

# Telematics Wire

Technology Driven | Futuristic Vehicle



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Path toward vehicle autonomy may be longer but will be fruitful

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Cybersecurity assessment for EV ecosystem - end-to-end approach



Atanu Niyogi  
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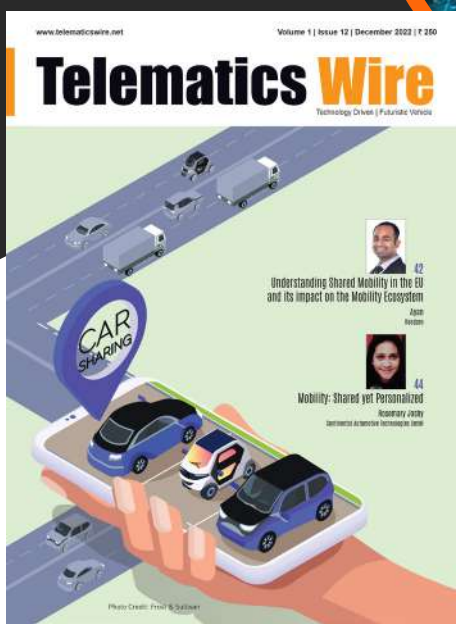


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## ZVISION launched short-range LiDAR ML-30s+

ZVISION launched its new short-range LiDAR ML-30s+ at CES 2023. The ML-30s+ LiDAR has an ultra-large field of view (FOV) of 140°\*70°.

ML-30s+ is a more streamlined design and also provides better coverage of the area alongside the rear part of the vehicle side without heading angle adjustment, sensing any object entering the designated area faster and earlier.

The 140° FOV is able to detect a vehicle advancing from behind 1.4m earlier than 120°, which gives the regulation and control system extra 300-700ms to respond. Furthermore, with the same case of 360° blind spot coverage, the blind spot splicing of 140° is twice as small as that of 120°.

About the vertical FOV, the ML-30s+ has an asymmetric design that directs the limited FOV to the most close blind area. The -50° (placed horizontally) of the ML-30s+ can effectively detect objects at ground level, such as low safety guardrails, bricks, boulders, stone abutments, safety cones and other road obstacles, as well as accurately identifying lane and parking markings. The actual coverage exceeds that of symmetrical vertical FOV of 90°. In addition, the asymmetric design allows for better coverage no matter the design of the body of the vehicles, so that the unit works well with the vast majority of existing car models.



### Ultra-high resolution and consistent ranging capability of full FOV

The angular resolution of 0.44°\*0.44° and the frequency of 512,000 points per second (in single echo mode) assure that ML-30s+ meets the requirements for constructing a detailed map of the object. This allows to obtain 20 point clouds from the black-clad pedestrian at a distance of 22 m, and 6 point clouds from the triangular cone barrel at a distance of 25 m.

Furthermore, when compared to other LiDARs on the market that have edge detection capability decay, the ML-30s+ has a consistent ranging capability of full FOV which can help automotive driving systems to make safe strategies.

### Good ranging capabilities under severe weather conditions

The ML-30s+ also has good ranging capabilities under severe weather conditions. Through unique algorithm and sensor technologies, the ML-30s+ is not only capable of achieving stable and clear detection in the dark, but is also fearless of direct sunlight, providing reliable 3D sensing capability for autonomous driving under all kinds of working conditions

### Extreme safety and reliability: New automotive-grade hardware and software

With a hardware architecture different from others in the market, the ML-30s+ adopts a non-coaxial architecture design. The MEMS mirror module is responsible for the two-dimensional scanning of the transmitting module, while the pure solid-state receiving module is responsible for the gaze reception of large FOV. The two do not interfere with each other. As for device reliability, the MEMS mirror module comes with new proprietary packaging, as well as temperature and humidity resistance and vibration shock resistance at the highest level in the industry. The design life tops 50,000 hours, fully meeting the requirements of passenger vehicles.

ML-30s+ fully meets the functional safety requirements of the typical scenarios of passenger vehicles and Robotaxi by transforming their top and specific functional safety requirements into internal technical safety requirements. And the protection and monitoring mechanism is added to the key chain where errors could occur. The product fully meets the ISO 26262 function safety ASIL B level and the Class I standard requirements for eye safety.

And the ML-30s+ supports the AutoSAR software architecture and standardizes many interfaces with the vehicle, including FOTA, UDS/DOIP, transmission and communication, and more. This significantly reduces secondary development work during the vehicle integration stage and allows for the quickest software adaptation of LiDAR to the vehicle.

In terms of cyber security, based on different application scenarios, ML-30s+ comprehensively improves the network security from the whole logical chain of threat and risk analysis (TARA), security scheme design, testing and production, so as to avoid LiDAR becoming a safety risk within the ADS.

