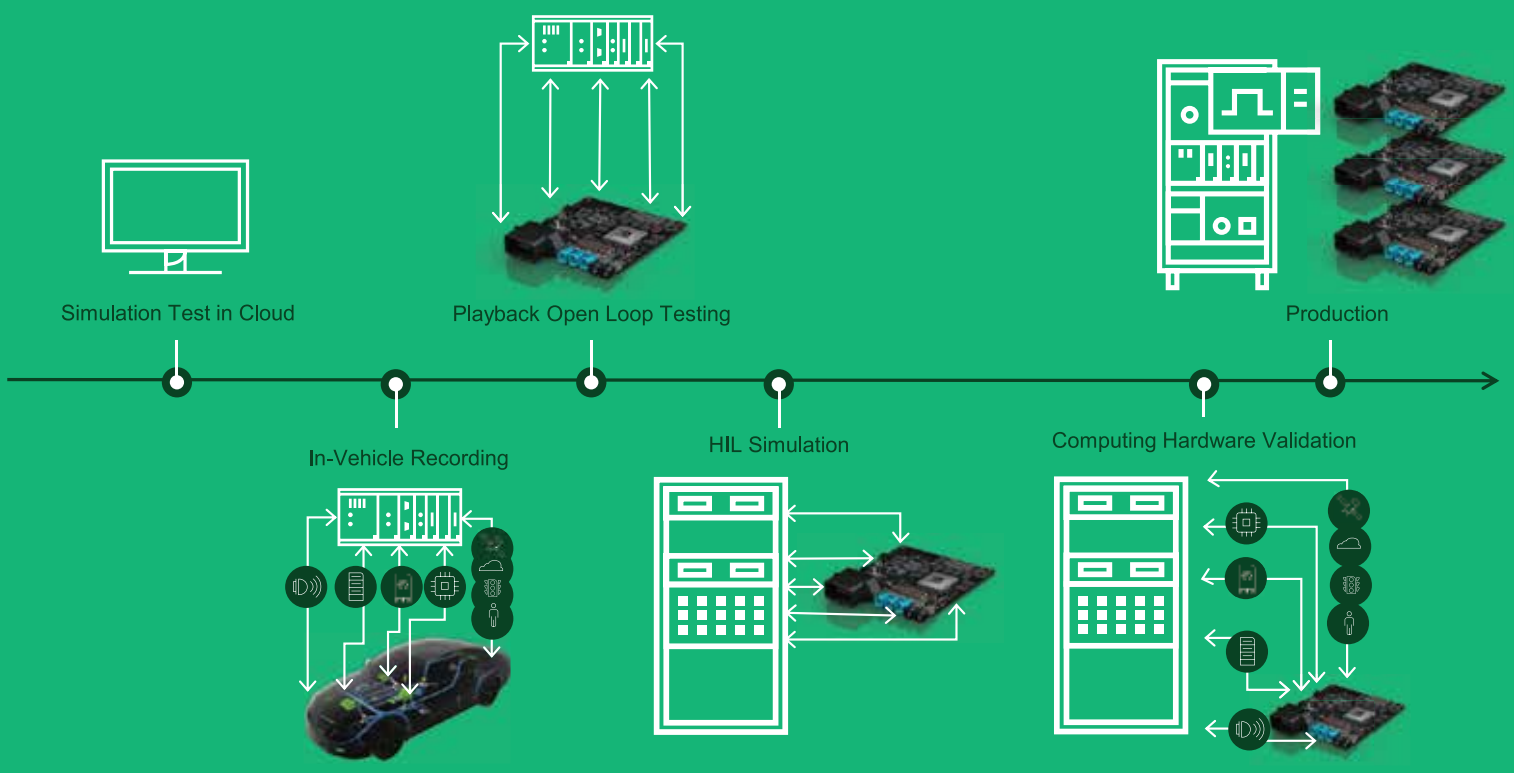
SEPTEMBER 2020 | ₹250

Telematics Wire

Technology Driven | Futuristic Vehicle



AUTOMOTIVE TESTING & SIMULATION: DRIVE TO A SAFER FUTURE

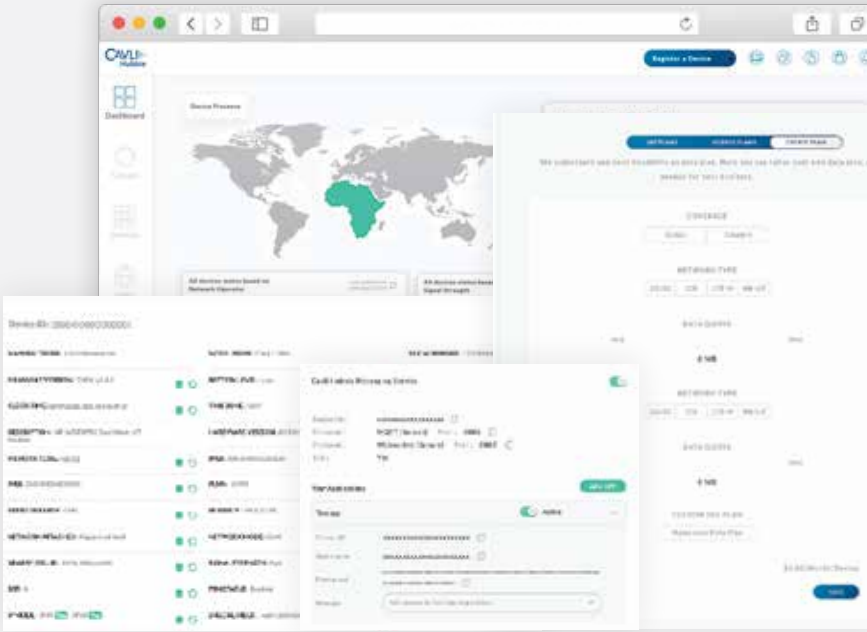
[PG NO. 30]

World's first truly scalable IoT Connectivity as a Service (CaaS) Solution

CAVLI wireless

Cavli Hubble

IoT CaaS platform from Cavli Wireless



Key Features

- Connect to local IoT network
- Device Orchestration and Monitoring
- Firmware Over-the-Air (FOTA) updates
- REST API
- GSMA SGP.02 version 3.2 SAS certified remote subscription management platform

Launch your IoT solution with Cavli Hubble

Choose your eSIM integrated Cavli IoT Module

Engineer your IoT solution with Cavli Modules

Integrate Cavli Hubble to your application platform

Get your IoT Devices Smart Connected

177 Park Avenue, Suite 200, Downtown San Jose, CA, USA

www.cavliwireless.com
www.cavlihubble.io

email us for more information
sales@ cavliwireless.com

RG500Q 5G LGA Module

3GPP R15, 5G NR NSA/SA, Sub-6GHz
LTE Cat 12 or above
PCIe 3.0 interface
USB 3.1 interface
RGMII interface
Embedded GNSS
Target Region: APAC, EMEA, NA

RM500Q 5G M.2 Module

3GPP R15, 5G NR NSA/SA, Sub-6GHz
LTE Cat 22
PCIe 3.0 interface
USB 3.1 interface
RGMII interface
Embedded GNSS/eSIM
Target Region: Global

Quectel L89 GNSS Module

Support IRNSS L5 band
Internal L1 and L5 antennas
GPS/GLONASS/Galileo available
Built-in LNAs for better sensitivity
AIS-140 compliant

Quectel Automotive Module AG35

Multi-mode LTE Cat 4 module backward compatible with 2G/3G networks
Ideal for automotive premarket applications with IATF 16949:2016 requirement
Wide operation temperature range (-40°C to +85°C)
Automotive quality processes (PPAP, 8D, DFMEA, PFMEA...)
Excellent EMC/ESD protection ensures great robustness even in harsh environments
Multi-constellation GNSS receiver available

Quectel Wireless Solutions is the leading global supplier of IoT modules which cover 5G, LTE, LTE-A, LPWA, Android Smart, C-V2X, GSM/GPRS, UMTS/HSPA(+) and GNSS technologies. As a professional IoT technology developer and cellular module supplier, Quectel is able to provide one-stop service for IoT cellular modules. We estimate that globally more than 100 million devices have at least one Quectel module inside, or, as we call, have been Accelerated by Quectel.

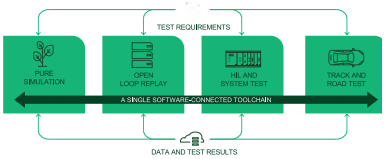
HQ Addr.: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China.
LinkedIn: Quectel-Wireless-Solutions
Email: india@quectel.com
www.quectel.com

QUECTEL
Build a Smarter World

CONTENTS

VOLUME : 01 ISSUE : 04

INDUSTRY INSIGHTS



ANALYTICS

CEO & Editor
Maneesh Prasad
maneesh.prasad@telematicswire.net

Deputy CEO
Anuj Sinha
M: +91 87440 88838
anuj.sinha@telematicswire.net

Director
Lt. Col. M C Verma (Retd.)

GM- Corporate Communication
Yashi Mittal
M: +91 98103 40678
mgr_corpcomm@telematicswire.net

DGM- Corporate Sales
Poonam Mahajan
M: +91 9810341272
mgr_corpsales@telematicswire.net

Editorial Team Member
Richa Tyagi

Web Developer
Neha Nagar

Designer
Bishwajeet Kumar Singh

Publication Address
Telematics Wire Pvt. Ltd.
D-98 2nd Floor, Noida Sec-63
Uttar Pradesh-201301
Email: info@telematicswire.net

Printed and Published by
Maneesh Prasad on behalf of
Telematics Wire Pvt. Ltd.

Telematics Wire Pvt. Ltd.
D-98, 2nd Floor, Noida Sec-63
Uttar Pradesh-201301
Email: info@telematicswire.net

Innovative Atmanirbhar Bharat needs to transition to upper middle income economy

MANEESH PRASAD
CEO & EDITOR
maneesh.prasad@telematicswire.net
+91-9810346117

India's quarterly(Apr-Jun'20) GDP growth has been dominating the discussions over the last few days and more so in the automotive sector which had difficult quarter in terms of vehicles sales, production, logistical supply chain challenges and many more unforeseen or not talked about issues, which will remain with each and every OEM as their own story of struggle in these times. The August'20 monthly automotive sales(India) figure has been released few days ago and seems comforting when seen on YoY basis. Not withstanding some industry expert attributing this to the low sales in last quarter(Apr-Jun'20).

Going forward, government seems to be looking at various option to give it a much need policy push, to revive the automotive industry and improve the GDP. Heavy Industries and Public Enterprises Minister, Prakash Javadekar ji mentioned during industry body annual meet on 4th Sept'20 that government is looking at reduction of Goods and Services Tax(GST). As reported in newspapers on 5th Sept'20, government is looking into the industry request for 10% reduction of GST. During the ACMA 60th annual session on 5th Sept'20, Minister for Road Transport and Highways, Shri Nitin Gadkari ji reiterated governments commitment towards vehicle scrappage policy, which could come through by the end of this month(Sept'20). It apparently look like government is considering various options. Both, reduction of GST and vehicle scrappage incentive if it comes through, could likely be for the EV segment. What is unclear, if the vehicle scrappage incentive, as announced by states, like Delhi State Govt in their electric vehicle policy, would continue, irrespective of incentives extended through central government policy. Or, will the scrappage incentive be left with the state; to implement with their automotive and electric vehicle policy while central government goes ahead with GST reduction.

Listening to the Honourable Minister Shri Gadkari ji at annual session of ACMA, the industry and common people should feel elated about the passion which the policy makers of the day have enthused into their respective ministry. The Hon'ble Minister talked about need for digitalisation, smart mobility and increasing the exports; while underlining the need to lower imports. His talk echoed the "Atmanirbhar Bharat" call given by our Prime Minister Shri Narendra Modi ji. This "Atmanirbhar bharat" now reverberates in the talks of automotive industry stalwarts of the day. The need to be self reliant is also linked to improving the automotive supply chain which was under stress in recent times due to Covid 19 and need to import from friendly economies. The recent pandemic also tested the manufacturing resilience which was tested due to migrant population.

During the last fortnight or so we came across news about India entering the top 50 global innovative index. In global competitiveness we are(in yr2020) at 48. If we look at the top 40 innovative economies, it has only three economies which are upper middle income group- China(14), Malaysia(33) and Bulgaria (37). Rest all are dominated by higher income group countries. Going by the Gaussian distribution curve, the above three countries are exception, which cannot make the rule. The thumb rule is, you need to bring the population into the higher income group, if we have to be globally competitive. Our economy is categorised under the lower middle income group and "off course" in our group we are doing fairly good, with just two other countries ahead of us in this group- Ukraine and Vietnam.

So, the Atmanirbhar bharat, which is going to be a global hub of innovation and manufacturing, has to rise up in the per capita income group, at the very least to the upper middle level income first. With GNI per capita of ~ US$ 2010 (yr 2018), we have to first double this to cross the threshold of US$3956 to get into the upper middle income group itself.

Verification & Validation (V&V) to Ensure High Quality of Complex Automotive Software

KALYAN BOGGARAPU
ELEKTROBIT INDIA PVT. LTD

The automotive industry is racing to newer heights with evolution in technology and modernization. The advancement of technology in the areas of infotainment, connected vehicle, autonomous driving, and high-performance computing has taken the world of mobility into a new era. According to a report by MarketsandMarkets Research Private Ltd., the global automotive software market size is projected to grow at a compound annual growth rate (CAGR) of 16.9%, to USD 37.0 billion by 2025. The Original equipment manufacturers (OEMs) and Tier1s not only have to rapidly adapt to the technology trends but should also enable faster production cycles with no compromise to quality & safety.

These latest advancements in the automotive industry are leading to more software components in the vehicle. The numerous lines of code and functionalities are making the vehicles driven by software. In today's scenario a premium vehicle has typically 100+ million lines of code that have stupendously been increasing over the last years and will be exponentially increased in the years to come. An industry estimate predicts an approximately 10-time increase of

the current software size in the next few years. The complexity is growing not just because of the numerous lines of code but also based on the increased level of integration across different vehicle components.

The vehicle software architecture encompasses multiple layers with a scalable, extendable operating system provisioning middleware and APIs handling multiple business functionalities. The architecture also hosts HMI (Human-Machine Interface) layers interacting with various applications both on-board and off-board with an integration of cloud infrastructure enabling improvements in connected vehicle features. In autonomous driving functions, the algorithms should possess advanced computing standards and real-time integration with various cameras and sensors. The autonomous solutions should effectively handle the time synchronization of the data retrieved from the cameras/sensors and should handle high volumes of structured/unstructured data elements. All these should be processed in milliseconds enabling the real-time decision-making ensuring the safety of driver, passenger, and pedestrians.

Adding to this, the architecture should be able to seamlessly integrate across the technology streams, for example, infotainment systems with driver assistance functions and data analytics with cloud connectivity. These integrations could invoke various functions or code snippets multiple times during the drive period. This makes the frequency of execution of a software function remarkably high in the current vehicles. With this high frequency of execution, even a small failure rate will lead to major faults in the overall system. Sometimes these faults could be fatal or lead to serious injuries. According to J.D. Power 2019 U.S. Vehicle Dependability Study SM (VDS), the industry average for 2019 is 136 problems per 100 vehicles (PP100), an improvement of six PP100s from last year, which is a lower rate of improvement than the 14 PP100s in 2018 compared with 2017. The report also stated that "Flawless dependability is a determining factor in whether customers remain loyal to a brand". The automotive software applications should be almost defect-free as it is not just an impact to the brand and cost but also relates to people's safety. This emphasizes the need for efficient verification and validation (V&V) methodologies to ensure a high quality of the complex automotive software. In order to seamlessly handle today's dynamic business scenarios, verification & validation should be based on the following principles:

- Early involvement with Continuous Testing approach
- Effective solutions powering automation to meet quality with speed
- Efficient frameworks enabling production like test environments
- Enhanced test strategy with well-defined quality standards

Early involvement with Continuous Testing approach

Gone are the days when testing is considered at the far end of the project life cycle. With agile ways of working, imbibing test-driven and behavioral-driven methodologies testing should be applied at every aspect and early stages of the project life cycle. The concept of early involvement in testing is better explained when based on V-model methodology.

Does your test approach take the standard V-model principle into consideration?

The V-model comprises of both quality assurance (QA) and quality control (QC) aspects. Quality assurance is a preventive mechanism. A defined QA approach leads to defect prevention while optimizing the overall cost of quality of the software development. Quality assurance encompasses verification of the process applied to build the software whereas quality control pertains to the validation of the developed software.

The left side of the V-model depicts the verification practices and the right side depicts the validation aspects. Principles

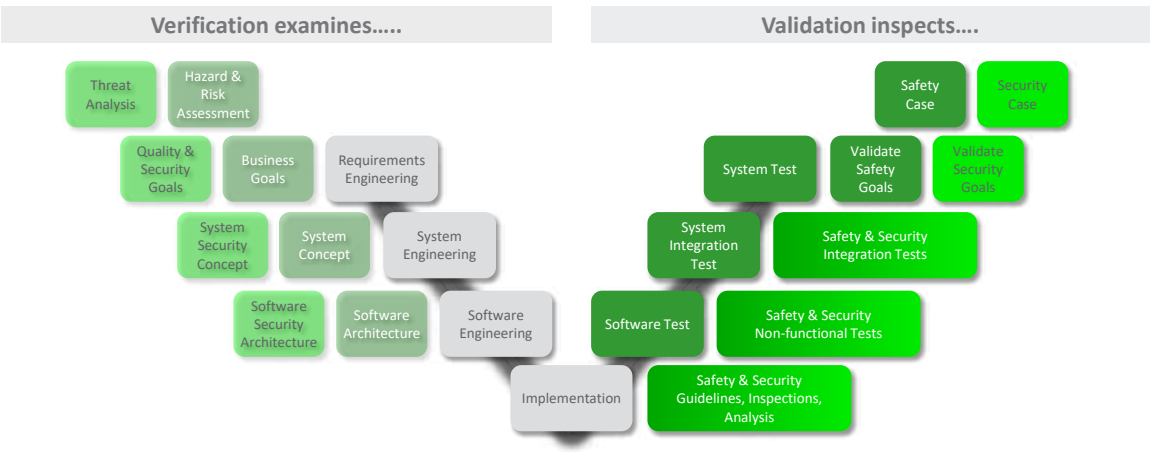


Fig. 2: V-model: conceptual view

of this model can be applied across multiple development methodologies like agile, iterative, and waterfall. A well-defined gating criterion based on industry standards like ASPICE and ISO enables quality-driven software development right from the project inception. This helps project teams to quantitatively measure quality and in turn make right decisions on the production releases.

In today's scenario many organizations are planning frequent releases to continuously enhance product capabilities and customer experience. This demands a continuous delivery with frequently new builds, integrations, and deployments. Testing should upscale to meet this demand by adopting Continuous Testing (CT) approach.

Are you falling behind to implement Continuous Testing (CT)?

Continuous Testing (CT) is based on the principle of triggering tests for each and every change to the code base as and when it happens. The tests are automated and are time-triggered for every code merge. The tests are configured and get executed in each branch associated to the project release methodology from a local developer branch to the Release Master. Given below are the critical elements to implement Continuous Testing:

- Robust test automation framework
- Compatible tool chain with regard to build management, code repository, test artefacts, and reporting
- Configurable test bots to set up on-demand simulated test environments
- Extendable test bots with hardware control system to enable remote executions by reducing the need of multiple hardware setups

Fig. 3 depicts the typical Continuous Testing approach across various phases of software development. For instance, when a developer is ready to merge code, a set of functional automated tests gets triggered. After the successful execution of the tests the code gets merged into the repository; in case of failure it loops back to the developer until all the configured tests have been passed. This approach is adhered to for each developer, thus ensuring quality and defect containment at the developer level. In the next stages, in line with the project quality goals, the required tests get triggered at the software integration and software qualification levels. These tests are time-triggered for every build; upon successful execution of the tests the build gets certified for deployment. Thus, Continuous Testing enables early testing, making the software development right the first time.

