things is a perfect match for vehicle tracking systems for many reasons but the superior connectivity and accelerated data transfer speeds take the effectiveness of GPS-based applications to the next level**



many tasks of a fleet executive. Putting all these into practice and performing at a high level is easier said than done. The Internet of Things is a perfect match for vehicle tracking systems for many reasons but the superior connectivity and accelerated data transfer speeds take the effectiveness of GPS-based applications to the next level.

## Operational Improvements

Business operations are logistical nightmares; planning and coordinating the movements of hundreds of vehicles is an impossible task without the right set of tools and actionable information. As one of the major benefits that set commercial and private usage apart, the operational efficiency of vehicle tracking systems



can be immensely improved by adopting IoT. Connecting the GPS-based tracking devices with an advanced network and transmitting data at greater speeds will be critical in making informed decisions based on the data at hand and responding to emergencies. Many tools such as real-time tracking, instant alerts, geofence zones and route optimisation can be enhanced with IoT and help streamline business operations. Normally, GPS and RFID technologies are enough to collect and transmit data for operational data requirements. IoT can be used to improve the data flow between the tracking devices, cloud-based data servers and executives who rely on the GPS and telematics information.

## Financial Benefits

One of the most significant advantages of GPS technology has been the financial benefits it brings to the table for both individuals and businesses. A simple vehicle tracking unit can help a daily commuter to lower their fuel usage significantly while an insurance tracker, as the name suggests, ensures the best rates from insurance providers by simply installing them into their vehicles. IoT's role in this equation is the extra security benefits for cars, predictive maintenance for vehicles and the critical role in locating vehicles more quickly by providing a more efficient data network. In the long run, IoT's advanced capabilities can

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BENEFIT THE MOST**

save companies hundreds of thousands if not millions. A single truck's untimely breakdown during a haul or the theft of a valuable shipment can cost a company tens of thousands of dollars, not to mention the damage to the company's reputation.

These days, insurance companies pretty much demand for commercial vehicles to be fitted with a tracking device, but they also offer massive discounts because of the additional protection these systems provide. However, having multiple layers of security doesn't really mean anything if the situation can't be handled in a timely manner. Whether it is a theft attempt or a vehicle malfunction, GPS tracking devices detect the emergency within seconds and relay the information to the responsible

parties. If the information flow is not fast enough, the response to the emergency can be delayed. At which point, it can be too late to recover a stolen cargo or the damage to the vehicle is un-salvageable. IoT technology can ensure that the data flow is seamless and faster than ever for GPS-based systems. Having an advanced network of devices with better data exchange capabilities can significantly increase the response times to emergencies and prevent the situation to get out of hand.

IoT is still evolving and will continue to grow, providing us with even more innovative ways to access and control devices remotely. It is very much possible in less than a few years, and we will have voice-controlled IoT apps that allow us to control our homes, vehicles and all inter-connected devices with a simple voice command. Right now, we are at the precipice of a great change in connected device technology with a global market of around \$250 billion. IoT solutions are expected to reach over \$1.5 trillion by 2025, and it says a lot about the potential of this ground-breaking innovation. Although primarily designed and integrated into the consumer electronics market, IoT already expanded beyond smartphones and home appliances. The Internet of Things will reshape entire business industries over the years, but GPS-based tracking systems are one of the few technologies in the world that will benefit the most. ■

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Ekim Saribardak is a highly motivated IT professional who possesses a never-ending love and passion for web application and software projects. He is experienced with technical knowledge in all areas of telecommunications, GPS technology, web applications, digital marketing and product management, with an aptitude for problem-solving and decision-making with the ability to influence others in complex and pressurized circumstances.

# Telematics Gateways and AI powering a personalised in-vehicle experience

“Automotive Data is now more profitable than the car itself”

 **TAWFEEQ AHMAD**  
iWave Systems



The Connected Car revolution has been the key trend in the automotive industry and has transformed the path ahead for Automotive OEM's across the globe. Technologies such as ADAS, Self-driving, Connected Car and Fleet Management have been powering the transformation in the automotive industry. A research by Markets and Markets estimates the

connected vehicle market at 166 Billion USD by the year 2025 and is bound to be growing.

The digital transformation of the human mind has brought about a great change in the way we live, the way we travel and the way we consume experiences across verticals. Transformation in the automotive sector such as shared mobility, extensive navigation systems, predictive

maintenance of vehicles have laid the roadblocks for extensive amounts of data from the car transforming the commercial models of the automotive industry.

## Why Personalisation in the Car

Organisations across verticals are now focusing on increasing customer loyalty and net promoter score amongst



customers. According to a study by Bain & Company, increasing customer retention rates by just 5% can increase profits by 25% to 95% for an organisation. Personalised in vehicle experiences can be the way forward for automotive companies to build loyalty and increased customer retention through a pathway of personalised customer relationships. With consumers now experiencing personalisation in their homes and offices through Alexa, Echo and the other Smart Home players, it would be the right time to extend this personalisation onto the mobility sector.

Indian spend 7% of each day commuting to office, Americans spend 10 hours and 50 Minutes per week and this time continues to rise across countries .

This valuable time provides automotive OEM and the platform companies significant data and provision to provide custom experiences and would serve as a key differentiator for the manufacturers.

There are various examples of how data can transform personalised experience to vehicle owners :

1. Pre-ordered breakfast ready for take-away at your favourite restaurant en-route to your office
2. Predictive maintenance of the batteries, automated scheduling of maintenance and service requests with the retailer based on the health of the vehicle
3. Connected workplace within the vehicle – Wi-Fi hotspot and video conferencing while on travel

## Challenges and The Eco-System Required to Drive Personalisation

The ability to power a personalised in-vehicle experience cannot be taken up by a single entity such as the OEM or the Telecom Operator or the Service Provider. There are various challenges in the road to providing such experiences within the vehicle.

**Harnessing and Collecting Data:** Automotive manufacturers do not manufacture cars with a data centric approach. There

is now a need to collect the data from vehicles and store and maintain the data. 25GB of data is generated per hour per vehicle on an average, there has to be a well-defined strategy on the data layer and good synergy between the telematic gateway manufacturer and the IoT platform would lay the foundation for a successful digital mobility experience.

**Effective Value and Use of the Data:** Effective utilisation of the data available and effective strategy to build across the algorithms and analytics layer is a must. The data must be available across platforms, services, departments and after-markets players. Also, the design and development of such analytics should be a well laid out strategy since some decisions might have to be taken on the edge and some on the cloud.

**Integration, Security and Life-Cycle:** Data Security and the maintenance of the services would be a key step in ensuring the success of such an experience. Automotive retailers and after market service providers, being the face of the OEM to consumers will have to take care of the integration and life-cycle of such offerings.

For the connected care revolution and bringing about an effective mobility experience, there needs to be an effective synergy between 5 different stakeholders:

### 1. Telematic Gateways and Device Manufacturer:

The telematics

gateway manufacture is responsible for an effective and modular gateway to connect to various vehicles and effective product development in pipeline complementing the Automotive OEM's.

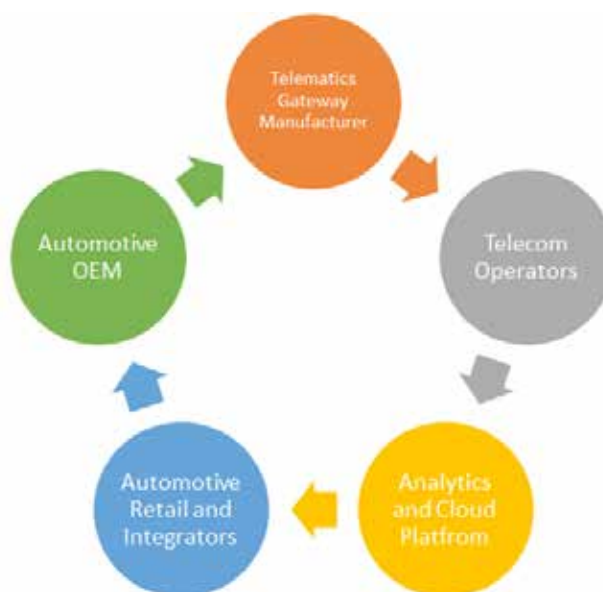
**2. Telecom Operators:** The vehicles and the gateways need to be connected to the various data networks across the globe. Telecom operators providing the embedded connectivity for such connected applications also need to take care of SIM Management and associated data privacy and security layers.

**3. Analytics and Cloud Platform:** Automotive OEM and other stakeholders in the ecosystem lack the experience to manage the vast amounts of data and device the right strategy for maintenance of such data. Building an agile and scalable framework for various applications and corresponding the AI algorithms to be run on the cloud need to be taken care by the IT providers and Cloud infrastructure companies.