Effective solutions powering automation to meet quality with speed

Effective test automation frameworks are crucial to improve validation capabilities and adapt principles like Continuous Testing. While building the automation frameworks, the organization should be performed with caution not to mushroom multiple tools in order to handle various topics. Such a scenario will add complexity to maintain the different tools, their integration, and usage in the projects. An automation framework should be built with a mindset of a product development and all the best practices of building and maintaining a product should be applied to the automation framework.

What makes an automation framework effective?

Specific to the automotive industry, the automation framework should be able to cater to the needs of the diversified technology streams like infotainment, connected vehicle, autonomous solutions, and user experience. The framework should be designed by factoring the key characteristics below:

- Platform-agnostic, for example, to be able to validate the application built on Android, QNX, or Linux and be able to write automated UI tests even when the code of SUT (System Under Test) is not yet ready
- Cohesive to validate service layer, user interface, and hardware integration
- Modularized to be extendable to incorporate newer use cases like speech validations and audio/video streaming, and to build simulated environments
- Test bots, time-triggered schedulers to enable Continuous Testing with Continuous Integration (CI) chain
- Reusable to be implemented across various functional and non-functional test types

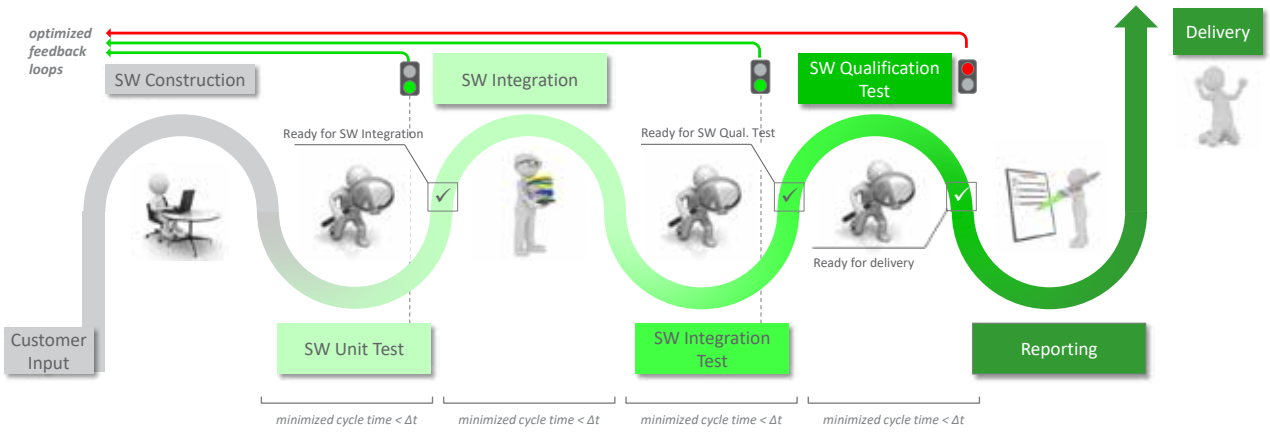


Fig. 3: Continuous testing approach

Escort TD-BLE

WORLD'S FIRST BLUETOOTH WIRELESS FUEL LEVEL SENSOR

- BLE-based microprocessor from Nordic Semiconductor enables Escort TD BLE wireless capacitive fuel level sensor to last for 7 years on one battery
- Escort sensors are easy to install and configure using Escort Sensor Configurator app for Android and iOS
- Escort sensors can detect any changes in fuel level down to microscopic ones
- Wireless connection reduces the risk of environmental exposure and external interference

This is not just another brand new product. It is an evolutionary leap into the wireless future of transport telematics.

**BLE — Bluetooth Low Energy technology*

+7 495 108 68 33
+7 916 907 47 78 (WhatsApp, Telegram)
INFO@FMETER.RU
WWW.FMETER.RU/EN/

- Capable of process automation by integrating test/defect/project management tools, thus minimizing the efforts into test reports

Abiding by these characteristics, automation can be applied early in the life cycle. The need of a stabilized application is not a constraint. The validation engineers can start working on the automation scripts in parallel to the development activities. This will enable in-sprint automation and the ease of adaption to the test-driven/behavior-driven development methodologies.

Efficient frameworks enabling production like test environments

Pertaining to technologies like autonomous driving, the frameworks should be more enhanced to simulate varied driving scenes and sensor evaluations. Developing more accurate and safe autonomous solutions heavily depends on reliable data gathered during test drives. More advanced functions require even more data that is generated by different vehicle sensors like radar or lidar. With increasing amounts of data being processed, organizations need cutting-edge tooling to record, ingest, enhance, find, and transfer the data. Fig. 4 represents a typical test environment view to validate autonomous driving solutions.

Capture and replay are the critical factors to effectively validate autonomous driving solutions. Capture is the process of collating data from all sources during the test drive and replay is the process of re-injecting the data in HiL (Hardware-in-the-Loop) or SiL (Software-in-the-loop) during verification and validation. In real time, autonomous vehicles should identify various objects (e.g. vehicles, pedestrians, road signs, markings, trees, buildings, traffic lights) along with weather and lighting conditions. To master the extensive task of validating the autonomous driving function, the test environment is aided by automated labeling, enhancing and simulation of data. This allows for an efficient generation and administration of test cases. The test environment is further enhanced by cloud technology that helps to effectively manage petabytes of driving scenes, enhance data storage and reuse data through proper data annotations. The data and test artefacts should be well structured to seamlessly manage the constantly changing project goals and requirements.

Pic 5: Quantitative measurements

Enhanced test strategy with well-defined quality standards

Current software development methods should be flexible to the changing requirements and customer needs. Many test teams face challenges to handle these frequent changes and an inefficient management of test artefacts will add to the chaos. This makes test team perform redundant tests, sometimes overdo testing, and yet lack confidence to decide on the "Go Live". Hence it is important to validation teams to define and align quality goals of the project based on certain industry standards like Automotive SPICE, ISO 9001, and ISO 26262 Functional safety. A well-defined test strategy based on these standards will enable test teams to take the right decisions during the software development life

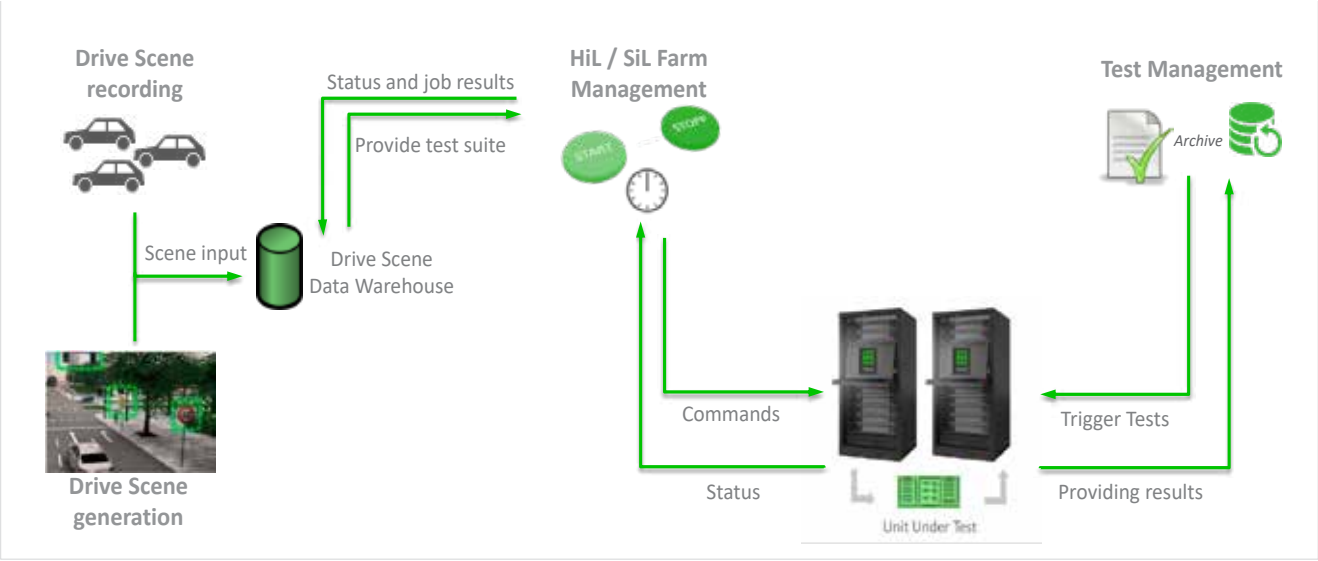


Fig. 4: Autonomous driving: typical test environment

Test phase	Test elements	ASPICE Reference model 3.1	Test coverage
System qualification test	• Vehicle/Embedded system • ECU (software-hardware interactions) • Software	SYS.5	System requirements
System integration test	• Vehicle/Embedded system • ECU (software-hardware interactions) • Software	SYS.4	System architecture
Software qualification test	• Software (inclusive of tests on simulators)	SWE.6	Software requirements
Software integration test	• Software (inclusive of tests on simulators)	SWE.5	Software architecture
Software unit test	• Software (white-box testing)	SWE.4	Software design

Table 1: Test phases – traceability concept

cycle. A good test strategy takes the following into consideration:

- Innovative test techniques with principles based on impact analysis, risk-based approach, fault injection, and non-functional tests
- Quantitative measurement of quality through matured key performance indicators (KPIs) and metrics covering productivity, quality, and test effectiveness
- Business-oriented with preventive measures to minimize and reduce the impact of failures
- Aligning the release strategy to enable faster time to market and readiness to mass production as needed
- Optimizing test efforts to maintain the balance between cost, time, and quality

Abiding by the Automotive SPICE standards, the validation comprises various test phases to evaluate the application in-vehicle, at ECU (software-hardware) integration and at software level. Each test phase has a focused coverage with evaluation and compliance criteria on various work products as indicated in the above table.

The test specifications should include all possible evaluations and compliance criteria measuring all test objectives like functionality, reliability, robustness, usability, safety, and security. In technologies like connected vehicles, the security testing should be given a special focus on both on-board and off-board components. Fig. 6 illustrates various layers of security checks to be performed in a connected vehicle.

Thus, verification & validation based on the aforementioned principles drive efficiency in the testing principles of an organization, thereby ensuring high-quality products and software applications. The validation teams should aim at investing in appropriate preventive measures. Optimize testing efforts through robust frameworks and infrastructure. Focus at being innovative, flexible, and adaptable to the changing technological needs. Strive to render state-of-the-art services to meet high-quality standards across the organization's software development and to maximize value creation. ❑

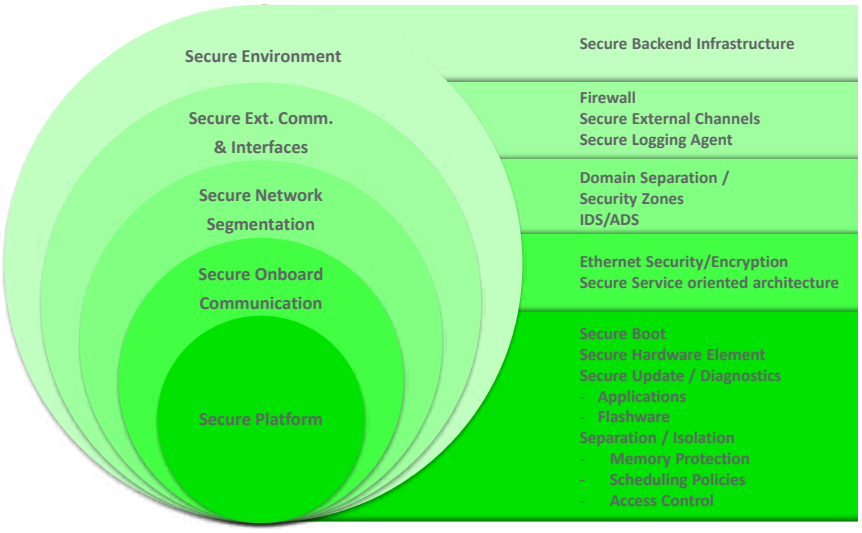


Fig. 6: Illustration of automotive system security layers

AUTHOR

Kalyan Boggarapu is a Team Manager in Elektrobit India Pvt. Ltd. He heads Validation Centre of Competence (India) has more than 17 years of experience in quality assurance service lines. A TMMi certified professional with profound expertise in improving organizations quality maturity leveraging TPI, CoQ models. He is a recipient of Great Manager Award 2019 in "Enhancing People Performance" category presented by People Business. Has extensive global exposure across multiple industries in Automotive, Insurance, Financial Services and Retail.

INDIA IS THE MANUFACTURING HUB FOR OUR GLOBAL MEDIUM DUTY TRANSMISSION

SATYAKAM ARYA
MANAGING DIRECTOR & CEO
DAIMLER INDIA COMMERCIAL VEHICLES PVT. LTD

Satyakam Arya shares his views with Telematics Wire on wide-ranging topics from- how automotive industry can recover from the slowdown, DICV being the global hub for medium duty transmission, transition to electric mobility, safety of transport vehicle and more.

In your view, what has been the impact of COVID-19 on Indian automotive industry? How much time will industry and specifically commercial vehicle segment take to recover?

The medium and heavy commercial vehicle industry is going through a tough phase in 2020 due to many reasons including COVID-19. The CV market is closely linked to the economic activity; until this improves, there will be a limited demand for movement of freight. Having said that, the economic stimulus package provided by government helps to bring revival of demand in construction and mining segments. We already see some positive traction in these segments. Further, we see E-commerce segment gaining momentum since people are switching more to on-line buying for essential goods and even for limited discretionary spending due to the pandemic. This will also improve volumes in small and light commercial vehicles due to increased demand for last mile delivery of goods.

Fortunately, DICV is uniquely positioned to weather the crisis in part due to the strong backing of the global Daimler group, but also due to the approximately 90% localization of its supplier network which allows us to be less reliant on international supply chains. Apart from that, we are already strongly positioned in construction and mining segment due to the robustness of our products, and in E-commerce where our products offer the best turnaround time and on-time delivery.

We believe India will recover sooner and better from the crisis than many other economies and growth would start to return in 2021 from the low level of 2020. In the next 2-3 years, the CV industry could return to the market volumes we saw in 2019.

How is Daimler India gearing up to serve Indian as well as global customers in post Covid-19 world dressing the major challenges?

To date, DICV has already exported over 30,000 vehicles to more than 50 markets. Additionally, we've put over 1 lakh BharatBenz trucks on Indian roads since we started production less than a decade ago. To ensure this level of success continues both here and abroad, we are focusing on making DICV even more resilient and using the crisis as an opportunity to emerge even stronger when the crisis ends. One of the areas we are focusing on is to further increase our localization levels from the 90% which we had achieved in the past. This will definitely also help us to manage our supply chains better in the Covid scenario.

Our suppliers contribute greatly in exports of parts to other Daimler entities. As of today, we have exported more than 125 million parts. This has given our suppliers an edge in competing globally. In fact, they have also won supplier awards in the Daimler world, thereby proving the quality of Make in India. Another proof is that India is the only manufacturing hub for our GMDT (Global Medium Duty Transmission) production which we ship to Germany. Our global manufacturing processes have been completely re-aligned to not only include Indian operations but also to utilize the competitiveness and capability of India more in the future.

What is Daimler's 'Bus Care' Program? How will it help customers to resume operations post lockdown?

The Daimler 'Bus Care' program started in July 2020 and will help customers restart their operations. The program includes a free service campaign with driver training on COVID-19 preventive measures and the distribution of personal hygiene kits, thermometers and disinfectant sprayers. This program has already been executed for over 1400 buses and 1900 drivers in 75 locations.

Do you think government initiative can hasten the market recovery of commercial vehicle sales in India?

The government can hasten market recovery by introducing a well-formulated scrappage policy that takes a long-term view on sustainability.

There are approximately 28 million vehicles that are over 10 year's old running on Indian roads, causing an excess of pollution. Until older vehicles are taken off the road, pollution will continue to increase at an unacceptable rate. If India takes 50% of BSII and BSIII trucks off the road, we would save about 800 million tonnes of crude oil a year and bring down CO2 levels by 2 million tonnes.

Apart from causing pollution, older vehicles are also a threat to road safety and are less fuel efficient. Although trucks travel at low speeds (average <30 km/hr), they still caused ~25,000 deaths and accounted for ~17% of accident deaths on India's roads in 2018. Older vehicles with poor maintenance and lesser safety and comfort features are the main reason for this. A clear scrappage policy will reduce accidents and save lives. During times like this, this policy could also trigger fresh demand in case there is a proper incentive for the owner to scrap. Of course, we must make sure there are proper scrap centres established based on principles of recycle and re-use before any such policy is rolled out.

Government can also look at a policy to encourage exports out of India in a much greater way than done today. The Indian automotive industry is quite mature but when it comes to exports, but so far we have only been able to grab a miniscule piece of the global automotive business pie. A policy in that direction which is linked directly to export revenues and is administratively simpler to manage would be a welcome step.

Daimler India has recently made investment of over INR 2,000 crores. What has been the area of investment?

DICV signed a second Memorandum of Understanding with the Government of Tamil Nadu several months ago covering INR 2,277 crore of investments. This investment is directed towards expanding our product portfolio, investment in technology, digitalization and represents approximately 400 jobs.

It demonstrates our unshakeable confidence in the long-term potential of India as a market for commercial vehicles, and our ongoing commitment to the country as a whole.

> **"PANDEMIC HAS PROVIDED DICV WITH AN UNPRECEDENTED CHANCE TO FOCUS ON NEW WAYS OF CONNECTING WITH STAKEHOLDERS. NOW WE SEE THAT IT IS POSSIBLE FOR US TO DIGITALIZE MORE PROCESSES AND TASKS THAN WE EVER THOUGHT POSSIBLE."**

What are your investment plans in bringing emerging technologies like connected vehicle to Indian Commercial Vehicle market?

DICV already rolled out Daimler's telematics solution 'Truckonnect' at the beginning of the year with the new BharatBenz BSVI portfolio. Truckonnect gives owners an unprecedented level of control over their fleet. Based on Daimler's global platform that already connects over 300,000 trucks worldwide, Truckonnect lets customers remotely monitor all key performance indicators including utilization, fuel & Adblue consumption, fleet health and driver behaviour. Users can access all this information 24/7 through an online analytics dashboard.

Truckonnect is provided as standard in all BharatBenz trucks and allows customers to remotely check and analyse vital vehicle information in real time via the Truckonnect online portal, including vehicle location and health, plus fuel consumption. With this, fleet managers can optimize driver performance, increase fuel efficiency, and reduce downtime. Vehicle owners are also supported by a customer assistance centre available during all hours of the day.

Can you throw some light on steps Daimler India is taking to improve safety and security of goods and passengers in its commercial vehicle?

Our new generation of BharatBenz CVs offers 'ProfitTechnology+', a package of technologies and features ensuring industry-leading fuel efficiency, safety, comfort and reliability.

For safety we have many features like a crash-tested cabin, reverse parking assist, and the Driver State Monitoring System which alerts the driver in case they show signs of fatigue, helping them avoid falling asleep at the wheel.

In terms of security, the Truckonnect telematics solution can instantly detect when a vehicle is being driven out of bounds or experiences a sudden drop in fuel levels – that is, when the vehicle or its fuel are being stolen.

What are your views about electric goods transport vehicle? When will it be commercially viable to run them on Indian road?

Daimler Trucks and Buses globally are involved in the development of alternative powertrains. These are an important means of avoiding emissions and becoming less dependent on fossil fuels. Daimler has a clear, future-proof strategy to avoid confusing businesses and consumers with the variety of alternative fuel options available. The way to the fuel of the future leads from fossil-based diesel to BTL (Biomass To Liquid = fuel from biomass) and finally to hydrogen for fuel cell powered vehicles. Being a part of the global network, DICV has access to the knowledge and can adapt these technologies depending on the market requirement.

Daimler already has several electric vehicles in its commercial vehicle line-up around the world and these can be adapted for Indian use once the market is ready with the necessary infrastructure (e.g., charging stations) and government support.

As all the conferences/exhibitions across the globe have gone virtual in the past few months, is it generating business or providing adequate B2B networking?

The pandemic has provided DICV with an unprecedented chance to focus on new ways of connecting with stakeholders. Until now, manufacturing was thought to be a 100% hands-on business. Now we see that it is possible for us to digitalize more processes and tasks than we ever thought possible. We connect with our employees, suppliers, dealers and customers virtually, regularly and comprehensively to manage our value chain.

The opportunity to explore new technologies and ways of thinking (such as work from home, virtual sales meetings and events that involve participants from all across India) has shown us new ways to increase productivity and efficiency with impressive cost savings.

In fact, just a few weeks ago we launched our used vehicle platform 'BharatBenz Exchange' with an online press conference and a virtual customer meet broadcast live over our social media channels. ❑

www.securethings.ai

SECURE THINGS™

The Preferred Partner of Automotive Manufacturers in India for Cyber Security

Multilayered Automotive Cyber Security Solution

- ECU Protection
- Network and In-Vehicle Network Protection
- Connected Services Cloud Security and Security Incident Analytics

PRODUCTS AND SERVICES

- Advanced Network Protection for Connected Vehicles (IP, Cellular)
- AI based Comprehensive Vehicle Network Intrusion Detection & Prevention System (CAN, Ethernet)
- Advanced ECU Protection (Telematics, Infotainment, Gateway etc.)
- Highly Secure OTA update for efficient and cost effective deployment
- Security Assessment & Penetration Testing for entire Vehicle and Ecosystem
- ISO 26262 (Cyber Security Provisions) & ISO 21434 Compliance

Recognized as one of the 20 Most Promising AUTOMOTIVE TECH Solutions Provider 2019 by CIOReviewIndia

SecureThings.AI Pvt. Ltd.
401-403, Tower 2, Montreal Business Center, 272/4,
Pallod Farms Rd, Aundh, Pune, Maharashtra 411045, India
+91-7350988670 | Email: info@securethings.ai

USA Office Address:
640 W California Avenue, Suite 210 Sunnyvale CA 94086
+1-408-769-6036 | Email: info@securethings.ai

PERFORMANCE SIMULATION AND VIRTUAL TESTING

S. MANIVASAGAM, PH.D
TATA TECHNOLOGIES LTD.

Automotive industry is currently experiencing major changes on multiple fronts. We are noticing more consolidation and growth of electric vehicle market, more focus on connected and smart vehicles and more interest on autonomous and advanced driver assisted vehicles. Exploration of fuel cell technology is also happening simultaneously. Despite these very advanced developments, the traditional vehicle development process has retained its importance and even become more sacred now than ever. The automotive industry has very well realized that the huge investments involved in a vehicle development program will be at stake if a structured development process is not followed properly.

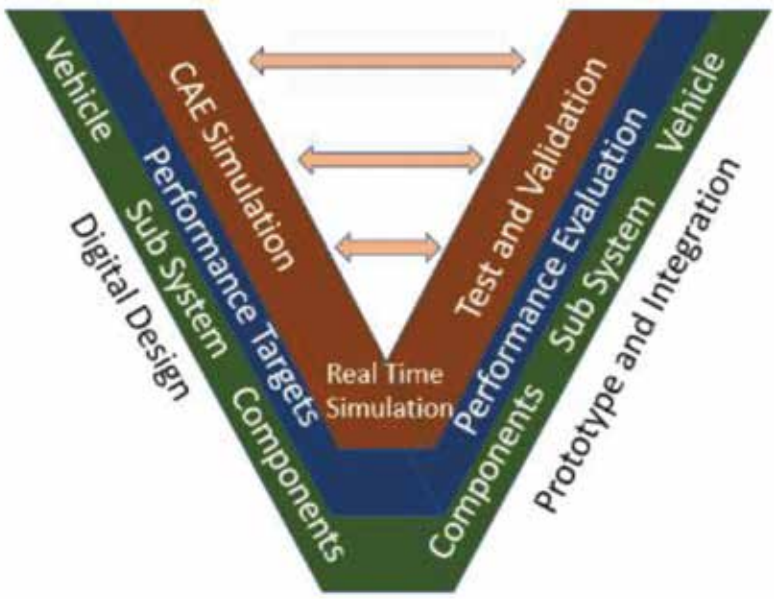
Vehicle development typically follows a V process which focuses equally on the digital product development and the test and validation of the new vehicle before launch. The left arm of the V indicates the cascaded development process – from component to subsystem to vehicle. At every stage of the development the intended performance is validated by physical testing depicted by the right arm of the V process. But we need to keep in mind the huge expenses and enormous preparations involved in physical tests and validation. Simulation tools have become very handy in reducing the number of tests required as they provide good confidence of the product's performance during the digital development phase. During the last two decades, we have seen phenomenal advancements in simulation methodologies to virtually test the performance parameters like driving dynamics, cooling, safety and acoustics which have resulted in a drastic reduction of the number of vehicles planned for physical testing.

In spite of such advancements, it has been observed that there are still some gaps between physical testing and simulation-based verification as the traditional virtual simulations seldom take into account the real time incidences. For example, a driver encountering an unexpected obstruction would try to drive away with a sharp steering manoeuvre. Performing a simulation for such encounters were not possible till recently but the product developers have started performing co-simulation and Software in Loop (SiL) simulations to understand real time events.

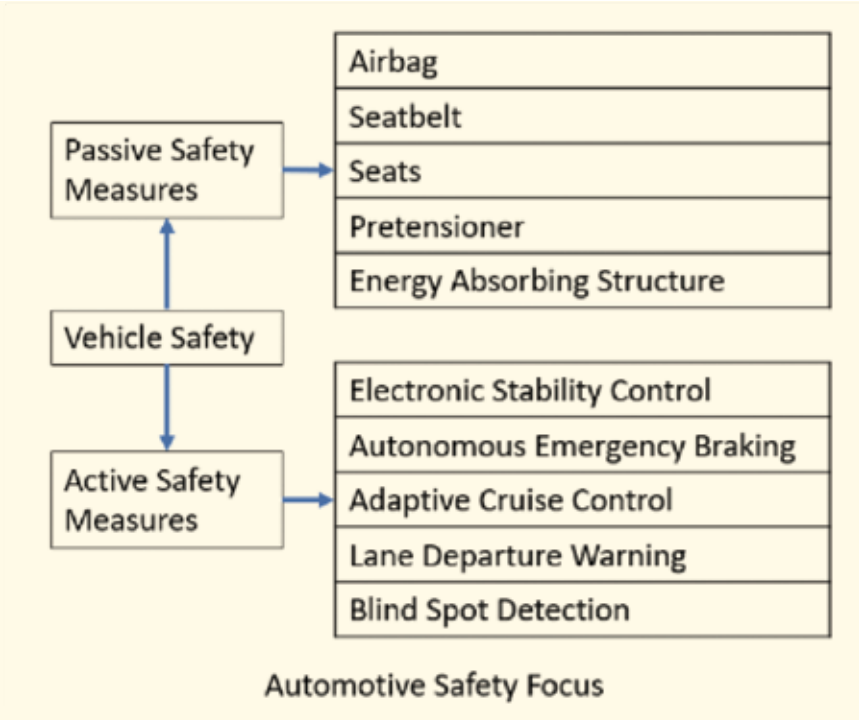
In addition to the current breakthrough technology shifts in the automotive world, the emphasis given to safety aspects has also gone significantly high. The traditional simulation and test approaches focus more on the energy absorbing vehicle structure, safe seats, seatbelt restraints and airbags. These focus areas are referred as passive safety areas. Last few years, automotive industries have started focussing more on active safety measures including Electronic Stability Controls (ESC), Autonomous Emergency Braking (AEB) and Adaptive Cruise Control (ACC).

The real time simulations need to necessarily include the active safety measures to understand the vehicle behaviour during unexpected events. Software in Loop testing framework helps to understand the real time vehicle simulations with a good accuracy.

A recent study shows that more than 40 percent of fatal single vehicle accidents happen due to vehicle rollover. Most of the times, the rollover happens due to sudden attempt made by the driver to manoeuvre

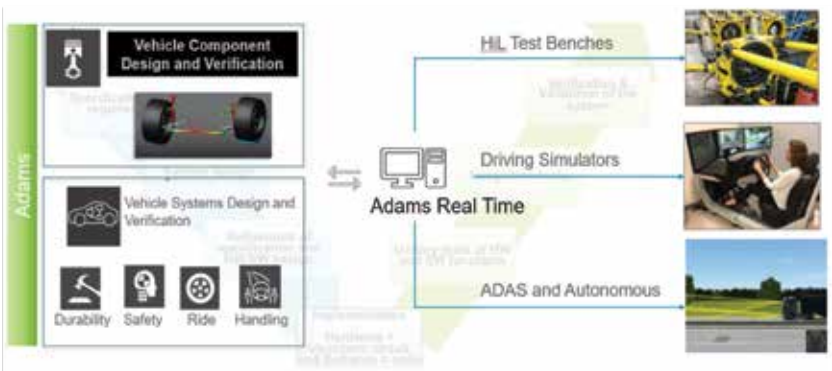


Vehicle Development - V Process



an obstacle on his way. Another reason for rollover is the misjudgement of curvatures. Electronic Stability Control plays a major role in preventing the 'loss of control' situations by applying brakes on the respective individual wheels to prevent the unintended heading direction leading to spinning. A co-simulation approach using an MBD Software like ADAMS and MATLAB will be able perform the real time simulation of vehicle manoeuvres. In fact, the Electronic Stability Control module can be developed by combining the vehicle Multibody Models and MATLAB Controls and the same can be calibrated with test results so that the same can be used for any complex drive simulations. Such simulations help the vehicle designers to develop the control algorithm for the vehicle stability.

VTD (Virtual Test Drive), a toolkit from MSC Software is used for the development of Physics based sensors (Radar, Lidar and Camera), ADAS and automated driving systems. It covers the full range from the generation of 3D content to the simulation of complex traffic scenarios and, finally, to the simulation of either simplified or physically driven sensors. It is used in Software in Loop and Hardware in Loop applications. Due to its open and modular design, it can easily be interfaced and integrated as co-simulations including 3rd party or custom packages.



Integrated Development Cycle (Courtesy: MSC Software)

Integrated Development Cycle (Courtesy: MSC Software)

Another good example co-simulation from safety point of view is the performance prediction of ABS brakes during real time braking events. Multibody Simulation tools like ADAMS along with the ABS control modules developed using MATLAB-Simulink will be able to help the vehicle designers to predict the performances of the vehicle under various driving conditions and braking events. Such simulations also help to finetune the design and the control algorithms to meet the brake system performance targets.

An important area of vehicle safety is the protection of its occupants. Airbags along with seatbelt form the primary protective system for the occupants. The most crucial aspect of the airbag system in the event of a collision is its deployment timing as the entire collision event takes place in a few milliseconds. In addition to performing various crash simulations, tools like LS Dyna help the airbag sensing system development by providing the impact pulses, the basic input for the sensing system.

The enhanced capabilities available with structural simulation tools like ANSYS, OPTISTRUCT, ABAQUS and NASTRAN have great potential to be a part of co-simulation for structural optimization and vibration control by focussing on real time scenarios and help the vehicle industry to develop great products. ❑

AUTHOR

S. Manivasagam Ph.D
Global Head – Vehicle Engineering
Tata Technologies Ltd.

Dr. Manivasagam is the Global Head of Vehicle Engineering at Tata Technologies. His current focus areas include simulation driven design and development, vehicle tests and validation, vehicle integration and vehicle attribute management and balancing.

3D Model and BD Simulation of High Frequency Wireless Power Transmission by Resonant Inductive Coupling for Electric Vehicle Charging

NAGENDRA GOUTHAMAS
WIRELESS VIDYUTH

Electric vehicles are spearheading the global transition of mobility towards sustainability. EV charging infrastructure is the most oversight space in the EV arena, on the other hand, Electricity is one of the least perfect things in the world until we cut the chords and end the age of tethering. Charging EVs without wires will be one excellent alternative for the EV charging and to accelerate the EV adoption around the world and further developing the technology that drives future generation transportation charging infrastructure and to make charging ecosystem easy, comfortable, safe and reliable to the users.

Charging of Electric Vehicles can be unwieldy when autonomous vehicles thrive in the market. The cords can get tangled, come under the vehicle or the parking spots can become limited by the range of wire. Wireless charging will be aesthetically pleasant, charging will be convenient and there will be no risk of electric shock to the user and can be automized. Finally, the future is wireless and the world is already moving towards a cord-free future.

For these challenging technologies like Wireless charging to succeed, we need an innovation-driven approach with strong technical solutions. A brief overview of the wireless charging technology 3D Model, Block Diagram and simulation is presented below;

3D Model of Static Charging of Electric Vehicles:

Wireless power transfer in electric vehicles may bring a profound change in the charging system. Plug-in Electric vehicles need cables & Plug charges but physical plug charges and Cables may become hassle and messy. With the system where we have to physically plug-in chargers, there are a number of occasions where the owners can often forget to charge the vehicles.

For stationary applications like charging of plug-in electric vehicles at home, Wireless transmission technology adds a convenient factor compared to actual plugging in. which means the vehicle will have a full charge every morning. By re-configuring, the transformer and altering the resonant frequency energy is transferred to the battery with lower energy losses.

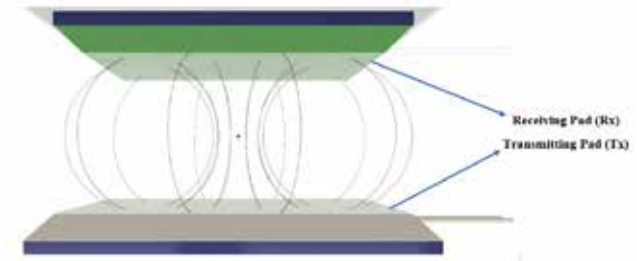
Sufficient power for the battery can be transferred from the primary to the secondary circuit without significant energy losses. The electrical power is then transmitted to the battery which is electrically coupled to the secondary circuit through the air-core transformer.

3D Model of Magnetically Coupled Static Wireless Charging System

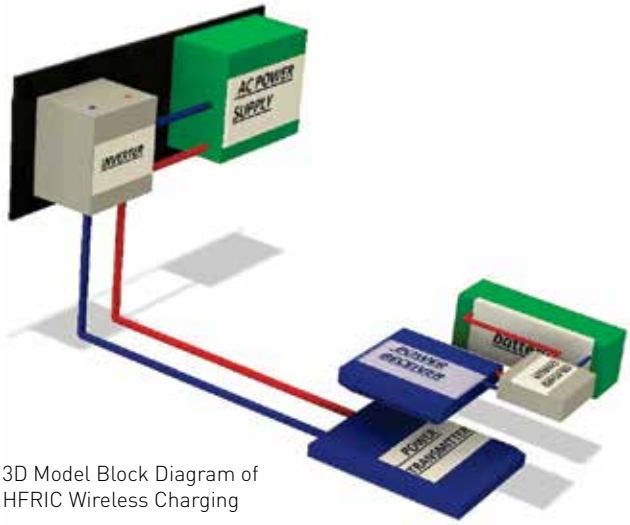
Block Diagram of High-Frequency Resonant Inductive Coupling (HFRIC) Wireless Charging:

The Wireless Power Tx pad or The Transmitter pad contains a single loop of hallow copper tube which carries high-frequency alternating currents, in turn, producing high frequency alternating magnetic flux around it, the range of flux depends upon the resonant frequency. Along with the single loop of hollow copper tube, there will be supporting power electronic components which are responsible for producing high frequency signals, AC/DC conversion, power conditioning, DC/HFAC conversion (Square Wave), Impedance compensation or resonance tuning.

The Wireless Power Transmission system consists of a power source which is a high-speed switching circuit for generating high frequency signals, primary impedance compensating network



Magnetic Coupling of Wireless Power Transmitter and Receiver



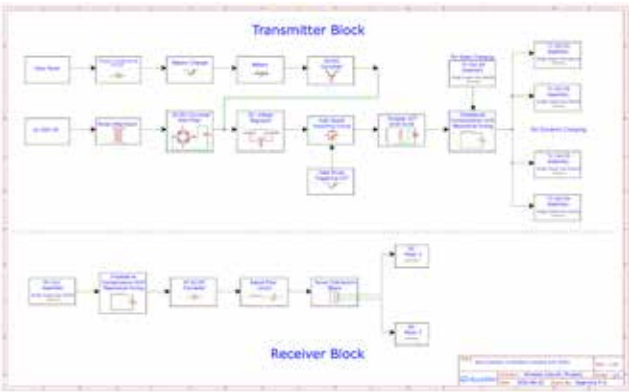
3D Model Block Diagram of HFRIC Wireless Charging

and primary magnetically coupled coil; all these components put together to form transmitter circuit.

The Wireless Power Rx pad or The Receiving pad contains a single loop of hallow copper tube which receives high-frequency alternating flux from the transmitter coil, in turn, producing an EMF in the secondary circuit. The receiver circuit comprises of secondary magnetically coupled coil, a secondary impedance compensating network, a high frequent rectifier, a voltage regulator.

There are many power electronic components which recondition the power received from the receiving coil. The high-speed switching circuit is one of the main blocks, a high-frequency resonant inverter that comprises of power MOSFETs and gate trigger circuits. A power MOSFET is a Metal Oxide Semiconductor Field Effect Transistor (MOSFET) designed to handle significant power levels and can operate at high frequencies in the range of hundreds of kilohertz. With the advancement in the field of power electronics a new power MOSFET (SiC MOSFET) that can operate at frequencies up to Mega Hertz which is used for high-frequency switching applications.

The major blocks of HFRIC Wireless Charging system are the power inverter and the resonant magnetic coils which are responsible for efficient and reliable power transmission. When the receiver pad comes in the vicinity of the transmitter the power transmission happens at resonance. The receiver which is retrofitted below the EV picks up the transmitted power, the received power is then used to charge the battery in the electric vehicle.



A detailed block diagram with discrete transmitter and receiver blocks

The Wireless Power Transmission system consists of a power source which is a high-speed switching circuit for generating high frequency signals, primary impedance compensating network and primary magnetically coupled coil; all these components put together to form transmitter circuit. And receiver circuit comprises of secondary magnetically coupled coil, a secondary impedance compensating network, a high frequent rectifier, a voltage regulator and a DC load. The highspeed switching circuit is a high frequency resonant inverter that comprises of power MOSFETs and gate triggering circuits.

The impedance matching network has a significant role in Wireless Power Transmission system. The impedance matching network reduces the VA (volt-ampere) rating of the power source by minimizing the reactance of input impedance and increase the power transmission efficiency by utilizing the magnetic field resonance. The time varying magnetic field is generated from the primary coil and is transmitted to the secondary coil. A high frequency rectifier is used to convert high frequency AC power into a DC power.

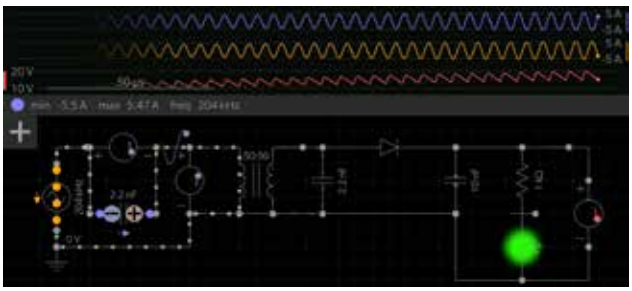
The Transmitter block contains series of circuit topologies, Tx00 block indicates the transmitter coil for static charging and Tx01 to Tx04 is for dynamic charging. In the Receiver block, everything will be mounted on a small car powered by 2 motors no battery is kept for the clear demonstration of wireless charging. The demo car may be controlled by a relay mechanism or a wireless control system. The main intention is to demonstrate both static and dynamic charging concepts with the same circuit elements.