**4. Automotive Retail Integrators:** Providing aftermarket services such as fleet management, service and maintenance scheduling and other applications are driven by integrators who put together the device, cloud and analytics while also taking care of the integration of the gateways onto the vehicles. The integrators are the first face to end consumers and play a vital role in the whole eco-systems

**5. Automotive OEM:** Vehicle Manufacturers and the OEM's need to work in tandem with other stake-holders to ensure that the gateways are able to effectively communicate with the ECU and the right protocols. The manufacturers and the integrators need to be work together to position a single brand image and purpose since they will always be linked to each other.

Therefore, for a successful connected mobility experience, there needs to be an active synergy between the 5 stake-



holders and bring about a change in the auto value-chain.

## Telematics Gateway and Personalisation

The telematics gateway will be positioned as the heart of the whole connected mobility transformation. Bridging the ECU Data to the cloud, the protocol conversion, the data storage, sensor-based edge analytic and other important features need be taken care by the Telematics Unit on the vehicle. With V2X and V2V communication in the near future, a single secure gateway is needed on the vehicle ensuring scalability and accessibility.

Vehicles are increasingly dependent on electronic control units (ECU) to manage the advanced features that enhance the driving experience. The telematics gateway functions as bridge the ECU used by these different applications, managing different protocols such as GMLAN / SAE 1939 / 71 / ISO 1576-5 and the external interfaces such as Ethernet / HS CAN / LS CAN and CAN FD.



The Telematics gateway also encompass sensors which can enable applications such as E-Call / Driver behaviour analysis / Idling time and other key features which can enhance the personalisation experience. With the embedded connectivity on the Telematics Unit, there can also be

effective network hotspot within the car for the passengers to access Internet and work while in the car. The Bluetooth and Wi-Fi connectivity can also provide for an interface to connect to the various sensors such as the fuel sensor, tyre pressure, door sensors enabling a single gateway for all data points within the vehicle.

Complementing the telematics gateway with Machine Learning and AI Analytics, Automotive OEM can redefine their value creation model to a more data centric approach

## Key Considerations on the Telematics Gateway and the Future

With Telematic Gateways playing a crucial role in the connected mobility, there are a few key aspects to be considered when choosing a gateway for the connected mobility transformation.

## Vehicle Interfaces and Protocols

With various interfaces available across the range of vehicles such as CAN / Ethernet, J1939 and many other. Telematic Gateways should be modular in architecture to suit the complete available range. Ethernet is available in vehicles to connect to the infotainment systems and the IP Cameras on the vehicle, J1939 being support in the heavy-duty vehicles such as trucks and tractors and CAN being the backbone of various electronics systems within a car; each network has individual application within the connected mobility ecosystem. To extend the connected mobility ecosystem, it is important for the Telematics Gateway to be able to connect to various networks to harness available data providing an extensive transformation experience.

Another key aspect to consider is the software stacks available on the TCU. With protocols such as GMLAN on the LS CAN Interface, ISO5765-4 on the HS CAN Interface, CANOpen and the list keeps growing. A scalable software on the gateway is a must to ensure interoperability and reduced development time for customised applications. With a secure and scalable software on the gateway, Automotive OEM and integrators can be assured of one multi-purpose gateway catering to various vehicles and mobility infrastructure.


## Connectivity

Another key aspect to be taken care of is the ability of the Telematics Unit to be able to scale up and down the communication based on the requirement and connectivity infrastructure. With networks such as NB-IoT, 5G, Wi-Fi 6.0 and DSRC (Dedicated Short Range Communication), the Telematics Gateway should be able to integrate with various wireless infrastructure based on the end application.

There needs to be an ideal compromise between the connectivity options, input interfaces, form factor of the gateway and the price to position as an ideal gateway for the connected mobility transformation.

## Conclusion and the Next Steps Ahead

With connected mobility being a huge ocean and the need for the automotive manufacturers to scale up the value chain while focusing on a more data centric commercial model, there are a few key questions to be answered while stepping into the telematics and personalisation experience.

1. What is the drive experience we aim to provide to complement our connected car?
2. How do we manage the huge amounts of data? Who owns the data? What is the best use of the data?
3. What is the right IoT Platform to build analytics and algorithms and who are the right ecosystem partners?
4. How do we monetize the personalization experience?
5. How do we offer the personalised experience to end customer? 

### AUTHOR



#### Tawfeeq Ahmad

Tawfeeq Ahmad leads the product marketing for Telematics Solutions at iWave Systems Technologies Pvt. Ltd with primary responsibility of driving innovation, growth and project deliveries.

With a passion for developing IoT Solutions and a background in sales and marketing, Tawfeeq aims to help Automotive OEM on their connected mobility journey.

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# ZUPPA's Cutting EDGE Data Acquisition Platform For Telematics & IoT

Zuppa one of the newest entrants to the telematics space is a completely Made In India cutting edge tech innovator who has literally descended from the Sky into Vehicle Telematics.

Zuppa's entrance into the telematics space was based on just one thought

*"We Navigate drones, click cameras using GPS location, we can track vehicles on the ground using the same GPS Technology".*

As the only company in India to have developed an Indigenous drone autopilot under the Government Of India TIFAC-SIDBI Srijan Innovation fund Zuppa's end 2 end control has enabled it to leverage its Globally Patented technology "SYSTEM OF DISSEMINATED PARALLEL CONTROL COMPUTING IN REAL

TIME " to create a unique architecture of modular platforms for Geo Location and Navigation .

## How are VT & IoT Connected to Drone Autopilot ?

The answer to this question lies in the fact that the Autopilot Of a Drone actually uses Geo Spatial Data to remotely control the Drone and fly autonomously along pre programmed paths using on board sensory data to ensure the stability and attitude of the Drone .

GPS location is also used on drones to trigger a camera for 3D Mapping Missions . ZUPPA extended use of GPS data to Develop Land Leveller as well as for Dropping seeds by controlling electric motors with Geo Spatial Data .

Hence in reality the use of Geo Spatial technology combined with sensory data is much more than just tracking the drone.

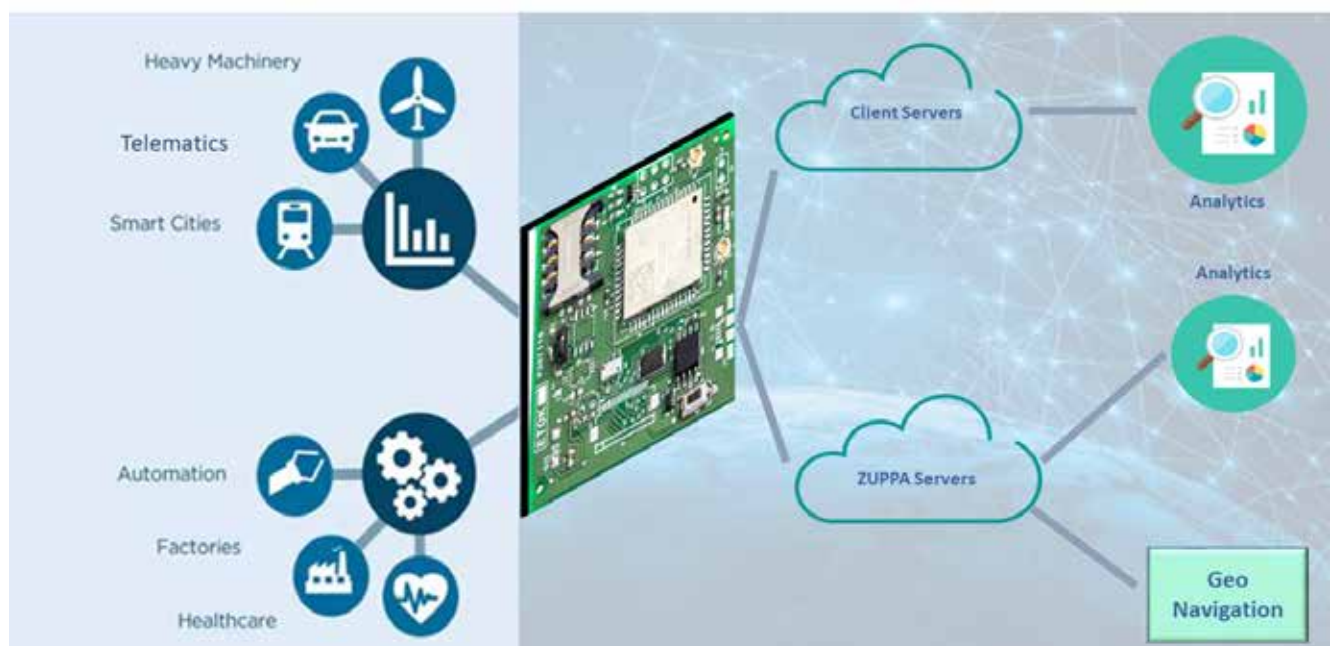
"EDGE" is Zuppa's answer to deliver economies of scale to Vehicle telematics and IoT at significantly low volumes and compete with mass produced Chinese products .

ZUPPA Developed the Edge Platform by removing the Navigation control layer from its autopilot .