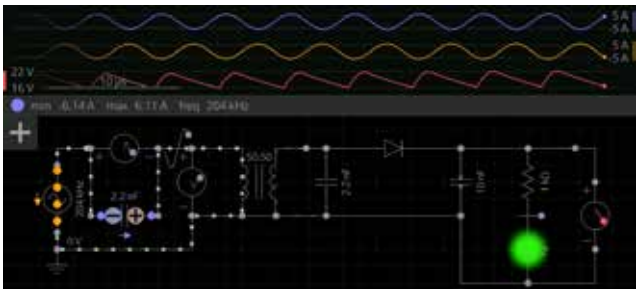
A coil of High Q-Factor copper tubes or copper wires can be used, but with the high-frequency circuits only hallow copper tubes are recommended to avoid skin effect. A special type of MOSFET called SiC MOSFET will be used to reduce switching & heat losses.

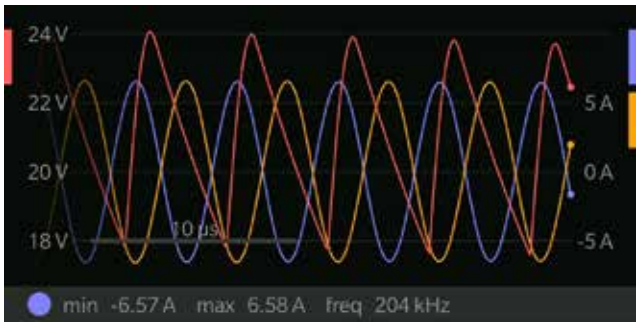
There are two losses associated with the diodes in a high frequency rectifier; losses due to the forward conduction of the diodes and the high frequency loss according to the switching time of the diodes. These losses act as the reverse recovery time for the diodes. To eliminate these losses, Schottky diodes or ultrafast diodes are used in the rectifier circuit instead of normal 1N4007 diodes. The voltage regulator is used to stabilize and control the DC voltage level according to the required load voltage.

Simulation of Schematic Diagram of a Wireless Power System:

The above Schematics shows the hardware model and simulation results of Inductive coupling. In this project, Wireless







Power Transmission for EV charging is done by using inductive coupling technique.

In this, we have converted AC voltage at the input to DC voltage using a rectifier. The power is transmitted from the transmitter to a receiver as DC voltage due to mutual induction principle. The simple working prototype of a wireless power transmission system require some copper wires for making primary and secondary coils which may be of same turns, a transistor which acts as a static switch and a capacitor is connected at the receiving coil. The basic theory behind this includes the inductive energy that is transmitted from a transmitter coil to the receiver coil through a magnetic field. The transmitter coil is connected to a power source through a high-speed switching circuit. The magnetic field links with the secondary coil and induces an EMF on the principle of Faraday's laws of Electro-Magnetic induction. In the receiving coil, a capacitor may be connected for maintaining the output constant.

AUTHOR

Nagendra Gouthamas
Lead Scientist – Energy Storage and Charging Systems
Wireless Vidyuth

Nagendra is a passionate electrical engineer, inspired by a great scientist Nikola Tesla. He is working as a Lead Scientist – Energy Storage & Charging Systems in Research & Development. He Co-Founded an early-stage Global Project called Wireless Vidyuth at Bengaluru, aspiring to become a full-fledged Clean-Tech Startup. Nagendra is a certified IoT designer from Stanford University and University of Helsinki and he has been involved in European Graphene-Battery flagship program. He is extremely zealous in building a viable, efficient and cost-effective wireless charging solution for charging EVs.

The circuit works at a resonant frequency of 204KHz and the value of current is varying according to the load in the secondary. In the first image, Imax is 5.47A at 20V viewing at 50 micro-seconds. In second image Imax is 6.11A at 22V viewing at 10 micro-seconds. With 22 nano-farad on both the ends creating a resonant frequency of 204KHz. No static switch is used as a function generator is used for the demonstration purpose.

Future Scope: Dynamic Charging using High-Frequency Resonant Inductive Coupling

Dynamic charging in simple words means charging of the electrical vehicles even under the movement in electrically equipped roads. In larger cities, dynamic charging offers an even greater impact utilizing existing infrastructures as vehicles travel along the busy freeways wireless charging can also occur while the vehicle is in motion. The transmitting plate kept under the road will be ON only when the vehicle passes over the plate (the vehicles having to receive plate comes into the area of transmitting plate it turns on) this is known as a segment control technology. The power lines are managed by Segment Control Technology, which supplies power to the vehicle only when it is passing over the power line. This technology prevents a magnetic field from being generated while pedestrians walk or other vehicles run on the road as well as wasting energy.

Dynamic charging allows electricity to supply a very large fraction of the energy for the transportation sector and reduce considerable petroleum consumption. Previously traffic delays now provide of charge while passing over in motion charges.

Norway's appetite for electric cars is booming, and its capital of Oslo will be the first to install wireless charging infrastructure for the city's electric taxis. Oslo, Norway has recently become the world's first city to start setting up city-wide wireless charging infrastructure for EVs. While waiting for customers at the stands, the taxis will charge via induction. Its wireless charging infrastructure is built to solve the issue of taxi drivers searching around for chargers and waiting to charge. U.S Department of Energy in collaboration with Oak Ridge National Laboratory is developing Wireless chargers for Evs. Also, BMW is building its own wireless charging system for its EVs.

Conclusion:

The transmission of power without wires is not just a theory, it is now a reality and in future, it should be made available for a large number of EV charging. EV Charging infrastructure can be seen more in urban and dense urban areas but if there are more charging stations spread all along the cities and high ways, makes range anxiety fade with the users and with assured charge points. The 3D model and the Simulation results give a brief overview of modelling a sample High-Frequency Resonant Inductive Coupling wireless power schematic for charging EVs and opens-up a new dimension for future research and dev elopement of the technology with adroit innovative solutions for an unwired future. ❑

ADVANCED DRIVER ASSISTANCE SYSTEM

A smart move towards **Zero Road Accidents**

ANS

Forward Collision Warning (FCW)

Advanced Driver Monitoring

- Closed-eyes Detection
- Yawning Detection
- Smoking Detection
- Calling Detection

Headway Monitoring Warning (HMW)

Lane Departure Warning (LDW)

ANS IT INDIA PVT. LTD.

+91 70463 54345

operations@ansitindia.com

www.ansitindia.com

AUTOMOTIVE TESTING AND SIMULATION WITH AI INSIGHTS

JAISAL SURANA
TECH MAHINDRA

RICHARD FOSTER-FLETCHER
NEURALPATH.IO

STEVE MULVEY
IMMENSE SIMULATIONS

Challenges for testing and the simulation of autonomous and connected vehicles

The expense of developing new hardware and software to achieve a viable, autonomous and connected vehicle system is considerable. Using intelligent simulation applications, you can identify possible issues early, and fix them faster. This will help you avoid costly mistakes and ensures your ideas are validated before building an expensive solution.

With intelligent simulation technology a developer can perform multiple parameter sweeps to test traffic flow, scheduled maintenance, challenging weather conditions, accidents, connectivity issues, vehicle range, refuel or recharge rates, CO_2 emissions and even cost expenditure per trip.

By capturing data collected from geospatial sources, a high fidelity 'digital twin' of your simulated world can be created. Also, by injecting consumer behavior data, the movement of vehicles and pedestrians through this world can be predicted using deep learning algorithms. Once a living digital twin is established, a developer is free to use design thinking principles to refine their autonomous and connected system. The simulation will define how quickly and safely the vehicles could be trained in a risk-free virtual world, and could highlight likely outcomes when the system is taken out into the real world.

With intelligent simulation technology a developer can perform multiple parameter sweeps to test traffic flow, scheduled maintenance, challenging weather conditions, accidents, connectivity issues, vehicle range, refuel or recharge rates, CO_2 emissions and even cost expenditure per trip.

What is ADAS and how can it bring safer roads?

Advanced driver assistant systems (ADAS) is being used since decades in order to ensure safer driving to help drivers by warning about potential dangers and reduce the roads hazards and incidents. It can also ensure driver inattentiveness or common mistakes can be avoided.

ADAS functions are already mandatory on new vehicles in some regions around the world, one of the example being the anti-lock braking system/ autonomous braking system becoming mandatory across Europe since 2004.

A report by 'Wholesale Insurance Provider Swiss Re' indicates that due to the advanced ADAS system the road accidents reduced by 45.5% on motorways and 27.5% reduction on other roads in the UK.

With the future inclining towards autonomous driving cars we would need connected cars and with advanced communication of Vehicle to Vehicle, Vehicle to Infrastructure and Vehicle to Everything communications.

Deep Learning algorithms and data analytics will serve as a backbone for assisting drivers ahead of time for any dangers and a safe road experience.

AI with deep learning algorithms can carry out complex data intensive calculations to read surrounding environment information including moving objects, pedestrians, detecting traffic lights, movement of other vehicles, detecting type of vehicles, extracting road context information and communicate successfully in real time to the connected infrastructure.

Simulation and Testing steps

1. For connected cars, we need to check Connectivity for vehicle to infrastructure and vehicle to vehicle communication. With the upcoming 5G, as latency for data transmission shall reduce, it can bring in processing of data collecting and processing much faster.
2. The second part is, critical scene understanding as these are an inclusive part of simulation - vehicles, pedestrians, cyclists, animals and texture-map surface elements and this is exactly what Waymo has been doing simulation by using the camera images collected by its self-driving cars.
3. A creation of 3D environment to mimic the data driven system with 3D geometry,

For an autonomous vehicle to be a SAE level 5 vehicle and reach 'Vision Zero' in theory they should be safer than human operators with no place for error.

Use of AI for vehicle simulation

For an autonomous vehicle to be a SAE level 5 vehicle and reach 'Vision Zero' in theory they should be safer than human operators with no place for error.

The Dynamic vehicle simulation systems are the newest of simulators to mimic the real world driving scenarios and can also help manufacturers. With the combination of AI and simulation systems, with the virtual world testing involved, we can ensure better response time, cost-effective and scalable AI based EMS in the future.

semantics, appearance of objects within the scene and also testing the weather conditions like snow, hailstorms, fog, heavy rains, sunlight and the simulation will analyze the scene and have decision making based on different angles and varying distances.

4. As the scene changes, the AI model should be able to learn and adapt to the updated environment and recreate additional data sets.
5. Once these elements fall in place we now need to test the cars from a virtual world to real road with safety.

EYE ON IT – Current Industry Standards

Some of the deep learning algorithms the companies are looking are Convolutional Neural Networks (CNN), Bayesian regression, Decision forest regression, K Nearest Neighbor, Principal Component Analysis, Histograms of oriented gradients, K-means, multi-class Neural Network, Gradient-Boosting and AdaBoosting. With the complexity of intensive computation for object detection, classification, combination of Regression, clustering, Pattern recognition, decision making algorithms are used. But more complex the algorithm, we need to be mindful that it does consume a lot of fuel once it is tested on the road due to the computational power.

Types of Simulators

Driver in Loop (DIL) Simulators, one such application would be in gaming applications and installations in theme parks and trade shows. This can be extended to Hexapod motion bases which are human factor DIL, need to measure human driver behaviors and are an expensive investment. The Dynamic vehicle simulation systems are the newest of simulators to mimic the real world driving scenarios and can also help manufacturers.

Emergency Medical Services (EMS) and Simulation

The Goal of EMS is to increase the patient survival and reduce the response time to reach the scene of the incident. To improve the response time to reach the incident, dispatch and relocation planning needs to be done.

The simulation system to test the EMS coverage to find the ambulance availability, travel time, anticipated demand that can then help to find shortest time to reach the incident area.

For emergency calls, ambulances are deployed across different locations already so they can reach faster at site, simulation programs in the 3D environment can help to test real world scenarios of multiple ambulances being tested based on variant calls from diverse areas.

AI can be used to calculate and predict ambulance location and relocation problems, ambulance dispatching, staff scheduling, demand forecasting, simulation and queuing for evaluating performance of EMS system, and decision support systems with Geographic Information Systems (GIS).

The simulation systems also need to consider the increase in ambulance numbers, different shifts, addition of ambulance stations, increase in number of calls, ambulance specialization, hospital selection, inter-hospital transport, changes to relocation and rerouting policies, fleet composition.

With the combination of AI and simulation systems, with the virtual world testing involved, we can ensure better response time, cost-effective and scalable AI based EMS in the future.

References:

https://iiot-world.com/artificial-intelligence-ml/machine-learning/machine-learning-algorithms-in-autonomous-driving/

https://www.mscsoftware.com/sites/default/files/Achieving-Autonomous-Driving-with-Simulation-and-Testing.pdf

https://venturebeat.com/2020/05/20/waymo-is-using-ai-to-simulate-autonomous-vehicle-camera-data/ .

AUTHORS AND CO-AUTHORS

Jaisal Surana is a business and data analyst with the Telecom domain with in-depth knowledge on product lines, architecture, billing experience for 14 years in IT with Tech Mahindra.

Richard is an Artificial Intelligence (AI) Influencer, Speaker and Podcast Host. He is the Founder of NeuralPath.io, Chair of MKAI and Host of the Boundless Podcast: Designing Our Digital Future.

Steve is the Product Designer (UI/UX) for Immense Simulations. He has been a design professional for 13 years and has provided UX and design expertise to a diverse range of industries.

The tech that can make or break micromobility

Anyone can make an e-bike or an e-scooter. It takes great hardware to build a compelling micromobility offering that people will want to ride – again and again.

DIEGO GRASSI, MATHIAS VETTER
ublox

Without reliable real-time knowledge on the whereabouts of each individual e-scooter, e-bike, or e-motorcycle in a fleet, today's platform-based business model in micromobility would simply fall apart. You'd be hard-pressed to find a single provider that doesn't depend on satellite-based positioning information. As a result, micromobilty has, in just a few years, become a key market for GNSS receiver manufacturers.

> "WITH RAPID EVOLUTION OF MICROMOBILITY SOLUTIONS, INVESTING IN EVEN HIGHER ACCURACY, FOR INSTANCE WITH HIGH PRECISION POSITIONING SOLUTIONS THAT USE GNSS CORRECTION DATA TO ACHIEVE CENTIMETER-LEVEL POSITIONING, COULD SOON BECOME A PREREQUISITE"

But even though there's a GNSS receiver in every shared ride, there's still plenty of room for differentiation. In real-world settings, in particular in dense urban areas, standard GNSS receivers are accurate to 10-15 meters – assuming that they are within direct line of sight of orbiting GNSS satellites. In even more challenging conditions, accuracies can increase to 60 meters, 80 meters, or even more. Luckily, these are rare, and using regular GNSS receivers has been good enough to bring a shared e-mobility service to market. But if the goal is to deliver a smooth and uncomplicated user experience that your customers won't forget while building a long-term leadership, think again.

Accuracy: important today, indispensable tomorrow

With the abundance of shared e-bikes and e-scooters on the road today, locating the exact one you just reserved or that was flagged for maintenance can be like looking for an apple in a ball pit. Higher positioning accuracy helps customers (and service staff) cut the time it takes to find the bikes they are looking for, translating to less hassle, time saved, and an altogether better experience.

Simply tuning the antenna can deliver significant improvements in a GNSS receiver's sensitivity and accuracy. Tracking the signals of multiple GNSS constellations on multiple frequency bands can lead to further gains in accuracy. But with the rapid evolution of micromobility solutions, investing in even higher accuracy, for instance with high precision positioning solutions that use GNSS correction data to achieve centimeter-level positioning, could soon become a prerequisite to being able to keep up with new innovative functionalities as they hit the market.

As cities enforce stricter regulation to manage the ballooning number of shared e-two-wheelers, centimeter-level geofencing could gain in importance as a means of enforcing speed limits, keeping rides out of restricted areas, or ensuring that vehicles are only left on designated spots.

> **POSITIONING SOLUTIONS WITH INTEGRATED 3D INERTIAL SENSORS, SUCH AS OUR NEO-M8U UNTETHERED DEAD RECKONING MODULE, ARE IDEAL SOLUTIONS FOR UNINTERRUPTED POSITIONING**

And as micromobility evolves from being merely a convenient way to get from one place to another to a means of staying fit, high precision positioning could enable superior performance metrics.

AUTHORS

Diego Grassi
Senior Manager Application Marketing, Industrial Market Development, ublox

Mathias Vetter
Principal Product Manager, Product Strategy for Standard Precision GNSS, ublox

Coverage beyond line of sight

Urban environments present a critical challenge. If an e-scooter or an e-bike weaves its way through traffic in a built up metropolitan area, the positioning receiver can be thrown off by GNSS signals bouncing off surrounding buildings, leading to unstable positioning performance with errors in the dozens of meters. Dead-reckoning solutions that combine inertial sensor measurements with satellite-based position offer the most cost-effective way to rein in these multipath errors and even bridge short GNSS outages, and that without the hassle and effort that dual-band GNSS integration would require.

Positioning solutions with integrated 3D inertial sensors, such as our NEO-M8U untethered dead reckoning module , are ideal solutions for uninterrupted positioning, providing continuous vehicle tracking and navigation even under such challenging signal conditions.

Staying ahead in a crowded market

The micromobilty segment is fiercely competitive, and it's particularly challenging for companies hoping to get rich by simply copycatting others. Fortunately, as we've seen, with constant evolution brought by platform innovation, connectivity infrastructure rollouts, and fast-paced hardware development, there is no lack of room for micromobility providers to carve out a niche for themselves to offer a user experience, features, and performance that sets them apart from the competition today and puts them on a solid path to future leadership in innovation. ❑

INTELLI TRUCK
FLEET TRACKING & SAFETY SYSTEM

TRAK N TELL

TRACK YOUR FLEET WITH ADVANCED SAFETY & SECURITY

BUY ONLINE
₹1899

- REAL TIME GPS TRACKER
- GEO-FENCE NOTIFICATION
- OVER SPEEDING ALERTS
- FUEL MONITORING*
- 90 DAYS TRIP REPORTS
- NEAREST VEHICLE LOCATOR
- FREE FMS
- AIS 140*

*Extra Charges Apply.

www.TrakNTell.com/truck

TO KNOW MORE
CALL : 8010-80-8010

TRAK N TELL

Designed in India, manufactured in India #MakeInIndia
Trak N Tell™ is a registered trademark of Bits N Bytes Soft Private Limited

MAKE IN INDIA

What's the Limit with Simulation in Automotive? Hint: It's not software

ARTURO VARGAS MERCADO
NI

It's hard to pin the single moment in which I had my first encounter with the automotive industry. From pictures, I know that my family's car when I was born was an AMC Gremlin from the 70s which, by those day's standards, was surprisingly equipped with an automatic transmission. Then I remember my mother's favourite car, a 1994 V6 Cutlass Eurosport, with manual transmission, power windows, and fuel injection, with which I learned how to steer. My next big encounter, now as a driver, was with a 1990 Volkswagen Beetle, or as we call it in my country, Mexico, a Vocho. Each of those cars had innovations in their own way: their powertrains, the cooling systems, the number of electric elements and of course, they all represented an engineering challenge in their own times. Now, decades later that I think of them, I can appreciate the level of complexity that was met by the engineers involved, with the tools that they had at hand.

As a young engineer, my real encounter with the automotive industry was when I was trusted to help test engineers solve their challenges. I was a field engineer working with automotive OEMs and Tier 1 suppliers as part of my portfolio. The biggest one was a German car manufacturer with a massive development department that designed test equipment in-house. During that time, a lot of our conversations were about the equipment we would use, the test methodology, and the benefits of using the technology I was offering versus alternatives. There was a boom of embedded, reconfigurable devices and I recall them doing a lot of prototyping of their test systems. Fast iterations of many prototypes was a big value my solution delivered. Now, many years later, as my involvement with the automotive industry has changed, I find myself in more and more conversations that discuss the ability of technology to integrate and bring other tools onto one single software-connected toolchain that can span from design and simulation, to road test, with the objective of relating test requirements with test execution and results (Figure 1). The trend to maximize reuse, deliver on shorter timelines and do more test without increasing resources continues to consolidate in the automotive industry and as engineers, we recognize that without such connected approach, the risk of investing in specific tools that do the one job, but don't provide value to future test stages, becomes too high to justify.

The ascent of simulation in automotive

Computer simulation technology started almost side-by-side with computers and, just as computers have evolved and improved drastically, simulation has grown to be used in almost all aspects of science and engineering with one major goal: to help predict what will happen to what we're creating.

In automotive design, simulation is one of the drivers behind faster innovation, improved safety, and business sustainability. It allows you to "see" reality without creating it, to try designs without

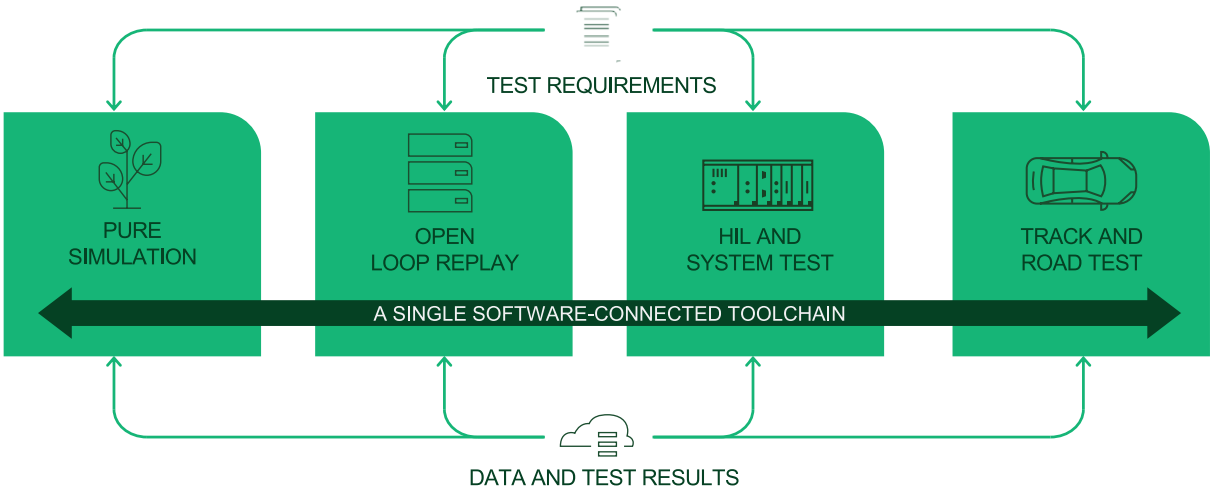


Figure 1. To effectively bridge simulation to road test, the whole test strategy needs to be assessed to ensure there's a single toolchain that relates test requirements to test data and results at each stage. [©NI, 2020]

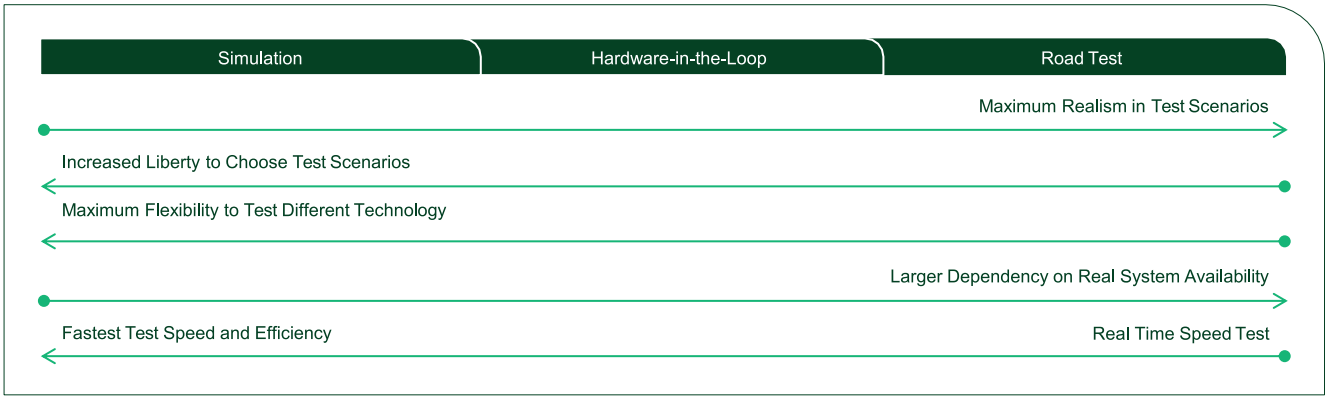


Figure 2. This continuum shows the trade-offs and benefits of testing at different stages [©WMG, The University of Warwick, 2018].

re-creating, to prototype without time-consuming hardware tasks, and to "finalize" without even starting. While there are multiple branches of simulation in automotive that we could explore, all the way from mechanical component design to vehicle dynamics, one of the most exciting –and critical– branches is in Advanced Driver Assistance Systems and Autonomous Driving (ADAS/AD).

To illustrate this criticality and the role of simulation, let's use a simple example. You're driving down the highway and there's a piece of tire that ripped off from a truck. You can see it, you calculate distances, speeds, risks, and steer in a smooth curve to avoid the obstacle without even interfering with the lane next to you. Other drivers understand you're not changing lanes, nobody overreacts, and off you all go.

Good, now consider this: have you ever encountered two of such pieces of tire in identical conditions in different occasions? I haven't. I've encountered them in different weathers, times of day, positions, speeds, neighbouring vehicles, and other conditions. Yet, I know what to do every time and I'm sure you do too. We know because, for some reason, we're trained on how to manage such situation, either by experience or by observation. Cars are not trained and that's where simulation comes in.

Simulation presents large benefits when designing and testing ADAS/AD systems and by far the single most important is supporting the development towards the safest possible end. Simulation opens the door to the car training facility that will accelerate the process within reasonable constraints, so that you can move on to the road test safely, confidently and effectively. Figure 2 above presents a few variables that change based on where the test is happening throughout the design and development process. Seeing words such as flexibility, liberty, efficiency, realism, dependency, is not surprising, but it should be enticing: how do we make that happen?

Companies such as Waymo rely on simulation and their "car", which means essentially their driving algorithm, or Waymo Driver, go through billions of miles in simulation before going on the road, with the intention that when it does go on the road, it's as complete and safe as it can be and then improves upon itself with the real scenarios. At NI, we've seen companies at different starting points, anywhere from minimum leverage of simulation, to maximum use such as the Waymo example. Whatever that balance is at the moment, the trend is to move towards more simulation on design and test, especially for ADAS/AD components.

A couple months ago, Raghavendra Bhat, from ANSYS, wrote a valuable piece on automotive simulation around the topic of safety, security and reliability of autonomous vehicles in which he covered types of simulations, safety standards such as ISO 26262 and, in one of his closing paragraphs regarding how autonomous vehicles must be analysed to assess and resolve security risks, he makes this remark: "the vehicles must be continuously monitored for security exploitation throughout their lifetime, across the markets". Let the phrase to sink in and see how one word comes to mind: data.

The role of data in simulation

In figure 1, data is represented at the bottom of the illustration with connections to every stage of the test. That seamless flow of data across the stages also represents the purpose of making ADAS/AD systems as safe as they can be, and to accomplish it, several challenges and potential solutions can be assessed. Let's drill one level down to look at the hardware-in-the-loop (HIL) type of test, abstracted in Figure 3.

Just like in the higher-level representation, data connects every stage and at the core, we have either a data centre that can be on-premise or a data cloud service. Simulation, in this example, is only one step in the HIL validation process but it cannot be seen in isolation.

The role of simulation here goes beyond providing an environment with variables, standard and user-defined scenarios, customized configurations, and high-fidelity sensor data. It also has a very important role of providing data that represents all of those variables to a system that can send (play) it to the ADAS controller (ADAS ECU) you're testing.

We know there are several tools for vehicle simulation in the market, each with their own strengths and areas of opportunities, but the one thing they have in common is precisely data, and that common feature can become a

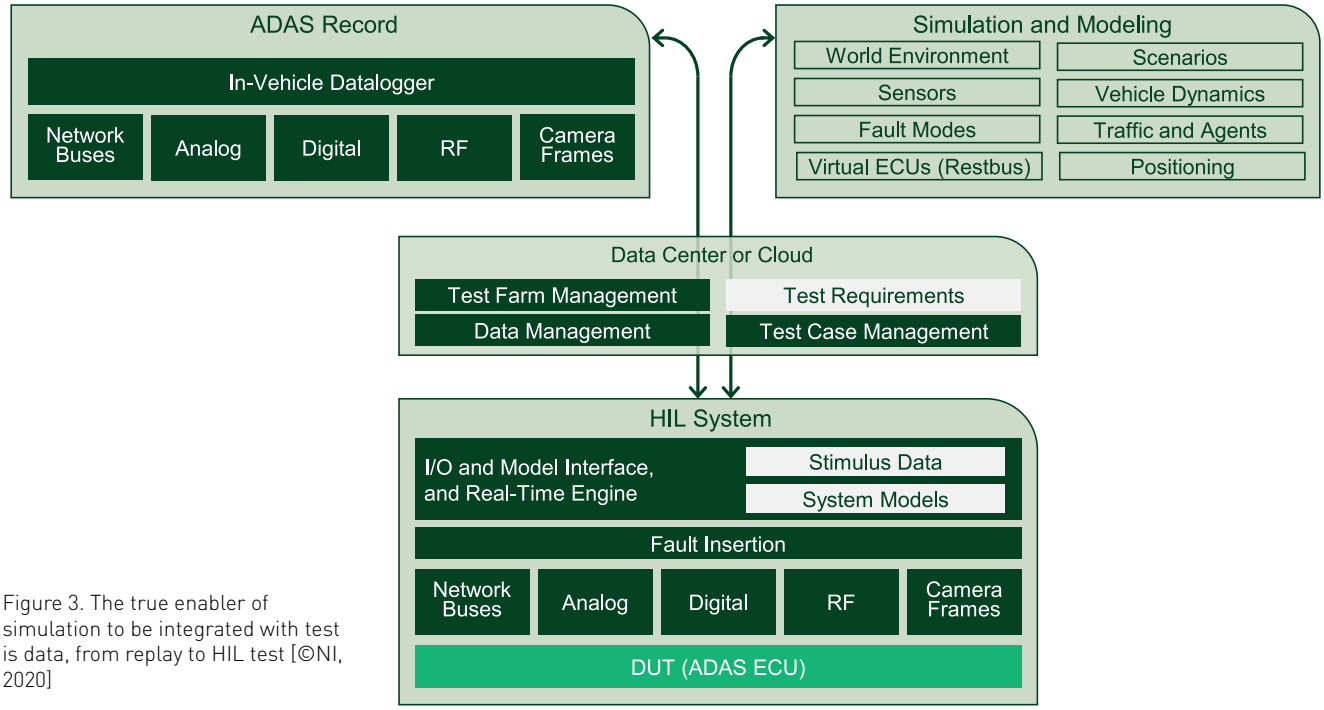


Figure 3. The true enabler of simulation to be integrated with test is data, from replay to HIL test [©NI, 2020]

differentiating factor when choosing the right tool for the task.

Let's consider the example of simulating an Autonomous Emergency Braking (AEB) test scenario in which you have a car driving at certain speed and encounters a vehicle stopped right in front. The simplest variables to modify are the speed and moment the brake command is sent, and with those two you already can have a large number of test cases to run. Now, let's start adding complexity to the scenario: another sensor; for instance, a camera, to detect the same stopped car in a different way, a ramp of acceleration instead of constant speed, a slope on the road, different weather conditions, and you can go on and on adding complexity to the same AEB test scenario. Being able to effortlessly modify these variables is a minimum expectation when using simulation software. Being able to connect all the way, through data, to hardware that can eventually play the test scenario to the ADAS Controller is the area in which we see value.

Since that ADAS ECU will eventually go into a car, we have to test at many different phases. We have to send simulation data to the algorithm, we have to send raw sensor data to it, we have to send processed sensor data, we have to replay data previously recorded from real world scenarios, and we have to correlate all to test requirements, test plans and test results. Finally, we have to make sense of all that data so that the test engineers will have a clear view of what absolutely needs to be tested on the field/road, how, and with which level of completeness.

Make better use of simulation data, and data for simulation

Now that we've established the value and relative position of data within the test framework let's look at how we can make better use of it.

Better understanding of test coverage

Through a wider, multiangle, multi-process view of the test in all environments (simulation through road), data can confirm that the test being covered meets expectations and regulation and uncover areas that are not yet exhaustively explored. In other words, data should naturally become an input and an output of the simulation stage

Better simulation and statistical modelling

Simulation tool providers invest heavily in providing their users the ability of effortlessly configuring and defining scenarios that will be turned into the simulation data test engineers need. Their investment is not with the intention of including every single possible scenario, but to enable the user to explore their test scenarios to the maximum. Test data is a critical feedback loop to maximizing the value of scenario definition through statistical modelling and hence, the value of the simulation tool becomes proportional to the level of user-empowerment to define simulations that come from actual test results.

Test automation

For test case scenario generation, leveraging data from the automated process, it's possible to eliminate unnecessary test re-runs and ensure the proper correlation of the test requirements with the test results.

Risk mitigation

Beyond the obvious benefit of having test result documentation to prevent recalls or failures, test data can drive decisions on capital investments, which reduces risks of going over-budget, over-time and over-working the test team.

Enable the future – AI and ML

Perhaps the most technically relevant element of data in test is how it opens the door to the future implementation of machine learning (ML), artificial intelligence (AI) and other technologies

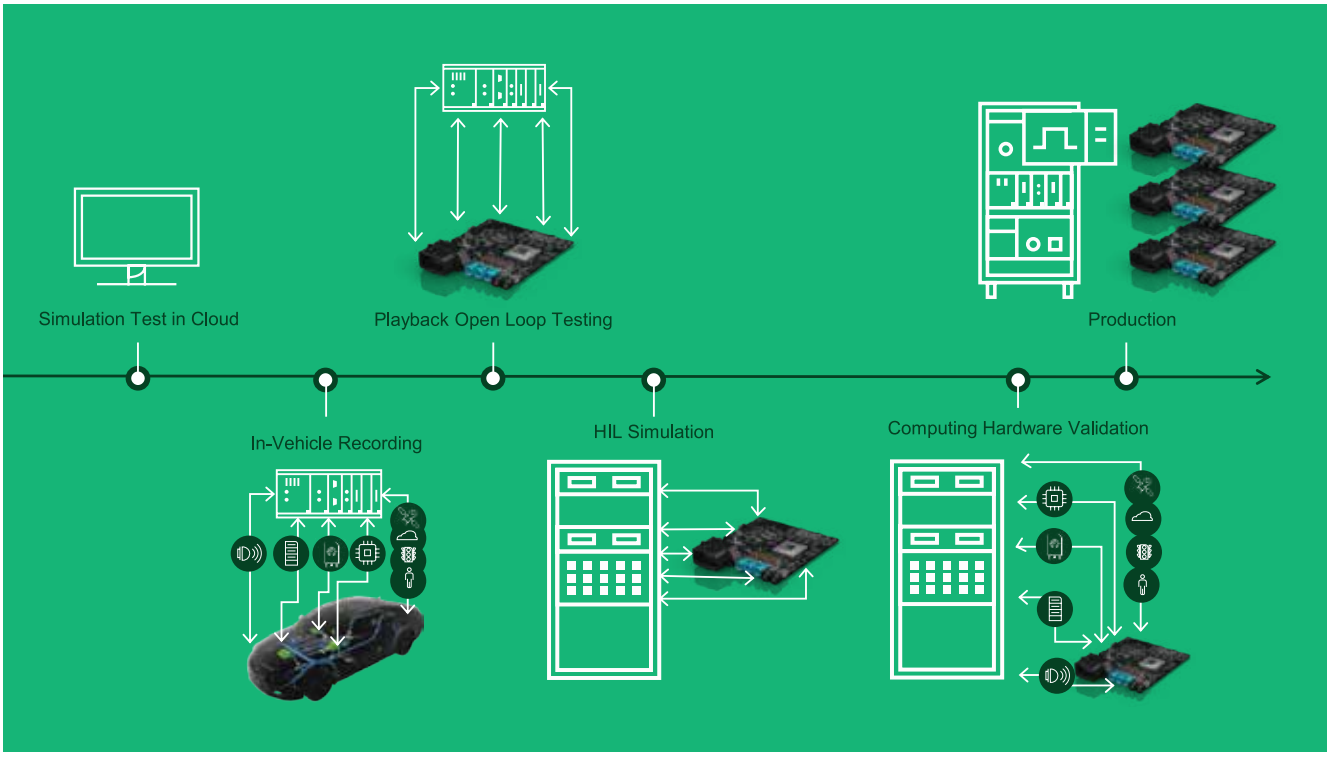


Figure 4. NI tools can be used across the different test stages thanks to their software-connected approach and the openness to work with the data from any simulation tool of choice [©NI 2020 | Copyright © 2020 NVIDIA Corporation]

that will further test automation and bring simulation closer to reality more effectively.

In essence, proper leverage of data, enabled by the right simulation and test tools, unlocks the possibilities of faster test development and a shorter timeframe between conception of safer, better tested ADAS technologies, to production and deployment in the cars we all use.

While compelling, the points regarding the value of data also uncover the limitations that still exists when performing test from simulation to production (Figure 4). When choosing how to do the simulation, we must ask ourselves if what we're choosing serves the greater purpose of safest and most effective test down the line due to its interoperability, openness and interconnectedness.

Conclusion

Throughout this article we've explored only a fraction of what simulation means to the automotive industry. This is not only because of how vast the topic is, but because, in the automotive test context, talking about simulation is really talking about data.

Early in the article I provided a few reference points of my experience with the automotive industry and how the innovation has been on par with the tools available. The designers of AMC did their best with the Gremlin over 5 decades ago. The creators of my Vocho did their best modelling of the airflow with the tools they had available at the time and decided on the design that, beyond some minor inconveniences, granted the car a level of simplicity and efficiency that was never matched again. Today, simulation allows us to virtually create and test anything we can think of without having to prototype it in the physical world first. With such powerful value, what's limiting us? It's the way we work with data from simulation, from test, from real world scenarios that's limiting us. By not flowing freely amongst the test stages because of format limitations, by not being detached from the tool and attached to the process and by the level of competition it exists in providing "the best data platform". When it's time to choose our simulation and test tools, we should be compelled to think about how data from it will connect to the hardware we'll later use for validation, and how it will relate test requirements with test result in the lab and on the road. While the "best data platform" comes to life, at NI we've worked with the right software-connected toolchain that works for you as the data bridge to take your test from simulation to road test, and from design to production, with transparency and openness, so data unleashes in the benefit of your design, and ultimately of the automotive industry. ❑

AUTHOR

Arturo Vargas Mercado
Solutions Marketing Manager - Automotive ADAS, Connectivity and Infotainment
NI

As Solutions Marketing Manager, Arturo is responsible for accelerating business within his prioritized focus area by using his industry and application expertise to position NI solutions to specific customers, at different stages of their solution-seeking journey.

CONSIDERING CONNECTED CARS!

RAJESH BHAMBANI
IBM INDIA

Increasing customer need for connectivity is well recognized by the Indian auto industry. A Connected Car therefore has become a key experience factor that has to be delivered to the customer along with the product. Indian auto OEMs intending to pursue this inevitable industry trend, however are confronted with some basic points of contemplation.

Business Case to this investment?

It is hard to quantify the magnitude of direct/indirect benefits from a connected cars initiative and formulate a solid business case for this investment. There is however enough opportunity for auto OEMs to monetize the data received from connected cars. Enhanced service revenue through malfunction detection & service reminders to the customers, cost savings by capturing vehicle performance as input to warranty and R&D teams and potential sales push by offering an enhanced customer experience with a whole range of connected cars functionality are just a few examples that could drive value for the auto OEMs.

As custodians of the car probe data the OEMs also have opportunity to monetize it by sharing anonymized data with partners like map service provider who could possibly enhance their live traffic navigation service, mobile network operators to help them spot issues with their network and other third parties like traffic police who can leverage this data to improve traffic management.

Is there a matured partner ecosystem which can build and run a connected cars service?