Edge is a System On Chip (SOC) that can be used in stand alone or expanded using its multiple interfaces like CANBUS, MODBUS, UART, I2C, SPI, RS232, RS 485, J1979 to name a few.

Edge's exceptional unit economics is derived from the fact that majority of the

## ZUPPA *EDGE* Device's Key Role In Industry 4.0



## Edge Devices Key Enablers Of Scaling



### Routers

Edge Devices that Enabled  
The Internet and Ecommerce



### SMART Phones

Edge Devices that Enabled  
Mobile APPs Industry

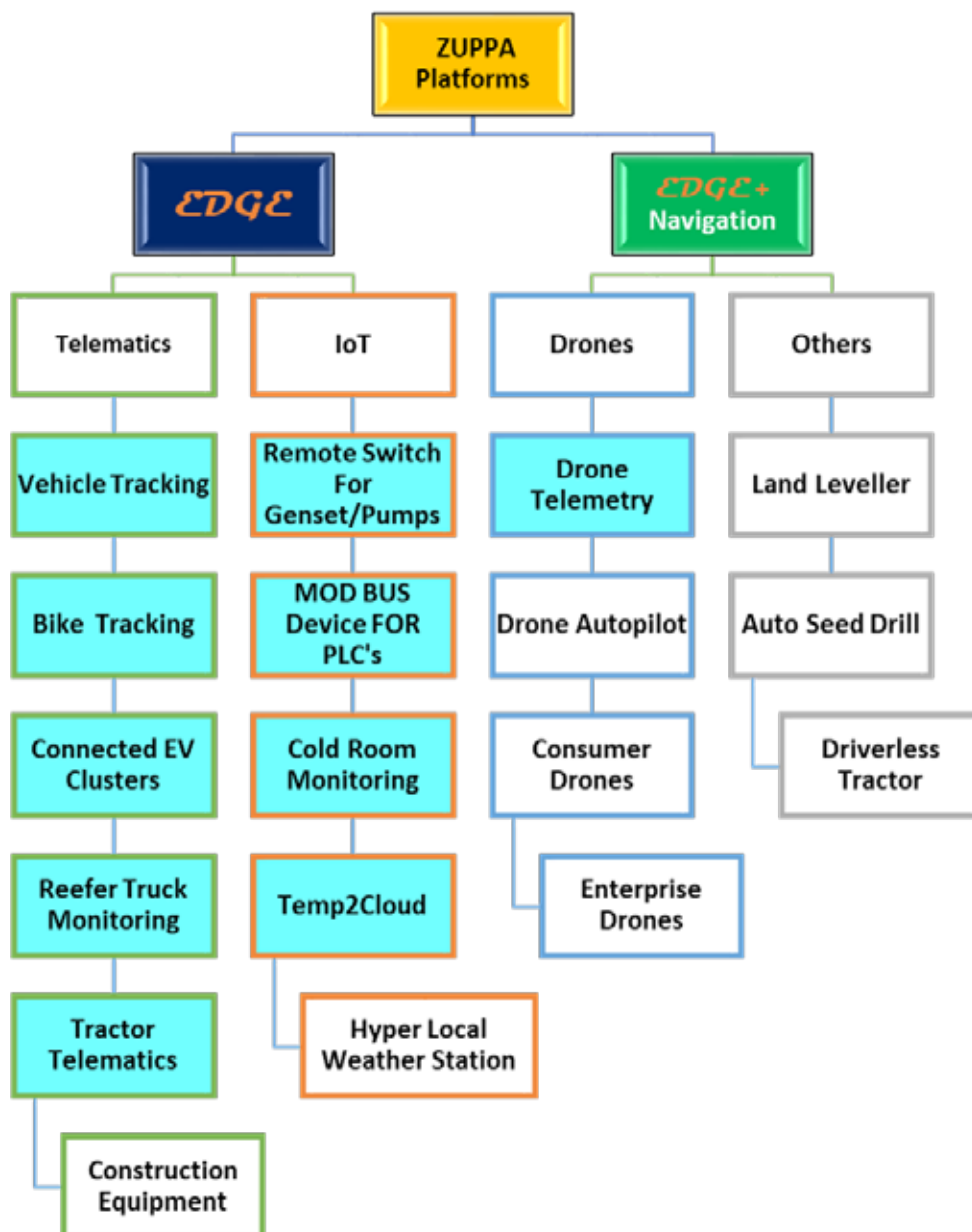


### ZUPPA *EDGE*

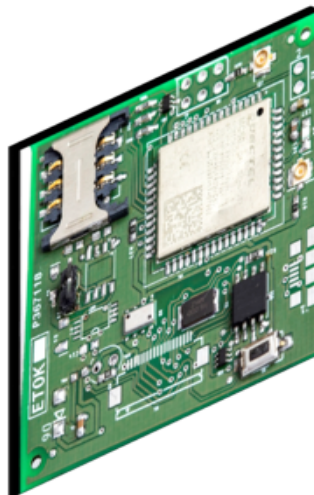
Devices to Enable Industrial  
Revolution 4.0 Applications



**EDGE is  
Zuppa's answer  
to deliver  
economies of  
scale in vehicle  
telematics  
and IoT at low  
volumes and  
compete with  
mass produced  
Chinese  
products**



Chipset = STM v7 ARM - x32 processor  
 Operating System = OPEN-LINUX  
 Processor = Media Tek - MTK 3333  
 Processor Speed = 260Mhz  
 RAM Type = NVRAM  
 RAM Speed = 128  
 Operating Voltage = 7 - 33 V (default)  
 Support = 90 V for EV with Additional Board  
 Built-in Charger Circuit = 250 mah – 2000 mah  
 Minimum Operating Temperature = -20  
 Maximum Operating Temperature= 105  
 GSM/GPRS : 2G Support  
 Quad Band support  
 GPS /IRNSS  
 Maximum Sensitivity of -160 dBm  
 Hot start - 30 sec



phone connected People Data ZUPPA  
 EDGE Enables connection of DATA of  
 Things to cloud servers and Analytics

## EDGE Technical Specifications

ZUPPA's EDGE Platform Supply Options:

1. Bare Board PCB's that can be used by OEM's with existing systems
2. White Label box assembled devices
3. Sale Of Designs with source code on Out Right / License basis

## Auto Applications Beyond The EDGE :

EDGE's modular platform architecture has enabled Zuppa to develop and deploy a range of telematics and IoT products .

Zuppa is currently working of a standard range of Connected EV Cluster modules that can be purchased and deployed from as as low as a dozen at a time to Hundreds per lot .

Zuppa's drone tech based Virtual speedometer is a unique plug and play device that measures speed with a accuracy of +/- 2km/h without the need for any other components like Cable, gears, sprockets, wheel Tick sensors etc. □

applications are software layers on top of it with the option of adding hardware layers to it as Modules .

## ZUPPA EDGE Two variants :

The Edge platform has been optimized to address two specific emerging technologies :

1. EDGE Vehicle Telematics (EVT) is a CANBUS enabled SOC manufactured using Auto Grade components meeting

2. Automotive Industry Standards AIS 140
2. EDGE IoT (EIoT) has multiple user selectable interfaces like RS232, RS 485, SPI to enable connecting PLC's, HMI's as well as sensors for temperature, humidity, ultrasound etc to cloud resources for analytics.

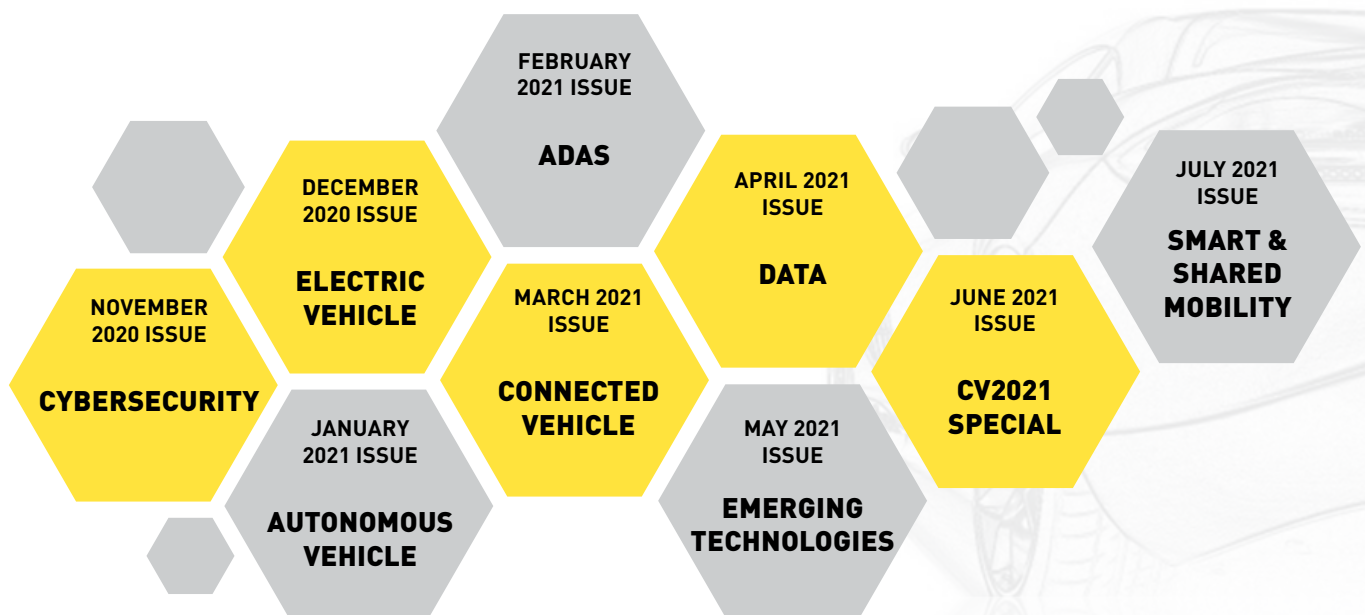
## The Edge Advantage:

Like the Routers Connected early computers to the World Wide Web and the SMART

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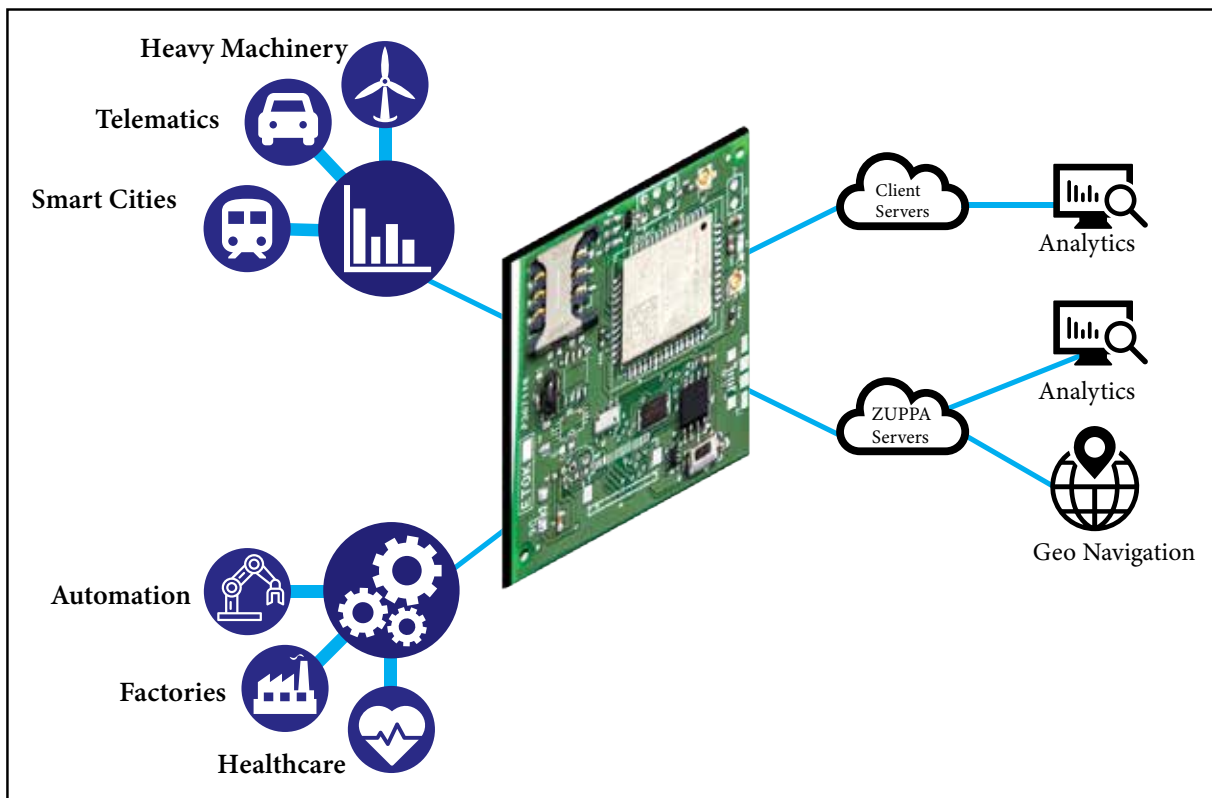
## Editorial Calendar







## ENABLING VEHICLE TELEMATICS & INDUSTRY 4.0



**EDGE** is a unique Platform that enables Developers in Vehicle Telematics, IoT, Connected Vehicles & ADAS to build applications as Software Layers like they would on Smartphones, Laptops Computers with or without additional Hardware / Sensors.

**EDGE** simplifies integration of Sensors or Additional Hardware by providing a range of interfaces like CANBUS, MODBUS, RS232, RS485, UART, SPI .....

### Contact

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Phone : +91 44 42054910

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Mobile: +91 9380577074

# ALTERNATIVE POSITIONING SYSTEMS THAT ARE BEING USED FOR FLEET MONITORING

 **SUNAYANA SENAPATI**

BIGTRUCK TECHNOLOGIES PVT LTD

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**Y**our ability to manage the fleet of your trucks can make or break your trucking business.

A big part of managing your fleet of trucks is remotely monitoring driving patterns. Technologies these days allow you to track the routes taken by your drivers, how carefully they drive your vehicle, how often they accelerate or suddenly hit the brakes, how many times they stop on their way to the destination, and for how long, and many more insights.

With the hard, indisputable data you can reduce chances of accidents and challans, cut down or eliminate pilferage, bring down fuel consumption costs, ensure better and timely deliveries, improve the safety records of your drivers, and increase the longevity of your fleet of trucks.

Fleet management technologies also help you logistically. Over a period of time, you have enough data to find out how much time your fleet takes to move from position A to position B within the safe speed limits and at which touchpoints a particular truck is going to be along the route, at what times. This gives you better predictions, helps you set up maintenance schedules, and prepare efficient estimates for your customers.

Multiple technological options are available to you if you want to implement an efficient fleet monitoring system. Two prominent alternatives are

1. GPS-based fleet management system
2. SIM-based fleet management system.

Both have their pros and cons and it all depends on the objectives and goals

of your operations on how you make the right decision for your trucking business.

## **GPS-based Fleet Management System**

GPS stands for Global Positioning System which is basically a satellite-based navigation system. One of the greatest benefits of using a GPS system is that it works in any weather, anywhere in the world, anytime and usually, without a subscription fee or a setup charge.

If you use Google Maps or other map applications you prefer, it uses GPS technology in the absence of an Internet connection. This means, whether there is Internet connectivity or not, for your directions you can always depend on GPS technology.

A caveat is, the accuracy of your GPS system depends on how many satellites it can connect to. For example, to transmit latitude and longitude coupled with track movement, your GPS receiver must be locked onto the signal of at least 3 satellites. In GPS lingo, this is called 2D positioning.

For 3D positioning – latitude, longitude, and altitude – your GPS receiver needs to link with at least 4 satellites or more.

## **SIM-based Fleet Management System**

Alternatively there are other technologies used for monitoring fleet management, like the SIM card instead of the GPS connection.

Instead of directly connecting with the satellite, your device, whether it is a

mobile phone or a tablet or a standalone device bearing the SIM card, sends the data to the central computers via a cellular network.

A typical device used in telematics comes with built-in technologies such as an accelerometer, gyroscope, and light sensors. These technologies can be combined to gather data such as acceleration, sudden halt, movement and stillness, and direction and speed. It also captures the traditional GPS data and then beams everything to the cloud, or the server supposed to store and process the information.

Even if there is no connection with a cellular service, the data is temporarily stored on the device until a connection is established.

## **Benefits of SIM-based fleet management technology compared to the GPS technology**

The immediate benefit of implementing telematics or SIM-based fleet management systems for your trucking business is a fast implementation, aside from the fact that comparatively, it is way cheaper than installing GPS-enabled devices in all your trucks.

Every truck driver these days has a mobile phone. Every standard mobile phone comes with all the technologies needed to gather the data that you need to manage your fleet of trucks. Every mobile phone has a SIM card. The SIM card is already connected to one or another cellular network.

All you need to do is, install the mobile app connected with your fleet management system, get the mobile phone number registered with your SaaS setup and the tracking is initiated. Every movement is tracked. Every peculiarity is registered. As long as your driver has his phone with him, you don't need to bother with any other device.

Another benefit of using the mobile phone or the tablet (bearing the SIM card) is that your driver can also capture additional data such as manually inputting information or capturing documents like invoices and receipts with a phone camera and immediately transferring the images to your central server.

On the other hand, the GPS technology is better suited for finding a destination while your driver is driving the truck. The data, even if it is limited to just a few parameters, is not as accurate as the data provided by the telematics technology. Whereas GPS technology caters more towards the driver, the sim based technology caters more towards your fleet management system.