Connected cars solution typically encompasses a relatively large ecosystem of partners. The IOT (internet of things) platform provider, telematics device manufacturer, map services provider, mobile network operator and the overall system integrator (to develop customer facing applications and integration with enterprise systems) are key players of a connected cars solution ecosystem. Dependence on multiple partners with no single one offering end to end solution capability increases complexity for the auto OEMs.

Auto OEMs are progressively engaging with single partner who bring with them relevant implementation and run experience of a connected cars service. Large system integrators offering a reliable inhouse IOT platform, and who can partner with other solution providers to offer an end to end solution are increasingly becoming a choice as a single solution implementation partner.

Is there enough consumer readiness to adapt and use the connected cars solution?

A connected car offering brings a whole gamut of features including advanced navigation aid using weather and traffic data, remote vehicle controls, emergency services in case of breakdown and crash and a whole set of alerts for theft, tow away, over speed, security etc. Institutions and fleet owners use driving behaviour data for monitoring and check the drivers driving patterns.

Maximizing the solution adaption and its usage will be the key to the success of a connected cars program. The endeavour of the OEMs should be to scale up the usage by continuously offering new connected cars features offering safety, security and convenience to the customer.

Cost recovery from customer for the connected cars service, which currently is the key direct revenue source will increasingly diminish. Data collection and its monetization through enhanced usage of the solution will take priority over charging the customer for the services.

Is there an adequate Infrastructure to support advanced connected cars features and enable the ecosystem to reap its benefits?

The envisaged benefits of the future connected car can be reaped with adequate vehicle to infrastructure interaction (V2I). Government initiatives to integrate highway toll gates, electronic road pricing, charging stations and emergency services will be a true manifestation of the benefits from connected vehicles.

The auto industry is also seeking greater government support for instance availability of radio frequency channels for v2V and V2I communications for next generation connected cars and autonomous cars using Advanced Driver Assistance System (ADAS) to function.

Conclusion: Key considerations for your connected cars initiative

a. Data monetization opportunities will take precedence over subscription based cost recovery from customers for the connected cars service. Key is to achieve scale of solution usage by the customers and maximize data accumulation to reap benefits from it.
b. Technology companies offering proven IOT platforms, carrying an experience to implement & run such initiatives and who can partner with multiple solution providers to offer an single window solution will remain to be partner of choice to implement and run connected cars service for the Indian auto OEMs.
c. The auto manufacturers' will have to consciously work towards ways to increase the solution adaption and usage by the customers through continuously introducing new features offering safety, security and comfort.
d. The Indian auto industry must be future ready by keeping an outlook on the next level of ADAS capability for connected cars to keep it relevant and useful to the consumers. ❑

AUTHOR

RAJESH BHAMBANI
Sr Managing Consultant, IBM India Pvt. Ltd

Rajesh Bhambani is a Senior Managing Consultant at IBM India Pvt. Ltd. and is part of IBM's "Intelligent Connected Operations" practice. He has been instrumental in formulating the connected cars vision for a number of automotive players and has been involved in lead roles for implementation of connected services for leading Indian automobile manufacturers.

KNOW HOW YOUR DRIVER IS DRIVING THE VEHICLE

Drive Smarter, Save More!

Reduce Accidents with insights into Overspeeding, Hard Braking and Freerunning instances

Gain Control over Mileage by monitoring Idling and Gear Utilization

Monitor Behavior with Driver Performance Dashboard

INTANGLES
A DIGITAL TWIN COMPANY

8088 865 865
intouch@intangles.ai
www.intangles.ai

How to maximize research budgets for automotive usability assessments

ADAM O'SHAUGHNESSY, SASANGK SARMAH
SBD AUTOMOTIVE

The automotive industry, which can be viewed as lethargic at times, is undergoing a shift with the consumer electronics world having more of an impact on the purchase decisions. One of the areas which has seen substantial growth, with increased importance from manufactures, is the in-vehicle infotainment experience. Poor user experience, sparse feature sets and an abundance of software bugs used to be an acceptable evil for consumers, but this is no longer the case. Being able to effectively benchmark, target set and validate a pre-production solution is more important now than it ever was.

The ability to make informed decisions which

impact on the final customer experience is vital. It is too easy to allow confirmation bias and preconceived viewpoints to dictate business decisions which will inevitably lead to poor performance.

Testing methodology choice is important and should be based on the current stage in development, the output needed, timeline and budgetary constraints. Outlined below is an overview of the core types of evaluation methods with a cost indication. Another point to consider is what parts of the user experience are being evaluated, broadly grouped into three domains:

1. **Functionality:** does the system provide the features needed by the end user?
2. **Ergonomics:** has the HMI approach considered the user's tasks and environment?
3. **Usability:** have the features and UI been implemented well?

When to use it? To benchmark a current solution on the market which has concerns or to evaluate a pre-production design. It can be used to provide further depth and supporting evidence to the usability of vehicle's HMI. It provides a perspective that is separate from the usability of the solution's information architecture and provides analysis and insight with regard to packaging and layout. It can also reveal common issues that remain a challenge to overcome, or unique mistakes that provide "lessons learned" for other OEMs.

When to not use it? When a detailed, and expensive, computer simulated ergonomics assessment is needed. It should be noted that an "quick" ergonomic assessment should not be used on its own and should not be used to provide a definitive, clear-cut answer to why usability is considered particularly good or bad for a particular solution. Its use should be as a supplementary element of a larger usability evaluation, or to benchmark similar vehicles against each other from a pure ergonomic point of view.

Evaluation method	Overview	Cost
High level expert UX evaluation	A "quick and dirty" assessment used to highlight product positioning and main concern points	Low
Detailed expert evaluation	A detailed assessment of all system components to outline improvement areas with detailed recommendations	Medium
Quick ergonomics assessment	An assessment which is used to highlight whether there are any major ergonomic issues to a design	Low
Detailed ergonomics assessment	Computer aided assessments which engineering specifications and outputs	Very high
Biometrics assessment	Quantifiable assessments used to provide indisputable data on physiological inputs	Medium
Consumer diary exercises	Longitudinal research which can last months to capture the consumer experiences at each touchpoint	Medium to High
Consumer concept testing	Robust validation of consumer preferences and take up rates to build business cases against	Low to Medium
Co-creation with consumers	Immersive workshopping sessions where clients and consumers interact for rapid prototype development	Medium
Depth interviews	An immersive one-on-one consumer interview to explore consumer reactions to ideas, concepts or new innovations	Low
Consumer behavioural observations	A holistic view of how consumers behave within an environment (such as a dealership)	Medium

To maximize research budgets the right tool must be used at the right time and the decision of when not to use a methodology must also be considered.

Some common research methodologies are explained below taking into account what they are, how they are carried out and when they should be used.

Quick ergonomics assessments

What is it? An assessment by an ergonomics expert to validate whether a solution (from outside to inside the car) has any major concerns and what they could be. This evaluation takes the form of a technical analysis of physical access to the vehicle's HMI hardware, rated by the expected level of customer satisfaction for users in the 5th to the 95th percentile.

How is it carried out?

Evaluation covers the natural user journey for interactions with their car; from vehicle entry, to getting into a comfortable seating position, static use of HMI, dynamic use of HMI and finally exiting the car.

Ratings are applied considering the condition of the HMI being evaluated against the tester's stature and whether or not they encounter physical difficulty operating that control. That performance is then considered against general user expectation for that vehicle in its segment; for example some sports cars may come with inherent difficulties but that is to be expected for that type of vehicle and would not be marked-down unfairly.

The evaluations are split into individual line items that cover common, over 30 everyday use cases such as:

- Unlock the doors
- Open the boot
- Operate the door handle/release mechanism
- Move the seat to a comfortable position

Example high level feedback report

Criteria			Rating 6	7	8	9	10	Reasoning
1. Walking up to the car	1.1 Unlocking the car	1.1.1 Unlock the doors			★			• Automatic unlock on approach • Button is easy to locate • The buttons wobble noisily when operated
		1.1.2 Open the boot			★			Easy to see button (so +1), but must stoop down to press it (so -1)
	1.2 Opening the door	1.2.1 Operating the door handle/release mechanism	★					The door handles can easily pinch your fingers. Your fingers easily slide up through the gap on the back side. When you release the handle, it pinches all fingers against the door. Quite painful.
		1.2.2 Opening the front door		★				Door must be opened at least 500mm to gain access for a relatively thin person.
		1.2.3 Opening the rear door		★				Rear doors are slightly longer than front and the entry to the rear passenger seat is a sharp angle, making it difficult to slide into.

Cost effective consumer viewpoints

What is it? Short, quick and cost-effective consumer feedback sessions. This approach is the opposite of complicated longitudinal research methods such as ethnography (the study of users in their own environment through expert observation) where the research findings capture the consumer viewpoint for immediate input.

When to use it? Always. End consumer viewpoints must be included in any product development to increase the chance of success.

When to not use it? When the methodology to be used will not provide a true picture of what the end user will experience. There are many methodologies which may appear perfect from a purely academic perspective but will provide misleading results. This in turn provides erroneous data to decision makers and impacts on any business decisions.

How is it carried out?

Various approaches need to be carried out at different stages of development. Here are three such stages and methods:

Vision creation and user needs: Consumer diary exercises: To capture the daily lives of the customer, and their regular interactions with product touchpoints, using moderation to dig into how those touchpoints are impacting customer perception.

Proof of concept validation: Consumer concept testing: Best used for measuring and validating customer preferences for a product/feature. This enables detailed profiling on who the prospective customers are, how many of them are likely to buy, at what price, all to aid business decision making.

Fast prototyping design: Co-creation with consumers: Immersive and multi-session workshops whereby the consumer is invited to test and feedback to a prototype in the morning, the feedback is then acted on over lunch/break, then retested in the afternoon to rapidly advance a prototype's development.

Further consumer study examples

Benchmarking/state of the market

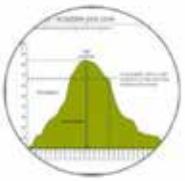
- Intercept interviews
- Short format surveys
- Quick turnaround focus groups
- Complex surveys
- Demand sizing

Consumer needs & feature specification

- Max diff
- Attitudinal segmentation
- KANO analysis
- Consumer diaries
- Online task immersion
- Purchase journey mapping
- Ethnography

Innovation & concept validation

- Co-creation workshops
- GUI depth interviews
- Qualitative immersion
- Standard focus groups
- Conflict focus groups
- Collateral biometrics



Pricing & marketing strategy

- Price sensitivity measure
- Conjoint(s)
- TURF
- Pricing awareness
- Willingness to pay
- Brand Price Trade Off
- Feature bundling

In-market feedback

- Mystery shopper
- Surveys
- Vehicle clinics
- Hall test
- Dealership observation

Biometrics testing

What is it? Evaluations carried out using biometric equipment to understand human emotions, behaviours and what they are focused on.

When to use it? When a more objective and quantifiable evaluation methodology is needed. This can be to quantify the level of driver distraction of a solution or to understand where the main frustration or excitement comes from an infotainment system, companion app or website.

When to not use it? When a "quick and dirty" methodology can be carried out. Biometrics evaluations take time, specialist equipment and detailed analysis. Because of the data which can be extracted from these studies the value for money is high however the amount of investment needed is also high.

How is it carried out? Test respondents are setup with equipment which measure various inputs with the most common being the following:

- **Eye tracking:** used to understand where the respondent is looking, for how long and how many times they revisit an area. Perfect to calculate eyes off road metrics.
- **Galvanic Skin Response (GSR):** used to understand the intensity of an emotion or the amount of stress being experienced. Can be used to understand whether specific use cases carried out or conditions have increased positive or negative sentiment.
- **Pupil dilation:** When taking into the correct context measures such as pupil dilation spikes can be used to provide an indication of cognitive load. Can be used to quantify the cognitive load for driver interactions. ❑

"TESTING METHODOLOGY CHOICE IS IMPORTANT AND SHOULD BE BASED ON THE CURRENT STAGE IN DEVELOPMENT, THE OUTPUT NEEDED, TIMELINE AND BUDGETARY CONSTRAINTS.

AUTHORS

Adam O'Shaughnessy, Senior Specialist-Connected Car & UX evaluation
SBD Automotive

Adam leads the User Experience testing practice at SBD and authors the industry leading monthly "UX Evaluation" series of reports which objectively evaluates the latest vehicles and systems to create a comparative view of the infotainment marketplace. He has worked with more than 30 automotive OEM clients (and tested 50+ unique systems) on studies ranging from expert testing, to consumer usability and focus groups, to dealership activation, on-boarding, and training initiatives.

Sasangk Sarmah
Project Manager-Connected Car
SBD Automotive

Sasangk is the Operations Head of SBD India office at Bengaluru. He drives all Connected Car related research initiatives and authors one of the most comprehensive report in connected car forecast that tracks some of the key technology trends in over 13 regions. Sasangk has led several strategically important projects for automotive OEMs in India on topics ranging from market sizing to forecast to consumer research.

NO SATELLITES LOCKED? TRY LBS SERVICE

TUSHAR BHAGAT
UFFIZIO INDIA

LBS stands for Location-based service which is designed for positioning location with the help of cellular towers. LBS accuracy can be quite rough, but it is one of the best ways to get the location when tracking data are unavailable. And with the help of next-generation mobile phone capability, Location Based Services (LBS) such as mobile GPS tracking have become much more effective. Let us go through one simple example to understand it better.

Suppose you have an important consignment to deliver to a destination. And a route to the destination consists of tunnels, mountain areas and remote locations. You can not rely on GPS all the time in this type of terrain.

GPS signals might get lost because of various reasons like dense areas, underground routes, tunnels, GPS malfunction. In addition to this, in this type of conditions, chances of accidents and vehicle theft increases.

In such a situation, if the GPS signal is lost then it becomes extremely difficult for a fleet manager to track and monitor the fleet. And your tracking system won't be able to help you out when you most need it.

How does it work ?

To track vehicles, one makes use of the GPS Tracking system. Which receives coordinates from the satellite and uses its latitude & longitude to provide you with the exact location of the object. Now, to obtain the accurate location continuously a high-speed internet is required. And if your vehicle moves in the region where there is no internet, then it becomes impossible to track your vehicle.

In this case, the LBS tracker sends data to the software with additional parameters mentioned below. These parameters help software in identifying the location of the closest cellular tower to the device. Therefore to locate a vehicle by LBS, the device should send at least 4 parameters: MCC, MNC, LAC & Cell ID.

1) MCC (Mobile Country Code) identifies the country code for example: India - 404, USA - 310, Hungary - 216 so on.
2) MNC (Mobile Network code) is a unique code which identifies a mobile network operator. For example MNC - 02 -Vodafone India (Delhi Operator), MNC - 10 - Airtel India (Delhi Operator) so on.
3) LAC (Location Area Code) each location area consists of a set of base stations that are grouped together to optimize signalling. Each location has its own unique number. For example LAC - 011 -Delhi, LAC - 212 - New York.
4) Cell ID is a unique number used to identify each Base transceiver station (BTS) or sector of a BTS within a Location area code. A valid CID ranges from 0 to 65535 on GSM and CDMA networks and from 0 to 268,435,455 on UMTS and LTE networks.

The LBS device used in vehicles consists of GSM sim card so whenever the software doesn't receive GPS signal from the satellite network, LBS device makes use of the above-mentioned parameters and collects data from the multiple Cellular towers. It then checks in which country, region and area your vehicle is moving with the help of those parameters. And provides you with the location of your vehicle. ❑

AUTHOR

TUSHAR BHAGAT
Director, Uffizio India Software Pvt Ltd

aquila Track

TS 101 BASIC

@ ₹ 1300/-

Different variant available with CAN & for EV

iTriangle
innovate • optimise • deliver

www.itriangle.in

LARGEST INDIAN MANUFACTURER OF VEHICLE TELEMATICS DEVICES

aquila Track

BHARAT 101 with IRNSS

INDIA'S FIRST AIS140 CERTIFIED DEVICE

EMPANELLED WITH:
MOTOR VEHICLE DEPARTMENT - KERALA, DEPARTMENT OF MINES & GEOLOGY - ODISHA, DEPARTMENT OF MINES & GEOLOGY - ANDHRA PRADESH, DEPARTMENT OF TRANSPORT A & N - ISLANDS, DEPARTMENT OF TRANSPORT - CHHATTISGARH, DEPARTMENT OF TRANSPORT - HIMACHAL PRADESH, DEPARTMENT OF MINES & GEOLOGY - JHARKHAND, DEPARTMENT OF TRANSPORT MAHARASHTRA, DEPARTMENT OF TRANSPORT - DELHI, DEPARTMENT OF TRANSPORT - UTTARAKHAND

HIGHLIGHTED FEATURES

- DRIVING BEHAVIOR
- EMBEDDED SIM PROVISION (ALONG WITH STANDARD MICRO-SIM SLOT)
- GPS AND GLONASS 1 GALILIO (FOR SUPERIOR LOCATION)
- IP65 ENCLOSURE (ROBUST DEVICE FOR DUST & WATER RESISTANCE)
- FREE LIFE TIME DEVICE MAINTENANCE SERVER ACCESS
- FOTA / COTA
- MULTIPLE IGNITION SOURCES
- 600 MAH INTERNAL BATTERY
- IP67 RATING (ROBUST DEVICE FOR DUST & WATER RESISTANCE)
- ALL PARAMETER CONFIGURATION THROUGH OTA, SMS & USB
- MAIN BATTERY REMOVAL ALERT
- 1 RS232, 1 USB PORT
- MOTION SENSOR, ACCELEROMETER, GYROSCOPE
- 850MAH INTERNAL BATTERY
- 2 ANALOG INPUTS, 4 DIGITAL INPUTS & 2 DIGITAL OUTPUTS
- DATA STORAGE WITH STORAGE CAPACITY OF 41000 RECORDS)
- REMOTE HEALTH CHECKING / DIAGNOSTICS THROUGH SMS
- LOW POWER CONSUMPTION & POWER OPTIMIZATION

GENUINELY !!
MADE IN INDIA

VEHICLE TELEMATICS
....REFINED & REDEFINED

Note: We pursue a policy of continuous research & product development. Specifications and features are subjected to change without Prior notice.

CONTACT: PHONE: EMAIL:

SAISHA	SHASHANK	SACHIN
+91-8884414611	+91-9739974445	+91-9513992362

SALES@ITRIANGLE.IN

Corporate Office: iTriangle Infotech Pvt. ltd. 803/A (803/A-1-3), 76th 'A' Cross, West of Chord Road, 6th Block Rajaji Nagar, Bengaluru, 560010,

SHARED MOBILITY CHALLENGES CALL FOR SHARED TECHNOLOGY SOLUTIONS

BHASKAR GHOSE
TATA COMMUNICATIONS

Covid-19 has brought the spotlight on shared mobility services, which perhaps would have taken longer to become apparent without the advent of the pandemic. Frost & Sullivan projects the global number of users of shared mobility services will reach 36 million users by 2025 – a doubling of numbers from 2020. While North America and Europe have been significant markets, the trend is shifting towards increasing adoption in Asian countries. By contrast, significant consolidation and divestment has also been the order of the day, as existing providers have failed to meet revenue and margin targets. The search for a workable business model in the shared mobility service space continues to be a work in progress.

There are many challenges in the mobility as a service space. Shared mobility models have not always delivered on the promise of integrated, affordable door-to-door transport. A customer requires a combination of multiple mobile apps and multiple shared mobility service providers to travel from one location to the other. Ideas around integrated transportation, particularly in urban locations, have been debated for several decades, but with mixed results. Some cities offer public transport tickets that are inter-changeable between bus, tram, metro and train services – but is this the extent of the mobile as a service vision? Not all locations in cities are covered by these types of arrangements and extra-urban and rural areas are not covered at all, meaning there is still a need to use different means to acquire access to multiple modes of transport. The involvement of municipal authorities is necessary to manage and co-ordinate services, else many different agencies and private enterprises become involved in an un co-ordinated approach to shared mobility, which can create additional problems with traffic congestion and co-ordination.

Technology innovation and adoption, already used so efficiently in the ride hailing sector, represents an opportunity to establish a more integrated approach to shared mobility service silos. Mobility as a service can be extended further to include micro-mobility services (bicycle sharing or scooter sharing for example). However, the first challenge for a user will be how to locate and access a rented vehicle? Do they go to a parking lot, or is there a roadside location where they can collect it? In so called 'free floating' models, a vehicle can be collected or dropped off anywhere within a defined geographical zone. This calls for a mobile app that can reserve, locate and unlock a vehicle, as well as some means for the mobility service provider to track the vehicle accurately, bearing in mind a vehicle might be located in an under-ground parking lot, making its location even more difficult to pinpoint.

Seamless vehicle connectivity is important, not just to help find vehicle's location, but also to monitor usage, ensure regular maintenance and update of relevant in-vehicle software, and to help recover vehicles in the event of theft. However, even the most-developed, urban location might face connectivity issues at times. This means that some combination of cellular and low-power WAN technology, possibly combined with satellite-based GPS might all be required for a vehicle. The optimum combination might be some form of dynamic, bearer independent connectivity to ensure that whether a vehicle is on the road, in a garage or parked in an under-ground parking lot, it can still be located. For remote locations the need to be able to switch between LP-WAN based connectivity, cellular or satellite is an even more important requirement, to ensure vehicle traceability. If a driver decides to take the vehicle beyond a prescribed zone, then it is important to monitor the driver's whereabouts both to recover a potentially stolen vehicle, as well as to bring it back into regular usage as quickly as possible. Avoidance of theft and vehicle recovery is one consideration, while cyber-crime and vehicle hacking is another concern. Shared mobility is just not limited to conventional vehicles. but also has the potential to tap into the autonomous vehicles of the future. Criminals have an interest in hacking vehicles for the purpose of theft. While automobile manufacturers are looking at innovative technologies to provide a world-class, all-connected driving experience to their car owners, security of the vehicle data ranks amongst their top priorities.

As shared mobility implies that vehicles are being driven for extended periods of time, the ability to use telematics to track wear and tear is important, so that a vehicle can be taken out of service at the right time for routine maintenance.

It is also important to ensure that an acceptable level of vehicle supply is maintained with a vehicle inventory

that meets the demands imposed by the subscribers to the shared mobility service. With station based micro-mobility services, racks with bicycles are maintained at certain points within a city. These are usually at train stations, but also in other popular drop-off and collection points. The ability to maintain visibility of assets and despatch collectors to re-distribute inventory is an integral part of the shared mobility service. In the case of shared mobility cars, there is discussion about the use of designated locations - so called 'Dark Dealerships' for vehicle collections and drop-off, although the cost of maintaining real-estate in some expensive urban locations puts further strain on shared mobility service provider margins.

Predictive maintenance and fuel/battery monitoring are some of the key benefits of a connected vehicle. Unlike conventional car hire models, there is little or no time between shared vehicle usage, so the vehicle cannot be checked for any mechanical or physical damage, or cleaned between different users. As shared mobility implies that vehicles are being driven for extended periods of time, the ability to use telematics to track wear and tear is important, so that a vehicle can be taken out of service at the right time for routine maintenance.

Shared mobility is gaining in popularity, but the commercial model challenges and some of the practical considerations in shared mobility adoption need technology solutions throughout the user journey – from using a mobile app to book, locate and access a vehicle, through charging and billing models, to the need for dynamic, multi-bearer connectivity to track vehicle usage and monitor telematics. These are integral requirements not just for commercial success but in many cases to comply with local licensing and regulatory requirements. Add to this the application of technology to secure vehicles against theft and cyber-crime, and it becomes clear that a technology platform-based approach to address these challenges is required. A technology platform enables the customer service and user access elements on one side, while enabling the mobility as a service provider to manage connectivity, visibility, vehicle monitoring and security –with a single integrated solution. ❑

AUTHOR

Bhaskar Ghose
Business Head
– Connected
Automotive Solution
(South Asia)
Tata Communications

TEST & SIMULATION - A GOLDMINE OF AI/ML OPPORTUNITIES

V SENTHIL MURUGAN
LATENTVIEW ANALYTICS PVT. LTD

Testing is often the most critical phase where vehicle systems matures! Most of the time, it is the testing maturity achieved that decides the product quality, reliability, and performance. But this is also the bottleneck for the entire vehicle development phase because of which the development time of the project is longer.

As the organizations try to keep up the competition and the demand of the customer, they are always on a lookout to reduce the development time! In the last decade, a lot of modularization, standardization has played a critical role in achieving this. But with the digital disruption literally sweeping across the functions forces the organizations to look for alternate ways to still achieve the same reliability, quality outcomes of the conventional testing methods however with the lower development time!

> **Testing is often the most critical phase where vehicle systems matures!**
>
> **But this is also the bottleneck for the entire vehicle development phase because of which the development time of the project is longer.**

Data to the rescue

Data driven test and simulation methods not just deals with the above constraint elegantly but thrives on! It is opening new value creation opportunities and influencing the way we work across multiple dimensions. Significant growth of AI/ML approaches, and organizational cloud adaptation is just acting like a catalyst to this situation.

The question remains is how to embrace this and ride this AI/ML wave to solve the very fundamental problems in the industry.

The above question basically translates into how to do it? What all the skills and approaches are required and most importantly how to drive the organizational acceptance and adaptation. I will highlight and discuss some of the opportunities in this space.

Testing of vehicle system- How to leverage AI/ML

Once the system specification is developed, the test cases are developed by the system engineers, and test teams at various levels like unit level, system level, vehicle level so forth. Though test automation is a well studied area and various tools provided by the tool vendors but still this automates the process of testing. But majority of the time and skill is consumed in test case generation and analyzing the test results to identify the root cause. To facilitate automatic test case generation, automatic analysis AI/ML can be used which are discussed below.

Automating test cases generation (AI/ML Approach)

Conventional approach

All the system requirements in the automotive ECUs exhibit kind of entity relationships across the modules. Generally, test engineers prepare the test case against this also, they will re-use the test cases which are evolved through the lessons learned.

AI/ML approach

With the advancement in the NLP (Natural language Processing), Text mining, and advanced machine learning algorithms from the specification document, it is possible to generate the graphical view of affected entities and simulate the effects of changes in one entity with respect to others. Using these relationships, test cases are mere rule generation exercise hence automating the test case generation.

Not only that, we have achieved the "executable specification" using which simulation is possible. This is no way replacing the human expert use case

generation, rather it is easing or aiding the testers to achieve better performance.

Automating the test analysis & root cause analysis (AI/ML approach)

Conventional approach

Lot of log data is getting generated during testing. We can declare the results of the testing as pass/fail automatically but finding the root cause and propagation of one failure mode and its manifestation of the same needs a deeper technical and domain expertise most of the time this is more time consuming.

AI/ML approach

Expert time is better utilized if the overheads on the data processing is reduced and prompting the expert to comment on the unexplained but important relationships. A/ML based methods not just achieves that but also offers the automation of root cause analysis capability.

Using the AI/ML methods root cause analysis activity is solved. Also, for the deeper understanding and explainability reasons Probabilistic graphical modelling leveraging the Bayesian networks and Hidden Morkov model-based approaches are used.

The incubation of AI/ML practices can happen at different levels to drive the organizational acceptance starting from basic descriptive analytics to predictive, prescriptive analytics.

ADAS Testing

Advanced Driver Assistance systems and autonomy has been an ongoing theme in the industry, across geography. It is fair to say that without the help of AI/ML systems, it is impossible to deliver the ADAS systems. But geographic constraints make ADAS problem unique to the market. For example, complexity of the Indian market is completely different from the other markets like Europe or USA hence there is no one fit all solution.

ADAS Testing Bridging the impossible

Developing the perception layer in the ADAS system already using the advanced computer vision, Deep neural networks which are very data hungry applications. Testing of these ML models to be done using the unseen data samples which makes the overall system extremely data hungry. Practically data logging across diverse scenarios are very complex and costly and sometimes even impossible. Imagine a data collection of situations ranging from foggy, mist, rain, various sun positions, air quality and dust reasons. Synthetic data generation and scene generation seems to be the leading approach to solve this problem.

With the evolution of GAN (Generative Adversarial Networks) and advanced deep neural networks methods it is possible to simulate data which are required for the testing of the ADAS perception layer. More so, with the minimum data, you can scale up to meet the high data expectation. More so training ML models can be controlled or orchestrated to deliver the required based on the available data. As they say garbage in garbage out is the old saying which is true. With the advancement in the ML algorithms and cloud systems allows us to realize "Minimum in Maximum out".

Complimenting the ADAS: Naturalistic driving study

Fundamentally ADAS implementation focuses mostly on offering the "assist " feature to the driver with the intent to achieve improved safety and comfort to the driver. Basically, it involves various perception and control systems working in a coordinated way. The focus on the driver is still not fully leveraged. There are many use cases possible by including the drivers state in the loop. Discussing one such solution as below which we have developed in house.

Anticipating driver maneuver

Driver's the visual cortex is far more powerful than the various perception systems in the ADAS systems then why not leverage that! With that intent, we have developed the in-vehicle driver monitoring system which observed the driver facial cues and eyeball movement and predicted the possible actions (we considered 6 different actions basically capturing turns and overtaking combinations). This solution we can predict the diver's actions on an average 4 seconds before the actual actions happen with the very good accuracy levels around 85%. The development of the system uses Recurrent Neural Network (RNN) based methods.

Combining the driver maneuver prediction information into the ADAS control strategy has a great potential for improved safety and reliability of the vehicle systems because the better control of the actuators is possible if the "action lookahead" is available. AI, ML methods make this possible.

Look ahead control of maneuver

In the previous section, we discussed using the "Driver's state" in ADAS application .With the connectivity revolution going on, we can leverage connectivity to even push the boundary for the ADAS there by experience of the driver.

Primary objective of the simulations has been to understand the performance elasticity of the current design and set the targets.

ADAS perception layer is having the limited horizon which is limiting the overall performance boundaries. The ADAS perception horizon can be extended using the connected maps and 3D mapping information from the various map service providers. However, over all contextualization of the data from the map service providers, along with the vehicle trajectory, ADAS systems need intelligent services to be developed which we refer to as "Geo enabled ADAS services".

This allows us to leverage the environment information's beyond the perception layer horizon! Combining look ahead scene understanding using the geo maps, along with the levering driver's intent makes an ADAS systems more safer and drivers experience is greatly enhanced as well.

This overall data orchestration, data stitching and consumable insights in the in -vehicle systems is possible by using the AI/ML approaches .

Simulation

Primary objective of the simulations has been to understand the performance elasticity of the current design and set the targets. If we consider the engine modelling or any physical system modeling basically done using the CFD techniques which can be referred as "Physics based approach". Straight way once sense that, the gap between the design and the real product because of the uncertainties in transients and environments, it is a difficult model. This gap can be bridged using the high complex models, but the cost and engineering efforts are too high. Data driven methods are an alternate to fill this gap with the lower cost and time.

Herewith highlighting some scenarios where AI/ML approaches can fill in.

Virtual sensing in stereo application (repurposing/ multipurpose the available sensors)

As we know that visual stereo applications need more than one camera source. But more than one camera source in many contexts is costly. Can we map the camera capabilities to another sensor with lost cost then we can repurpose or multipurpose a lost cost sensor that still achieves the end application with the reliable performance?

We have solved the above problem where "camera information" is modelled using the spatial sensors like accelerometer, gyro as the application demeaned us only "depth" information. We have re-purposed the sensors to model the camera information. Basically, we have modelled the information gain achieved using the camera systems using the other sensors. The modelling in this case involves ensemble structures of various deep learning models.

An alternate approach is possible to simulate one visual source in the system using the GANs. Thereby reducing the overall BOM (bill of materials) in the system and cost and reliability of the system. Moreover, this is an improving solution with more and more observational data.

The similar re-purposing of the available sensors for the new applications are possible using AI/ML methods.

Accident data simulation

Crash testing is done at the specified test conditions but road fatalities happen in multiple other forms. To investigate the accident information, generally there are companies which collect various information like the vehicle, impact locations, position, injury, error codes, other sensor data from the vehicle based on this the accident report is generated and shared with the authorities and development teams to gain insights and study the implementation. There are only a few rows of information available to describe the event.

Now with the help of powerful AI/ ML approaches we can re-create the movement by simulating the actual events using the same data.

Moreover, this also allows us to simulate the various other boundary conditions involving the laden, passenger, trajectory, pedestrian information. To put it short, environment simulation with different shapes, trajectory pedestrians, vehicles can be created along with the vehicle simulation with different load and trajectory conditions. Solutions of this nature will act as perfect virtual proving ground which reduces the overall development time, cost and allows us to capture more scenarios.

Summary

Data driven methods involving AI/ML have already influenced all the sections of automotive business.

Testing and Simulation is a source of data for many development activities is no exception and has huge potential to use the AI/ML methods.

The fundamental objectives of the testing and simulation is not only met by AI/ML methods but also thrives on it and opens new avenues of value creation opportunities.

Analytics adaptation into testing and simulation needs focused vision and executional skills which are very diverse in nature.

Simulations are transformed by the data-driven methods.

This article only motivates the audience by explaining the various possibilities. Each use case discussed in this article is a topic of its own. I encourage the readers to reach out for a detailed discussion on specific topics. ❑

AUTHOR

V Senthil Murugan
Senior Manager (Head - Automotive Industry Vertical)
LatentView Analytics Pvt. Ltd

V Senthil Murugan is a seasoned automotive professional with 14+ years of experience in diverse areas like product development, R&D, automotive body and security electronics,connectivity and data analytics. Has worked in various end to end vehicle development of various vehicle programs.
Currently he heads the automotive industry vertical at LatentView Analytics Pvt Ltd with primary responsibilities of driving innovation, delivery, and growth.

ACCURATE AND REPEATABLE ADAS TESTING ANYWHERE

ASHISH SAMANT
ZEN MICROSYSTEMS

Advanced Driver Assistance Systems (ADAS) are designed to improve road safety; minimising the risk of human error and reducing the number of collisions.

Testing and validating Advanced Driver Assistance Systems (ADAS) requires highly accurate measurements of position, speed and attitude from multiple vehicles, with more stringent testing requirements needed than ever before. The VBOX ADAS testing system from Racelogic can save valuable development time and simplify the process of testing and validating ADAS sensors in real-world environments, even in tunnels and indoor test facilities.

The VBOX 3i with RTK is an industry leading GNSS data logger and is ideal for ADAS testing. With real-time measurements of parameters from multiple vehicles, to within 2 cm positional accuracy, using a VBOX enables vehicle manufacturers to easily verify the effectiveness of their systems. By measuring and recording positional and time-to-collision data from up to 3 moving targets and a lane simultaneously, it is easy for engineers to test in accordance with the latest regulations from around the world.

As well as industry leading hardware, the free data analysis software from Racelogic, VBOX Test Suite, processes the data recorded by a VBOX and presents it back using visual aids such as charts, graphs and tables that can be exported and shared in simple to understand reports. Thanks to a variety of application specific plugins and pre-loaded test scenarios, it is quick and easy to conduct a wide range of ADAS tests using VBOX Test Suite. The software can be used both online and offline, clearly showing if pass or fail conditions have been met, live from the test vehicle using a Windows laptop or tablet.

For some tests which need the vehicle to take a repeatable and highly accurate driving line – such as Autonomous Emergency Braking or Lane Change testing - it is possible to use the VBOX system with popular steering robots from leading manufacturers, for consistent and accurate path following.

VBOX systems provide a simple and accurate way of testing and validating Autonomous and Advanced Driver Assistance Systems at test tracks, on public roads and indoor test facilities. The applications that you can easily test using a VBOX include Lane Departure Warning, Park Assist, Blind Spot Detection, Collision Mitigation, Autonomous Emergency Braking and Adaptive Cruise Control. Using a Video VBOX also provides synchronised HD footage with the data, which can be graphically overlaid on the video in real time and the VBOX Indoor Positioning System extends testing capabilities to any environment where you cannot get GNSS signal.

For anyone that is looking to test and validate ADAS sensors, VBOX systems provide a complete solution and come with comprehensive user manuals that are available online, helping you get started and set up your equipment. Combined with industry leading 2cm accuracy, this makes the VBOX ADAS testing system ideal for all engineers and automotive manufacturers. ❑

AUTHOR

Ashish Samant
Chief Executive
Zen Microsystems

Ashish is a seasoned Automotive Professional with 20+ years of Experience in Automotive Testing. He has been involved in many Testing Projects like, Benchmark Testing, Vehicle Dynamics Testing, Tyre Testing and ADAS Testing.

Currently we are Sole Distributors for few European Companies and sell Automotive Testing Equipments. We cater to the entire Automotive Industry like, 2/3 Wheeler, Car, Truck, Bus, Special Vehicles Manufacturers, Tyre Manufacturers, Certifying Authorities, and entire Auto Magazines.

Motional- an autonomous driving JV between Hyundai Motor and Aptiv

Joint venture between Hyundai Motor Group and Aptiv PLC for autonomous driving will be called 'Motional'. Launched virtually, the self-driving pioneer will be making driverless vehicles a safe, reliable, and accessible reality. The joint venture was established in March 2020.

Motional is developing SAE Level 4 vehicles – autonomous vehicles that will perform all driving tasks. Motional will begin testing fully driverless systems in 2020, and its driverless systems and supporting technology will be available for robotaxi providers and fleet operators in 2022.

Motional is led by driverless technology pioneers who participated in the historic DARPA Grand Challenge, and founded nuTonomy and Ottomatika. The Motional team was behind some of the industry's largest leaps forward, including the first fully-autonomous cross-country drive in the U.S., the launch of the world's first robotaxi pilot

(Singapore; 2016), and operation of the world's most-established public robotaxi fleet (Las Vegas; 2018 – present). That fleet has provided over 100,000 rides, with 98% of riders rating their experience five-out-of-five stars.

Motional is based in Boston, with teams in Pittsburgh, Las Vegas, Santa Monica, Singapore, and Seoul. The newest office in Seoul, will serve as a key technology hub and testing location.

Omnitracs and Trimble announce integration of their transportation platforms

Omnitracs, LLC, and Trimble announced the integration of their transportation platforms. This integration will allow customers to move fleet data seamlessly across both platforms. Trimble TMW.Suite customers will be able access Omnitracs One within their current suite. In addition, the integration enables Omnitracs One users to utilize TMW.Suite to reduce empty miles, minimize dispatch errors and enhance driver communication.

TMW.Suite customers will have access to a broad set of Omnitracs One applications, including Omnitracs Drive. TMW.Suite customers utilizing Omnitracs Drive will receive contextual-based workflow and user interface, designed to enhance the driver experience.

Additional benefits of the integration include: (1) Streamlined data-access across both platforms, improving driver performance and creating new business intelligence opportunities for customers; (2) More efficient routing, leading to enhanced customer service as well as saving cost and time; (3) Intuitive user interface and workflow, strengthening fleet communication and maximizing efficiency.

Subaru to use Xilinx MPSoc for its ADAS system

Xilinx, Inc. announced that its technology is powering the new version of Subaru's vision-based advanced driver-assistance system (ADAS), EyeSight. The Xilinx® Automotive-qualified (XA) Zynq® UltraScale+™ multi-processor system-on-a-chip (MPSoC) 16-nanometer technology gives the high-performance, ultra-low latency, and functional safety (ASIL) capabilities that helps EyeSight to accurately depict and react to dynamic driving scenarios. The new EyeSight will provide advanced features including adaptive cruise control, lane-keep assist, and pre-collision braking, putting best-in-class safety technology into the hands of consumers.

StradVision's SVNet to use Socionext SoC

StradVision has announced that it will be using Socionext Inc. system-on-Chip (SoC) solutions, for its StradVision SVNet. SVNet software allows vehicles to detect and recognize objects on the roads. It is currently used in mass production models of ADAS and autonomous driving vehicles that support safety function Levels 2 to 4.