## How Bigtruck Technologies and Fleet Intelligence are Revolutionizing Fleet Management

Bigtruck Technologies has carved out a name for itself for providing end-to-end IT-based services to road transportation businesses. Whether you are a trucking company or a business requiring the services of a trucking company, our SIM card-enabled fleet management system allows you to track the precise movement of your fleet or consignments, helping you manage your resources more efficiently and economically.

Being at the forefront of fleet management IT solutions, Bigtruck Technologies has made significant advancements in the field of SIM-based fleet tracking solutions that give our customers real-time actionable insights and data. Our team in Bigtruck Labs are constantly doing their research in the advanced alternative positioning systems that will enable scores of trucking businesses to bring down their operational costs, mitigate risks, and improve their bottom line by accurate tracking and big data analysis.

Bigtruck is also working on launching better products and solutions in the market that will leverage the telematics technology for more accurate data gathering, sturdiness, and reliability.

We strongly believe that every fleet management system is as good as the data it is able to gather. Telematics, benefits of GPS technology and the inherent features of an average mobile phone can create a singular and powerful fleet management solution for precise data gathering and accurate analysis.. □

### AUTHOR



#### Sunayana Senapati

Bigtruck Technologies  
Pvt Ltd  
Vice President -  
Corporate Brand and  
Communications

Self directed and driven Vice President of a technology logistics company for their internal and external communications with comprehensive accomplishments leading public and media relations, multi channel media management, product adoption and training cross functional teams to ensure success and achieve goals.



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# 5G HITS THE ROAD TOWARDS NEW AUTOMOTIVE CONNECTIVITY STANDARDS

 **MANFRED LINDACHER**  
QUECTEL WIRELESS SOLUTIONS

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**T**he automotive industry is working on additional standards to make 5G technology suitable for vehicles as the connectivity becomes more widely available. Manfred Lindacher, the vice president of global sales for the international automotive market at Quectel Wireless Solutions, explains how the industry is standardizing on cellular V2X and DSRC.

From where I sit at the heart of the German automotive industry in Munich, Germany, it's clear that the industry is currently defining additional standards, exceptions and use cases to make 5G suitable for use in a connected car. From the standardization side this is happening in the 5G Automotive Association, an organization backed by participants from across the connected cars industry including car manufacturers, tier one automotive suppliers, chipset-makers and infrastructure companies. The initiative is also supported by network operators and modem manufacturers who are drawing on their experiences of automotive use cases.

The focus is not only on 5G technology, but also on the cellular V2X (C-V2X) standard, which largely addresses automotive applications. 5G roll-out is happening now and as the footprint enlarges it will make the decision to adopt C-V2X technology easier. This is significant because there are two technologies on the market and the regulators in most countries have not made a clear statement about which standard – dedicated short range communication (DSRC) or C-V2X - they will support.

Most regulatory bodies have reserved spectrum for both technologies but this has not proved helpful, since both technologies are based on completely different standards and

are not able to interact with each other. As V2X mainly addresses traffic safety, having a common technology is mandatory.

Greater clarity is coming, though. China has made a clear statement so there is no doubt the country will engage in C-V2X technology but, if you look into the other big markets, things look different. In the US, there is still spectrum reserved for DSRC, while the European Union released a clear recommendation for C-V2X on one day but corrected its position to a neutral one right after. Therefore, it is difficult for the whole industry to take decisions because there is still uncertainty regarding the technology.

It's not only standards processes that cause delay. From a technology perspective, cellular standards have become more and more demanding to implement as the mobile generations have proceeded. The 2G standard, for example, required antennas to support – depending on the geographical market – just two frequency bands, 900 megahertz (MHz) and 1800MHz or 850MHz and 1900MHz. With 5G we're now talking about having multiple spectrum bands below 6 gigahertz (GHz), which might be extended, when car makers start to use millimeter-wave technology for stationary use.

In addition, the bandwidth availability is significantly increased by carrier aggregation, which is demanding to set up on both the modem and the antenna side. To illustrate the complexity, in today's industry we are currently talking about 4x4 MiMo setups. This is something the automotive industry cannot avoid engaging in because the performance enabled by the complex set-ups will be critical to enabling the user experiences predicted by the 5G headlines.

## AUTHOR



**Manfred Lindacher**  
VP Sales Automotive International  
Quectel Wireless Solutions

## Safety first

For advanced driver assistance system (ADAS) above level 4, where the car takes over the control completely and the driver has no involvement, large amounts of real-time data are required. For these robo-cars, greater bandwidth and lower latency of 5G is urgently required. The market recognizes this hence the focus on 5G by organizations such as the 5G Automotive Association and its members. □

# FLEET MANAGEMENT PROCESSES: HOW TO OPTIMIZE YOUR FLEETS IN 2020

 **STEVEN ROBERTS**  
OPTIMOROUTE

---

**I**n industries that rely heavily on transportation (like trucking, food delivery, and more), the cost of running and maintaining a fleet of vehicles is a significant portion of your total operating cost.

A single truck tractor in a shipping fleet, for instance, cost an average of \$166,632 in 2019.

And that's only for for-hire fleets. Company-owned fleets were up to 60% more expensive because of additional operating expenses.

## How can you reduce the costs for every vehicle at scale?

The answer is fleet management.

Fleet management is a discipline (and occupation), dedicated to operating fleets more efficiently and lowering your business' yearly costs without negatively impacting performance and client relationships.

In this article, we'll cover exactly what fleet management is, its benefits, and how fleet management software can help your business.

## What we'll cover:

- What is fleet management?
- What is involved in fleet management?
- FMS vs. Route Planning
- The One-Two Punch of Fleet Management + Route Optimization
- Final Thoughts

## What is Fleet Management?

Fleet management is a discipline that focuses on optimizing the whole lifecycle

of your fleet, from financing and leasing to maintenance, compliance, vehicle tracking, driver management, and more.

Fleet management helps you reduce costs across the board, lowers the chances of accidents and breakdowns, helps you to buy and sell commercial vehicles at the optimal times, and more.

## Fleet management systems (FMS)

Fleet management systems (FMS) are used for asset tracking and maintaining vehicle fleets in a company. They also help companies monitor driver safety and uphold legal regulations such as the ELD (Electronic Logging Device) Mandate.

They use GPS tracking and sensors to monitor how vehicles are being driven. That includes tracking the real-time location of the trucks, monitoring their fuel levels, speeds, sudden breakage, engine fault codes, and more.

For some fleets, an ELD-compliant hardware tracking system that integrates with the engine to track hours of service (HOS) is required by law.

## What Is Involved in Fleet Management?

Fleet management starts with the financing of and purchase of a vehicle and ends with remarketing or reselling. It includes everything in between as well, from fleet maintenance and compliance to tracking vehicle and driver performance.

To truly understand what it involves, a surface-level view is not enough. Let's take a closer look at the different elements

of fleet management.

## Vehicle acquisition

A fleet manager must not only locate suitable vehicles (based on capacity, refrigeration, mobility, etc.), but negotiate the right price and finance the purchases or leases in line with the company's budget.

## Vehicle maintenance

Likewise, a manager should leverage the company's position (having a large number of cars, trucks, or vans), to negotiate beneficial maintenance deals. They must also develop a maintenance plan or program to ensure that there is minimal downtime or accidents.

Monitoring data on vehicle usage like sudden breakage and engine fault codes can help guide maintenance decisions. Keeping a roadworthy fleet is essential.

## Driver safety and compliance

Maintaining fleet safety is a crucial responsibility for trucking companies. They must ensure that their drivers follow the regulations, and drive safely, through implementing an ELD, dashcam systems, or other measures.

## Fleet tracking and monitoring

Most FMS providers use dedicated telematics devices to track location by GPS and monitor the condition of each vehicle — checking RPM, fuel consumption, and engine fault codes.

With smartphones and mobile apps

for fleet management, it's possible to implement GPS-tracking of all your drivers and vehicles at scale without extra hardware.

## Driver retention

Keeping your drivers employed for the long term is more important than ever. There was a truck driver deficit of over 60,800 in 2018, and it's expected to double over the next ten years.

## Meeting increasing cost pressure

With new freight and trucking platforms and marketplaces like UberFreight, there's more pressure than ever to keep costs down. If you can't match the prices on these new apps, it's easier than ever for existing clients to replace you.

This extra cost pressure creates a unique challenge, as you need to pay drivers enough to keep them, offer competitive prices, while also keeping your profit margins intact.

## Fuel consumption

Fuel management, reducing mileage with more efficient routes, and cutting fuel costs through optimizing fuel stops is another critical responsibility of a fleet manager.

## Vehicle remarketing (selling used fleet vehicles)

A fleet manager must pick the ideal time to sell the used trucks or cars. They have to consider complicated factors such as vehicle condition, current shipping demands, sales channels, and more.

## FMS vs. Route Planning

Fleet management solutions focus on control, compliance, driver safety, and vehicle maintenance. Essentially, these tools streamline your business' internal management processes for fleet operations.

Route planning systems, on the other hand, help companies efficiently plan and schedule delivery routes. They consider complex business constraints and objectives during route planning and can drastically improve the efficiency of your entire fleet.

## FMS software can offer limited route planning tools

FMS solutions sometimes have limited route planning capabilities. For example, some offer your business the ability to sequence stops for a single vehicle or driver at a time. But they don't consider unique requirements such as time windows, vehicle load capacities, driver hours, breaks, and more.

Even when this functionality is on the table from an FMS, it's a limited solution that does little to optimize your route planning processes.

## Route planners track driver location but don't have vehicle telematics systems

Route planning systems often have a mobile application used to track drivers and vehicle location. You can use the real-time data to evaluate driver performance and assign last-minute orders efficiently based on your fleet's live location.

However, route planners don't include telematics, so they don't track vehicle data points in the same way as FMS. An FMS system tracks data from the vehicle control unit (such as fuel consumption) and external sensors (such as dash cams or temperature sensors).

Vehicle telematics is excellent for monitoring the fuel usage and maintenance status of an enterprise fleet. But it's not a prerequisite for all companies that handle deliveries internally.

## FMS vs. route optimization use cases

For larger organizations, it can often make sense to have both FMS and a route planning system in place to address different business needs. In fact, that's exactly what many of our clients do.

For instance, Hardie's Fresh Foods is a food distribution company in Texas with a fleet of 160 trucks making thousands of deliveries every day.

Hardie's uses an FMS to manage its vehicles and ensure that its trucks are inspected and maintained to perfect condition and that drivers comply with all regulations.

They also use route optimization and

planning software to help them plan routes and driver schedules.

This combination has enabled Hardie's to plan eight times more efficiently while lowering mileage and increasing delivery capacity.

Because Hardie's has a large fleet of refrigerated trucks that are subject to regulations like the ELD mandate, an FMS system is necessary.

The crux is this: large enterprise or government fleets might need FMS tools, but they also need an efficient route planner to maximize deliveries and revenue.

But enterprise fleet management isn't relevant to a small field service company or food delivery service. For example, if your drivers have their own vehicles, you don't need an FMS solution, but you still need route optimization to manage your drivers efficiently.

Route planning/optimization will help your dispatchers plan efficient routes and schedules while respecting different constraints and ensure better last mile delivery, with GPS tracking features for better managing your workforce.

The One-Two Punch of Fleet Management + Route Optimization

When used alone, FMS tools help you manage and maintain your fleet of vehicles, ensure compliance, and optimize fuel stops for recurring routes.

But that's it.

That's why it's best to combine FMS with a route optimization tool so that you can improve the efficiency of your planning, loading, and delivery routes as well. A combination of both will give you the best of both worlds.

Here are the leading benefits of using FMS and route optimization in combination:

### 1. Reduce operational costs and increase profitability per vehicle

An FMS system will help you purchase and sell vehicles for the right price at the right time. It will help you optimize fuel stops, improve driver safety, and lower maintenance costs and liability. As a result, you can reduce your fleet's operating costs significantly.

Route optimization will help you increase revenue and profitability by optimizing the



number of orders and deliveries completed by your existing fleet. It will also help with efficient load planning, address the last mile problem, provide your drivers with the most efficient routes, and help your team quickly and efficiently create weekly schedules that will increase productivity across the board.

The example we mentioned above, Hardie's Fresh Foods, used a route optimization software to reduce mileage by 20% with 12% lower driver cost for the same deliveries.

On top of this, their delivery capacity increased by 14%, leading to 330 extra deliveries each day from its existing fleet of trucks and drivers.

Plus, with real-time order tracking and automated email and SMS notifications, you can minimize failed deliveries and improve your shipping accuracy.

## **2. Keep track of your drivers and their performance**

With real-time GPS-tracking, you can keep track of all your drivers and cargo loads, as well as the individual performance of your drivers.

Positively reinforce good driving habits/driver behavior and reduce fuel consumption by creating individual driver fuel efficiency ratings.

Harsh braking and acceleration can be tracked by most FMSs, letting fleet managers identify the drivers at fault and prevent any wear and tear in the future.

## **3. Ensure better driver safety and eliminate potential liability issues**

With more accurate forecasting, you can schedule driver breaks ahead of time and use driver ELD apps to ensure they are taking enough breaks.

You can also use dash cams and other measures to ensure drivers focus on the road at all times. Trucking liability lawsuits are getting more and more expensive for trucking companies, with a record-breaking \$280 million dollar fine ordered in 2019.

## **4. Catch issues early with real-time vehicle diagnostics**

Proactively spot problems such as failing batteries and engine fault codes through the telematics system installed in each vehicle.

Avoid road breakdowns and quickly identify vehicles in need of service to protect vehicle health and extend vehicle lifetime.

## **5. Keep drivers for longer with healthier workloads**

With workload management tools, you can help your drivers maintain a healthier work-life balance and lower overtime costs at the same time. There is a real drought of commercial drivers, so lowering turnover is key to growing your business and keeping your capacity high enough to deal with demand.

A good route optimization software uses a feature that evenly spreads out deliveries and orders across drivers based on parameters that a fleet manager or dispatcher can quickly select using a slider.

Driver qualifications, break times, workdays, days off, any specific time windows that the driver cannot work are all factored in, and all are handled automatically by your software.

You can also set the schedule and break settings for individual drivers to ensure that you uphold regulations and that the order distribution matches their real work hours.

According to several state laws, drivers must receive at least one paid 10-minute rest period or longer break for every 4 hours worked or major fraction thereof; as practicable, in the middle of each work period. However, this is not required for employees whose total daily work time is less than 3 and ½ hours.

In the EU, drivers must get a break or breaks totaling at least 45 minutes after no more than 4 hours and 30 minutes of driving.

## **6. Ensure driver and vehicle compliance**

With an FMS system, you can make sure that your drivers comply by using ELD time tracking to monitor their schedules and breaks.

You can also use the management software to schedule checkups and maintenance, and measure essential fleet data to ensure your vehicles are roadworthy at all times. That includes regular checks at the DMV.

## **7. Automate complex workflows**

Many industries have complex restrictions and regulations that impact individual orders and deliveries.

With route optimization software, you can account for these restrictions by setting time windows, vehicle requirements, equipment, skill and qualification requirements, and more at the order level. Your software will help you efficiently manage complex orders at scale, easily handling over 100 daily deliveries per driver in a few minutes.

GPS-tracking and geofencing ensure that your drivers don't deviate from designated territories, and makes it possible to automatically redistribute deliveries based on the live locations of your drivers — for example, when a driver calls in sick, or a batch of last-minute orders come in.

## **8. More efficient planning and increased scalability**

With a manual approach, your dispatchers and managers will spend too much time on menial planning tasks. That will make it difficult, if not impossible, to scale your business without improving your systems and processes or expanding your team.

With a route optimization software, fire safety provider Telgian was able to spend 82% less time on planning, cut its operational staff by 66%, and increase its order volume by 70% at the same time.

As a result, Telgian has recorded an impressive YoY growth of 19% over the past three years.

## **Final Thoughts**

If your business relies on managers that keep track of different drivers, loads, and routes by using a mix of outdated software and spreadsheets, you won't be able to get the best results.

Route optimization can improve the efficiency of your fleet, with or without an FMS in place. By itself, it will help you reduce planning time and fuel consumption, save you money on overtime costs and driver wages, and much more.

This article was originally published at [OptimoRoute.com](https://OptimoRoute.com). 

## Smartcar and Pitstop partner on vehicle diagnostic and maintenance platform

Pitstop and Smartcar will be working on fleet maintenance solution for enterprises in the United States and Canada. Using Smartcar's API for mobility platforms, Pitstop customers can access all the data on any digital platform. The cloud-based prognostic maintenance platform unifies data from across the automotive industry to provide maintenance dashboards to vehicle fleets. Fleet managers can log in with their connected services credentials and review exactly which types of information Pitstop will be able to retrieve from their vehicles. Once onboarding is complete, Pitstop is able to retrieve the location, odometer reading, fuel tank level, tyre pressure, and remaining engine oil life from each vehicle in order to inform prescriptive maintenance plans and detect potential issues and testing location.

## Pony.ai and Bosch partner on AV fleet maintenance



Pony.ai announced an agreement with Bosch to explore the future of automotive maintenance and repair for autonomous fleets. Pony.ai and Bosch's Automotive Aftermarket division in North America plan to develop and pilot innovative fleet maintenance solutions to enable the efficient and scalable operation of future commercial autonomous fleets. Pony.ai says it began operating a maintenance program with Bosch in the San Francisco Bay Area in early July.

Pony.ai is following the footsteps of rival Waymo, which has maintenance contracts with Avis and AutoNation. Meanwhile, autonomous truck startup TuSimple recently announced it would partner with Penske's truck leasing division for preventative inspections.