PredictionNet to assist self-driving cars anticipate future traffic trajectories

Nvidia Drive has developed 'PredictionNet' deep neural network(DNN) to understand the driving environment around a car in top-down or bird's-eye view and to predict the future trajectories of road users based on both live perception and map data.

PredictionNet examines past movements of all road agents, such as cars, buses, trucks, bicycles, and pedestrians, to estimate their future movements. The DNN looks into the past to take in previous road user positions and also takes in positions of fixed objects and landmarks on the scene, such as traffic lights, traffic signs, and lane line markings provided by the map.

Based on these inputs, which are rasterized in top-down \ view, the DNN predicts road user trajectories into the future, as shown in figure 1.

PredictionNet, Nvidia adopts an RNN-based architecture that uses two-dimensional convolutions. This structure is highly scalable for arbitrary input sizes, including the number of road users and prediction horizons.

As is typically the case with any RNN, different time steps are fed into the DNN sequentially. Each time step is represented by a top-down view image that shows the vehicle surroundings at that time, including both dynamic obstacles observed via live perception, and fixed landmarks provided by a map.

This top-down view image is processed by a set of 2D convolutions before being passed to the RNN. In the current implementation, PredictionNet is able to confidently predict one to five seconds into the future, depending on the complexity of the scene (for example, highway versus urban).

The PredictionNet model also lends itself to a highly efficient runtime implementation in the TensorRT deep learning inference SDK, with 10 ms end-to-end inference times achieved on an NVIDIA TITAN RTX GPU.

Results thus far have shown PredictionNet to be promising for several complex traffic scenarios. For example, the DNN can predict which cars will proceed straight through an intersection versus which will turn. It's also able to predict the car's behavior in highway merging scenarios. It is able to learn velocities and accelerations of vehicles on the scene. This enables it to correctly predict speeds of both fast-moving and fully stopped vehicles, as well as to predict stop-and-go traffic patterns.

PredictionNet is trained on lidar data to achieve higher prediction accuracy. However, the inference-time perception input to the DNN can be based on any sensor input combination (that is, camera, radar, or lidar data) without retraining. This also means that the DNN's prediction capabilities can be leveraged for various sensor configurations and levels of autonomy, from level 2+ systems all the way to level 4/level 5.

Lucid launches DreamDrive ADAS

Lucid Motors announced Lucid DreamDrive, a new advanced driver-assistance systems (ADAS). The Lucid DreamDrive supports driving and parking assist features. This ADAS system is built upon a high-speed Ethernet Ring and its key features include:

Safety: Surround View Monitoring, Blind Spot Display, Cross Traffic Protection, Traffic Sign Recognition, Automatic Emergency Braking and Alerts for distracted or drowsy drivers

Driving: Full Speed Highway Assist (a combination of Adaptive Cruise Control and Lane Centering), Traffic Drive-Off Alert and Headlight Assist

Parking: Autonomous Parking Assist, Pullout Control and Maneuver Comfort Braking

Opus IVS awarded patent for Pass-Thru remote diagnostic system

Opus IVS has just been awarded patent 10,719,813 for a pass-thru remote diagnostic system. This system was developed by BlueLink Diagnostic Solution, which was acquired by Opus Intelligent Vehicle Support in August 2019. In the past two decades, the Bluelink team has developed technologies which will help technician to remotely diagnose a vehicle using J2534 and other standards.

Opus IVS will utilize the patented technology developed by Bluelink team, to remotely deliver diagnostic repair guidance and programming services.

Opus IVS is the Intelligent Vehicle Support division of Opus Group, made through the acquisitions of DrewTech, Autologic, Farsight, BlueLink, and AutoEnginuity to develop innovative automotive solutions for more than 50,000 repair shops globally, giving them the arrogance to urge the foremost complex vehicles back on the road safely and fast. Opus IVS helps shops repair complex vehicles with diagnostics, programming, and live repair guidance from OE brand-specific master technicians.

GEO Semi announces ADAS products using its GW4 and Gw5 product lines

GEO Semiconductor Inc. ("GEO") announced new design wins for Autonomous and ADAS system applications using the GW53x0 product.

GEO's application-specific camera video processors encompass both the GW4 and GW5 product lines. These products feature world-class high dynamic range image processing, geometric processing, featuring GEO's eWARP™ technology, overlay graphics, and within the case of the GW54x0, a DSP processor for computer vision processing.

Supporting a flexible design architecture with a little package footprint, low power design, and low cost, without requiring an external DRAM memory, the GW4 and GW5 products stand out as a solution to a variety of camera and video applications within the fast-developing automotive market.

GEO's GW53x0 product supports high resolution (8 megapixels), high dynamic range automotive image sensors with unique Color Filter Array patterns like RGGB, RCCB, and RYYCy. The GW53x0 allows customers to personalized the image quality to support viewing outputs also as optimizing the tuning to feed today's Computer Vision processors for decision making in ADAS or AD applications.

Groupe PSA will move to eVMP platform by 2025

Between 2020 and 2025, Groupe PSA will gradually move from multi-energy platforms to 100% electrified platforms to support the e-mobility development. The new eVMP platform will serve as the basis for a wide range of electric vehicles for the C- and D- segments. eVMP will offer of up to 650 km (WLTP cycle) and storage capacity with 50 kWh per meter.and stylish features," P Sanjeev, COO, Ampere Electric said.

ZF launches next-generation ADAS cameras

ZF announced it has launched its S-Cam4.8 to be used in Nissan Rogue in US. S-Cam4.8 has 100-degree horizontal field of view. It is in compliance with Euro NCAP 5-Star Safety Ratings and has also been IIHS Top Safety Pick+.

The camera system in S Cam4.8 has been provided by Mobileye. ZF S-Cam camera family, also includes an industry-first premium three lens Tri-Cam4 version to support advanced semi-automated driving functions, adding a telephoto lens for improved long-distance sensing capabilities and a fish-eye lens for improved short-range sensing with a wider field of view.

For light passenger vehicles within the near term, ZF is specializing in Level 2/2+ systems that utilize advanced camera technologies like the S-Cam4.8 and Tri-Cam4 for leading global automakers and will launch its coAssist Level2+ system, the foremost affordable Level2+ system available at well under $1,000, with a major Asian automaker later this year.

Cohda Wireless announces update to its C-V2X SDK

Cohda has announced update to its C-V2X SDK. This updated software development kit features an extensive range of useful applications and tools, as well as a virtual simulation tool (VSIM). This tool allows users to test their applications through high-quality simulated drives that provide full playback capability for actual drive tests. The Cohda C-V2X SDK is a self-contained virtual machine that allows anyone with previous embedded Linux experience to quickly compile and run C-V2X applications in conjunction with C-V2X development platforms. It includes source code for Red Light Warning (RLW) and Road Side Alert (RSA) to demonstrate the various APIs and enable quick application development.

In addition, it also includes binaries for the following applications:

- **FCW:** Forward Collision Warning
- **EEBL:** Emergency Electronic Brake light
- **CSW:** Curve Speed Warning
- **RWW:** RoadWorks Warning
- **BSW:** Blind Spot Warning
- **HLW-CN:** Hazard Location Warning for China
- **AVW:** Abnormal Vehicle Warning for China
- **SLW:** Speed Limit Warning for China
- **RLVW:** Red Light Violation Warning for China
- **GLOSA-CN:** Green Light Optimal Speed Advisor for China

The SDK also includes the Tester Control Interfaces for performing conformance tests.

Cohda's V2X solutions support C-V2X and Dedicated Short-Range Communication (DSRC).

Mercedes me Apps launched

Mercedes me Apps will link the vehicle and smartphone and turn them into a digital ecosystem. Initially there are three apps: Mercedes me, Mercedes me Store, and Mercedes me Service. They have been developed with cooperation amongst partners and customers. The new Mercedes-Benz Apps combine improved base functionalities with attractive customer experience.

The Mercedes me App links the smartphone with the owner's vehicle. This enables key status information, such as mileage, range or tyre pressure – to be displayed very conveniently.

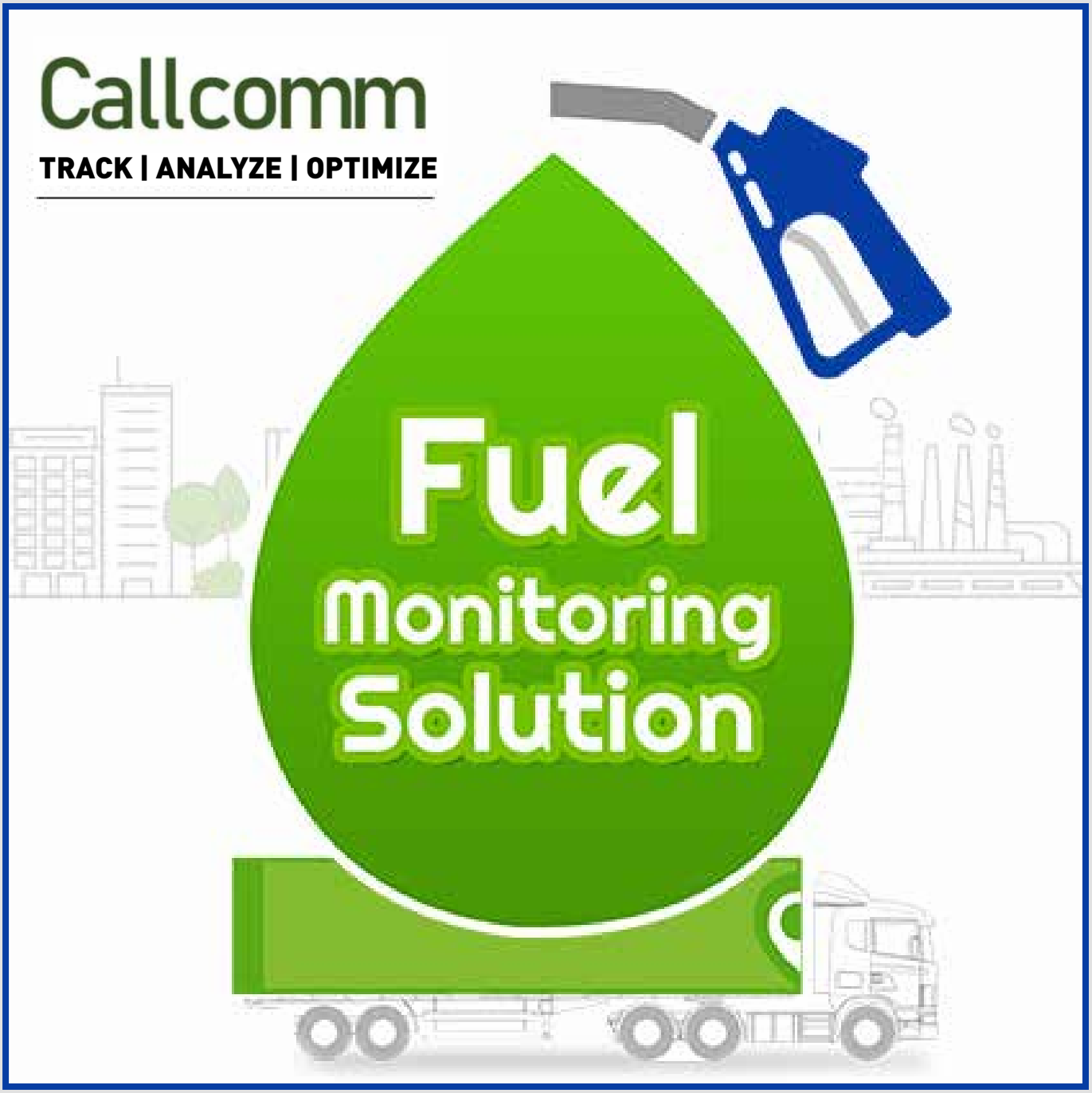
The Mercedes me Store App offers convenient access to the digital products from Mercedes-Benz. It provides a quick overview of the term of each of the Mercedes me connect services and on-demand features used. These can be extended via smartphone at any time, as required.

The Mercedes me Service App provides a reminder in good time of service appointments such as service or maintenance work. It displays active warning lamps and recommends appropriate measures, such as checking the tyre pressure at the next filling station. The app allows appointments with the workshop to be booked directly via smartphone.

CerebrumX launches its automotive data management platform in US

CerebrumX announced the formal launch of its operations in Princeton, NJ, USA, focusing on the Automotive Data Management Platform. CerebrumX makes and arranges an eco-system of end-users, OEMs, and Data Consumers within the verticals like Media, Insurance, Retail, Fleet, and Smart Cities/Municipalities. CerebrumX is centered around its API-first approach, tailored to give focused solutions to data consumers in specific verticals while being keenly focused on the data privacy and consent management aspects from the end-user and OEMs PoV.

CerebrumX utilizes its Augmented Data Learning Platform (ADLP) to deliver near real-time and execution of car data for solutions that require data-meshing from different sources, including the Automotive OEM cloud.



Decrease Fuel Theft by up to **90%**

Reduce Fuel Cost up to **15%**

Call Us Anytime
+91 9989094607

Email Us
callcommcba@gmail.com

Vitesco Technologies and Padmini VNA forms a JV- PV Clean Mobility Technologies

The new company "PV Clean Mobility Technologies" will offer selected powertrain technologies for the Indian market. The product range is focusing on sensors and actuators, as well as fuel delivery modules for passenger car, commercial vehicle and two-wheeler-markets. Both partners have a 50 percent share in the joint venture, which will be based in Gurugram(Delhi NCR), India.

India: Edison Motors to setup EV manufacturing unit in UP

South Korean electric vehicle maker Edison Motors has shown interest in investing almost Rs 5,000 crore(US$ 670million) to set up its production facility in Uttar Pradesh. According to the proposal, the company will invest Rs 500-700 crore in the first phase, Rs 1,000-1,500 crore in the second phase and Rs 2,000-3,000 crore in the third phase of its electric vehicle plant in the state. As per the proposal suggest by Edison Motors, the company would source up to 90 percent of the machine parts for their EV manufacturing facility from local vendors and manufacturers of the state, which would also give a fillip to the state's MSME sector.

Delhi gets its electric vehicle policy

The Delhi state government launched(Aug'20) 'Delhi Electric Vehicle Policy' under which it will waive registration fee and road tax, and provide incentive of up to Rs 1.5 lakh for new cars in the national capital. Under the policy, the Delhi government will give an incentive of up to Rs 30,000 for two-wheelers, autos, and e-rickshaws while for cars, it will give an incentive of up to Rs 1.5 lakh. Delhi government expects five lakh new electric vehicles in next five years. It will also give 'scrapping incentive' under the electric vehicle policy.

Detel launches electric bike for Rs 19,999

Detel Electric Mobility has launched low cost electric bike, priced at Rs 19,999. The two-wheeler has maximum speed of 25 kilometres per hour. This bike will not require registration. It has a 48-volt 12-ampere lithium-ion battery. It will take 6-7 hours to fully charge the battery, which can cover a distance of 60 km(as claimed).

Govt allows sales of electric vehicles without batteries

Government of India has allowed electric vehicles to be registered without their batteries. According to a statement by the Ministry of Road Transport and Highways, vehicles without batteries can be sold and registered based on the type approval certificate issued by the Test Agency. Further, there is no need to specify the Make/Type or any other details of the battery for the purpose of registration. However, the prototype of the electrical vehicle, and the battery (regular battery or the swappable battery) is required to be type approved by the test agencies specified under Rule 126 of the Central Motor Vehicles Rules, 1989.

For the promotion of electrical two wheelers and three wheeler vehicles, there are recommendations brought to the notice of the Ministry to delink the cost of battery (which accounts for 30-40% of the total cost) from the vehicle cost. Vehicles could then also be sold in the market without the battery. This will make the upfront cost of the electrical 2 wheeler (2W) and 3 wheelers (3W) to be lower than IC engine based two and three wheelers. The battery could be provided separately by the OEM or the energy service provider.

Zoomcar Mobility Stack for fleet owners

Vehicle rental platform Zoomcar has launched a software program stack targeted on corporates and fleet owners that can assist monitor driver behaviour and automobile standing in real-time to forestall rash driving and curb vehicular harm. The product 'Zoomcar Mobility Stack' (ZMS) consists of an IoT system and software program that can work throughout each inner combustion and electrical autos and is totally {hardware} agnostic.

ZMS contains two main software program choices, together with an IoT system as a product mixed with subscription as a service. One of many key options of ZMS is its proprietary driver scoring mechanism, an algorithm that tracks the real-time driving habits together with well being of the automobile. ZMS has noticed month-to-month working value financial savings of 25-30% utilising the motive force scoring system.

Pioneer to launch Amazon Alexa enabled car infotainment systems

Pioneer is launching three-car AV receivers with Alexa built-in. The models will be categorised under the names DMH-Z6350BT (6.8-inch), DMH-ZS9350BT (nine-inch) and DMH-ZF9350BT (nine-inch floating display). The prices of these products are yet to be announced.

With Amazon Alexa built-in, users can ask Alexa directly through the Pioneer DMH receivers. It's simple and hands-free – just ask, and Alexa will respond instantly. One can play music, place calls, play audiobooks, look for news, check the weather, control smart home devices and do far more – while keeping your hands on the wheel, and eyes on the road.

Zoomcar and ETO Motors partners for shared EV mobility

Zoomcar has signed an agreement with Hyderabad-based ETO Motors, an electric mobility solutions and services company, to provide an array of platform services for ETO's electric and shared three-wheeler business. As part of this agreement, Zoomcar will provide access to its proprietary tech platform. In the partnership, ETO Motors will own and operate electric three-wheelers for shared first-mile and last-mile passenger commute as well as goods movement within cities.

This co-branded platform is part of ETO Motors' plan to introduce a fleet of smart electric vehicles and strengthen its clean mobility solutions offering. ETO has already introduced its smart vehicles for the first mile and last mile connectivity service in Noida Metro(Delhi NCR) and is poised to expand its presence in the coming times.

Mahindra launches iMAXX, vehicle telematics platform

Mahindra Truck and Bus (MTB), announced the launch of Mahindra iMAXX. This new vehicle telematics platform will be fitted into Mahindra's commercial vehicle, including the BLAZO X range of HCVs, FURIO range of ICVs & LCVs and CRUZIO range of buses.

Mahindra iMAXX is coupled with FUELSMART technology. In addition to location tracking based services and basic vehicle performance analysis, Mahindra iMAXX provides: (1) Mahindra iMAXX provides engine and allied system data securely, and transmit on a real-time basis. (2) It provides predictive engineering insights. Mahindra iMAXX has capability to feature machine intelligence to normal data.

According to an actual case last April'20 Mahindra iMAXX system which monitors multiple correlated vehicle parameters was able to predict an engine cooling system issue, 33 hours prior to it actually occurring on the vehicle i.e. vehicle sending a high coolant temperature fault code through its ECU.

THE 1st MADE IN INDIA **PERSONALISED** VEHICLE TRACKING APPLICATION

trokzee Mini

TRACK WHEN IT MATTERS

NOW GET IT FOR FREE

GET IT ON Google Play | Download on the App Store

FEATURES

- DRIVING BEHAVIOUR
- MAINTENANCE REMINDER
- LIVE TRACKING
- SECURE VEHICLE THEFT
- ROUTE REPLAY
- PARKING VIOLATION ALERT

INFO@UFFIZIO.IN
WWW.UFFIZIO.COM

uffizio
We are the Software people

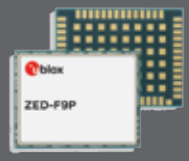
ZED-F9P

Multi-band receiver delivers centimeter-level accuracy in seconds

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
- No technology risk
- Low engineering cost
- Low capital investment
- Future proof
- Reduced supplier base

Navigation applications are demanding higher accuracy to increase productivity

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

Centimeter-level accuracy | Fast TTFF | Multi-constellation and multi-band | Global Coverage | Dead reckoning

Commercial UAV | Ground robotics navigation | Lane-level navigation | Heavy machine navigation | Industrial navigation and tracking

u-blox Singapore Pte. Ltd.

DBS House-26, Cunningham Road, Bangalore - 560052

Ph. No. - +91-80405092, Mob. No.: +91-9945329985 | E-mail: info_in@u-blox.com