## TTC Group and Collision Management Systems partner to create fleet driver safety product

TTC's new Continuum Dynamic Data Engine will have CMS's telematics data aggregation technology and its own driver risk management solution. The initiative provides managers and users with a real-time, personalised driver risk management programme. The joint proposition allows fleet operators to connect any existing devices such as connected vehicles, telematics units, mobile apps or connected cameras to the system. Which then aggregates the information into a standardised format for comparable and consistent insights.

Data collected by the Dynamic Data Engine is analysed and displayed within the TTC Continuum portal.

This allows users to enhance their risk insights with full visibility of all fleet, driver and remote worker risk-related data. Real time alerts notify of any critical incidents, whilst system analytics allow personalised driver training and e-learning to be delivered automatically to each driver.

## LG Elec to supply automotive telematics systems to Honda

LG Electronics has signed the contract with Honda for supply of telematics system. Automotive telematics systems for Honda Motor will be produced at LG Electronics' manufacturing lines in Incheon, Korea and Haiphong, Vietnam.





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# Ford and Bosch announce demonstrative automated parking demo



Ford Motor and Bosch along with a real estate development partner- Bedrock; are launching a demonstration project with connected Ford Escape test vehicles that can drive and park themselves inside Bedrock's Assembly Garage in Detroit using Bosch

smart infrastructure. Its an infrastructure-based solution for automated valet parking where the vehicle will park itself inside a parking garage.

The connected Ford test vehicles operate with a highly automated manner by vehicle-to-infrastructure (V2I) communication with Bosch's intelligent parking infrastructure. The infrastructure sensors recognize and localize the vehicle to guide its parking maneuver, including the power to assist avoid pedestrians and other hazards. If the infrastructure senses something in the vehicle's path, it will stop the vehicle immediately. Upon arriving into the garage, a driver will leave the vehicle in a designated area and use a smartphone app to send the vehicle into an automatic parking maneuver. Drivers will also use the app to request the return of the vehicle to the designated pick-up area, expediting the parking experience and removing the responsibility of finding the vehicle upon return to the garage.

## Veoneer and Qualcomm to develop platform for ADAS and autonomous driving system

Veoneer and Qualcomm Technologies have decided to collaborate on developing a platform for ADAS and Autonomous Driving solutions. Veoneer's perception and driving policy software stack and Qualcomm® Snapdragon Ride™

ADAS/AD portfolio of System on a Chip (SoC), and Accelerators, will be used to create an open platform for Tier-1 suppliers and automakers. The companies expect the integrated platform to be available through automotive Tier-1 suppliers

or directly to OEMs for 2024 vehicle production. The integrated platform with Veoneer's software stack will be built on the scalable Snapdragon Ride, offering industry L1 ADAS to L4 Autonomous Driving SoC and Accelerator products.

### VSI Labs to use Siemens Pave360 for its autonomous vehicle development

VSI Labs, announced that they will be using Siemens' PAVE360 platform for validation and testing of all processors, electronics, sensors and systems powering the VSI Labs Capability Demonstrator — an autonomous vehicle.

Siemens' PAVE360 pre-silicon autonomous validation environment delivers a comprehensive platform for multi-supplier collaboration across the automotive ecosystem. PAVE360 can extend simulation capabilities beyond processors to create digital twins that include automotive hardware and software sub-systems, full vehicle models, fusion of sensor data, traffic flows, and even the simulation of smart cities through which self-driving cars will ultimately travel.

### Altair acquires Ellexus

Altair, a global technology company providing solutions in data analytics, product development, and high-performance computing (HPC), announced the acquisition of Ellexus, a leading input/output (I/O) analysis tool, which helps customers find and address issues quickly, improving speed accuracy and cloud readiness.

The Ellexus software products, Mistral and Breeze, are used for I/O diagnostics, optimization, and dependency detection by HPC administrators of large enterprises. Altair plans to integrate them into the storage aware scheduling functionality of Altair PBS Works.

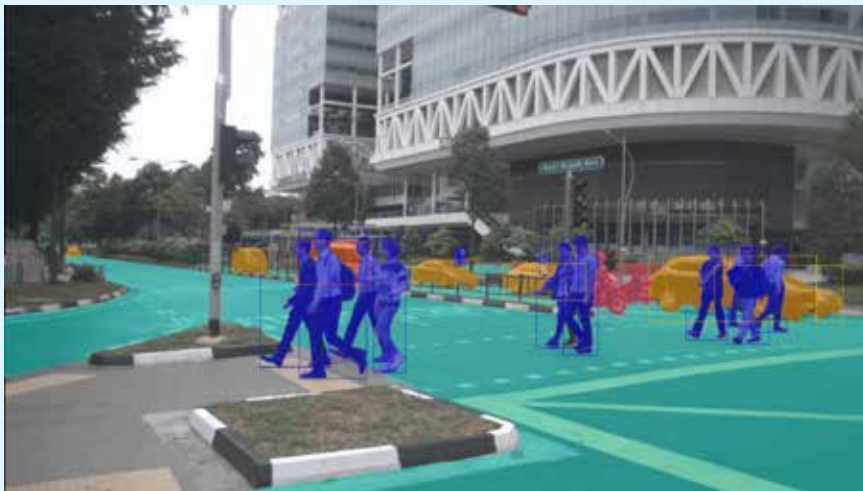
## Hesai Technology releases Pandar128 LiDAR for autonomous vehicles

Hesai, officially released its next-generation mechanical LiDAR, Pandar128.

Pandar128 offers horizontal resolution up to 0.1° and features a detection capability of 200 meters @ 10% reflectivity. It offers ingress protection (IP6K9K), ensuring reliability altogether weather conditions. It retains a little form factor: it is just 7 mm taller and weighs just 1.63 kg. It has power consumption is 27 W (10 Hz). Its sensor data is encoded to safeguard against data misrepresentation or falsification.



## Motional expands dataset for safer autonomous driving



Driverless technology company Motional has announced an expansion to its publicly available

nuScenes dataset for autonomous driving industry. It launched as a collection of 1,000 urban “street-

scenes” in Boston and Singapore. Motional reports, the scenes, composed of millions of photos and data-points collected from the vehicles’ full sensor suites, were then meticulously hand-annotated, and used to inform and advance machine learning models with the aim of building the safest possible self-driving vehicles.

Since release, Motional claims more than 8,000 researchers have used nuScenes, with some 250 scientific papers published using the data. Since 2018, Motional has also operated public robotaxi fleet in Las Vegas, providing more than 100,000 rides.

## Bosch developing hydrogen fuel-cell powertrain

Bosch is developing the fuel-cell powertrain primarily with a focus on trucks, and the company plans to start production in 2022–2023. Once they have become established in trucks, Bosch fuel-cell powertrains will explore usage in passenger cars.

Factors supporting this argument include climate neutrality, the high energy density of hydrogen, and efficiency. In the EU-funded H2Haul project, Bosch is working with other companies to build a small fleet of fuel-cell trucks and put them on the road. Additionally, to mobile applications, Bosch is developing fuel-cell stacks for stationary applications with solid-oxide fuel-cell (SOFC) technology. One intended use for them is as small, distributed power stations in cities, data centers, and charge points for electric vehicles.



### Algolux's updated embedded perception software for ADAS and autonomous vehicles

Algolux announced recently its Eos Embedded Perception Software. This new release delivers benefits for vision-based ADAS, autonomous vehicles, smart city, and transportation applications. Algolux developed a re-optimized end-to-end architecture and a novel AI deep learning framework. This reduces model training cost and time by orders of magnitude and removes sensor and processor lock-in, something not possible with today's learning methods.

### u-blox and Sisvel settle issues and sign license agreement

u-blox and Sisvel recently signed intellectual property license agreement, with Sisvel covering the sale by u-blox AG (u-blox) of its 2G, 3G and 4G products for a defined term. Litigation between the two companies has been dismissed.

### Global Traffic Technologies launches Opticom 360, an AI-powered, cloud-based telematics platform



Global Traffic Technologies, LLC (GTT) announces the launch of its smart city platform for mobility management, Opticom 360. The platform uses the power of Artificial Intelligence to supply an integrated suite of fleet management applications, including vehicle location, driver performance and a number of options to reinforce efficiency and safety, including traffic signal priority control.

Opticom 360 is made on cloud technology stack, leveraging video data and traffic light priority data, to simplify smart city operations and supply holistic situational awareness. The underlying AI engine can run through multiple terabytes of data instantaneously to supply analytics, alerts and actionable insights. The platform can easily integrate with other city infrastructure and mobile assets to shape cities' connected futures.

vehicles in next five years. It will also give 'scrapping incentive' under the electric vehicle policy.

### VIDAR: A new technology for digital city

VIDAR™ stands for vibration detection and ranging. It has been developed by FiberSense, founded by Mark Englund. VIDAR combines the range that RADAR provides with the classifying ability of SONAR. It also uses existing telecom fiber assets to detect and capture vibrations from nearby objects. These vibrations are transmitted to a digital platform called SuperSoniQ, which uses digital signal processing (DSP) and AI to capture, analyse, classify, and even action these vibrations.

FiberSense says it's also building an entire digital city grid by using its VIDAR technology. The grid will digitize and capture all vehicles in real-time. This can particularly help autonomous vehicle technologies.

### Otonomo's self-serve platform and API deliver secure access to car data

Otonomo announced the launch of its Self-Serve Platform and API, which give hassle-free, online access to real-time and historical, aggregated connected car data. The Otonomo Self-Serve Platform offers many features like easy-to-use geofencing, dynamic filtering, configurable APIs and visual data report generation capabilities, enabling developers to tailor the car data to their needs.

### Road Ready announces trailer telematics program with Vaughan Xpress

Road Ready from Clariance Technologies, LLC, has announced an agreement with Vaughan Xpress to integrate its trailer telematics system into the fleet's trailers. Road Ready is a wireless, multi-functional trailer monitoring system which is customizable for any fleet requirement. It offers fleets an overview of a trailer's environment, both inside and out, using a suite of customizable wireless sensors. The Master Control Unit's (MCU) long-life battery allows Road Ready to gather data from untethered trailers, and the intuitive user interface displays trailer location and condition in real-time and automatically develops reports to gain insight on fleet asset utilization.





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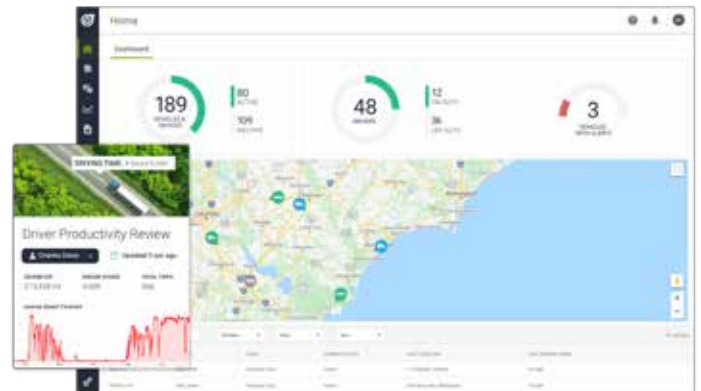


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## Teletrac Navman launches vehicle telematics solution

Teletrac Navman has launched TN360, which is powered by artificial intelligence for its vehicle telematics functionalities. Teletrac Navman vehicle telematics solution uses scalable cloud ecosystem that connects data from sensors, cameras, mobile and third-party applications in real time and translates raw signals into context. This helps identify traffic obstacles, distance between objects and predict potential safety hazards both on the road and inside the driver cabin. It allows managers to take corrective action as soon as impactful outliers occur.

The solution is available immediately in the United States, Australia, New Zealand and the United Kingdom. Teletrack Navman manages over 550,000 vehicles and assets for more than 40,000 companies around the world.



## Antzertech's MQTT vehicle tracker



Antzertech, has announced support for the standard-based MQTT protocol in its vehicle tracker products. MQTT brings advantages to customers and strengthens Antzertech's industry-leading portfolio of vehicle tracker products.

Antzertech's MQTT-based trackers consume less

network bandwidth and have more reliable connectivity and better real-time response. As MQTT is a standard protocol widely utilized in IoT applications, customers can find out their fleet management platforms in public or private clouds. Antzertech's vehicle trackers also enable customers to save lots of significant costs because of MQTT's light data load – without compromising trackers' rich features.

MQTT is an open standard protocol made for constrained devices and low-bandwidth, high-latency, or unreliable networks – typical for vehicles in fleet management applications. Compared with HTTP, MQTT features faster response and throughput, also lower battery and bandwidth usage, making it compatible for fleet management applications where connectivity is intermittent, bandwidth is at a premium, cloud applications got to interact with multiple tracking devices, and reliable data transmission is a key requirement. Because of MQTT's low bandwidth requirements, users can leverage low-cost data plans or LPWAN like LTE-M or NB-IoT.

## Teltonika launches Asset Tracker Easy

Teltonika has launched Asset Tracker Easy Teltonika TM2500. This unit is suitable for valuable goods tracking, wire reels, tools, construction equipment, containers, wagons, scissor lifts and many other non-powered assets. Its Features include- 1 year of battery life sending records once per day, Water and dust resistant for outdoor integrations (IP67); Convenient OTA (over-the-air) updating through user-friendly applications; Synchronized records sending and wake-up scenarios; and Magnetic, strap, and additional holder mounting possibilities



## Update on vehicle scrappage policy

Shri Nitin Gadkari, Hon'ble Minister, Road Transport and Highways, said on 5th Sept'20, that the much-awaited vehicle scrappage policy is in its final stages of approval. The Union Minister while addressing the 60th annual session of the Automotive Component Manufacturers Association of India (ACMA) said the policy could be rolled out within a month.

Shri Gadkari reiterated that India has the potential to become a hub for automotive manufacturing globally in the next five years. Urging the auto industry stakeholders to reduce import dependency, the Union Minister said the government plans to increase import duties on certain imported parts in the near future.

## Govt readies incentives for 7,000 E-buses, 55,000 E-cars, 1 million two-wheelers

Heavy Industries and Public Enterprises Minister Prakash Javadekar said in Lok Sabha that the government had provided a demand incentive of ₹950 million (~US \$12.9 million) towards 27,201 electric vehicles (EVs) until September 10, 2020.

These incentives have been provided under the second phase of the Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles (FAME) program.

Apart from this, the minister added that 5,595 electric buses had been approved for several states and city transport undertakings under the FAME II program. This also includes a government incentive of ₹28 billion (~US \$380.5 million).

The minister further added that during the Phase II of the program, 2,636 EV charging stations were approved at the cost of ₹5 billion (~\$67.9 million) in 62 cities across 24 states and union territories.

During the first phase of the program, the department had allocated 425 electric and hybrid buses to many cities in the country at an approximate cost of ₹2.8 billion (~US\$38.05 million). The government has made a budgetary allocation of ₹6.93 billion (~US\$94.17 million) for the second phase of the program for the financial year 2020-21.

The government is all set to assist with demand incentives for 7,000 electric buses, 55,000 electric cars, and one million electric two-wheelers under the second phase.



The FAME II program, with a total outlay of ₹100 billion (~US\$1.36 billion) over three years from 2019-20 to 2021-22, was implemented on April 01, 2019.

Earlier, it was reported that the sale of EVs in the country went up by 20% in 2019-20. The EV industry sold 156,000 EVs in the financial year 2019-20. Out of the total, 152,000 were two-wheelers, 3,400 cars, and 600 buses, according to the Society of Manufacturers of Electric vehicles. The increase of 20% has mostly come from electric two-wheelers. However, it does not include electric rickshaws, which broadly fall under the unorganized sector with a reported sale of nearly 90,000 units.

## Govt considers installing EV charging kiosks at 69,000 petrol pumps

The Indian government is in discussions to line up a minimum of one electric vehicle (EV) charging kiosk each at nearly 69,000 petrol pumps across the country to encourage people to go for electric mobility.

Additionally, the government is also thinking of making it compulsory to install EV charging kiosks at all Company-Owned, Company-Operated (COCO) petrol pumps of state refiners.

On EV charging infrastructure, Power Minister, Shri R

K Singh suggested oil ministry top officials that "they may issue an order to their oil marketing companies (OMCs) under their administrative control for setting up charging kiosks at all COCO petrol pumps"

Under the new guidelines of the oil ministry, new petrol pumps must have an option of one alternative fuel.

The power ministry has also chalked out an idea to focus on Delhi National Capital Region, Kolkata, Chennai, Hyderabad, Bengaluru, Vadodara, and Bhopal for creating EV charging infrastructure in cities also on highways to encourage people to convert over to electric mobility.



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**FOR MORE DETAILS, PLEASE CONTACT**

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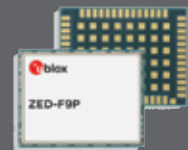
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## Highlights

### Multi-band receiver delivers centimeter-level accuracy in seconds

- Concurrent reception of GPS, GLONASS, Galileo and BeiDou
- Multi-band RTK with fast convergence times and reliable performance
- High update rate for highly dynamic applications
- Centimeter accuracy in a small and energy efficient module
- Easy integration of RTK for fast time-to-market



## Easy integration of RTK

### Integrated RTK

- No third party SW integration on host required
- No resources (RAM, MIPS) required on host
- No license fee or NRE for the host SW

### Multi-band in module

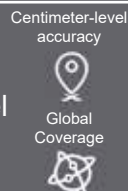
- Integrated HPG multi-band RF chain with guaranteed performance
- Little design effort, no design risk



- Quick to market
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## Navigation applications are demanding higher accuracy to increase productivity

- With high availability
- In all environments
- At sensible cost level
- Easy to integrate
- Globally deployable



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