### Software features and end-to-end engineering solutions

Compared with the long-range LiDAR, the use scenario of short-range LiDAR is different. The LiDAR closely monitors the area immediately



adjacent to the vehicle body, which will inevitably interfere with the surroundings of the vehicles, resulting in abnormal point clouds such as body noise and point cloud adhesion. This affects the correct judgment of the ADS and may result in emergency braking or slower forward progression. As a pioneer in the industry, ZVISION has accumulated years of practice in short-range products. Through specific point removal models and algorithms, ML-30s+ is equipped with special software functions to resolve the issue of point clouds in proximity to the body, and can adapt to different body shapes to meet the requirements of efficient mass integration.

It is not sufficient to only have different software features in order to get simple-to-use LiDAR. For OEMs, it is even more important to have a one-stop solution during the integration phase after delivery, as well as during use and maintenance once on board. ZVISION offers an end-to-end integration solution including multiple radar installation error prevention, off-line calibration, dirty detection and cleaning solutions, hibernation wake-up, window heating. It not only effectively reduces the difficulty of various engineering development before and after the LIDAR "on board," but also improves the overall vehicle integration efficiency, and lowers related costs.

#### Two-way micro-arc surface design

For the first time, ML-30s+ adopts the design concept of two-way micro-arc surface. Both the vertical and horizontal dimensions are based on micro-radian modeling. Compared with the previous generation unit, the depth of the optical window is reduced by 60%, while smoothness is increased by 30%, greatly improving the adaptability and aesthetics of the vehicle's design.

ML-30s+ has been comprehensively optimized in terms of geometry, at 120mm (W) × 60mm (H) × 97mm (D), a weight of 750g and power consumption less than 14w. Compared with the previous generation product, both volume and weight have been reduced by 40%, while power consumption has been curtailed by 20%.

ML-30s+ also adopts the assembly method of nested the upper and lower shell, with all internal components fixed on a unique datum structure, and the optical window pre-installed in the outer shell, effectively simplifying the installation process, improving product quality, and greatly lowering the repair cost after the light window is damaged.

## Hesai introduced solid-state lidar FT120

Hesai introduced its fully solid-state lidar FT120 at CES 2023. The FT120 debuted along with a series of automotive lidars to showcase the exciting progress of OEM and autonomous mobility partnerships in the global market.

Hesai has developed a fully solid-state lidar, FT120, for near-range blind spot coverage. The FT120 boasts an impressive 100° x 75° ultra-wide field of view (FOV). Its maximum detection range is 100 meters. Data rate per second is 192,000 points (in single return mode) and overall resolution is 160 (H) x 120 (V).

Designed as a blind spot detection sensor for ADAS, the FT120 helps vehicles accurately identify small objects while turning, passing, parking, and improves overall driving safety in even the toughest scenarios. Together, with Hesai's long-range hybrid solid-state lidar AT128, the two sensors form a complete automotive grade lidar perception solution.





## Volkswagen unveils its upcoming ID.7 EV sedan

Volkswagen unveiled its ID.7 electric sedan ahead of CES 2023, in a eye-catching orange and black camo scheme that hides an illuminating surprise.

That camo is not randomly generated each aspect is specifically designed to "create light effects on parts of the vehicle. In all, some 22 sections of paint, all of which are comprised of more than 40 individual layers of paint and electronics, will light up at the driver's command, or in time to the sound system's beats. The QR codes painted on the hood and doors will allow authorized users to control the paint job (that's so weird to write) through their smartphones.

The ID.7 is based on the Aero3 concept sedan that we first saw revealed earlier this year and is expected to achieve an all-electric range of 700 km. "With the new ID.7, we are extending our electric model range into the upper segments. The sedan will offer top-class technology and quality. The ID.7 is one of 10 new electric models that we are planning to launch by 2026," Thomas Schäfer, CEO of Volkswagen Passenger Cars, said in a statement.

Details are still scarce regarding hard performance numbers but the company plans to release the ID.7 with an augmented reality head-up display, 15-inch central infotainment screen, digitally controlled air vents which can be personalized to each passenger and which respond to voice commands and illuminated touch sliders. The company has not stated when production will begin but did confirm that when the ID.7 does go on sale, it will do so in the Chinese, European and North American markets.



## Marelli to showcase Diorama Display

Marelli showcased its Diorama Display to present a new in-cabin vehicle experience, alongside a wide selection of its innovations. The Diorama Display technology provides high-quality reflections on the bottom edge of the windshield, depicting images for navigation, indicators, warnings, etc. from a TFT source placed at its base. It ensures clear visibility and readability no matter what time of day or road environment.

The solution offers a much larger viewing angle compared to most heads up displays, with the ability to span and display information to all vehicle occupants. Alternative to a single display, the pillar-to-pillar modular configuration allows a driver to easily recognize objects in their blind spot.

Utilizing scaled technology and limited mechanical content that is easily integrated into the existing surface area, it provides both cost and space saving solutions to customers.





VinFast\_VF7

## VinFast announced the specifications of electric SUV models

VinFast announced the specifications of its newest all-electric crossover models, the VF 6 and VF 7. Early reservations for both vehicles will begin in March 2023. These two models are in B and C segments respectively.

The VF 6 and VF 7 have stylish, sophisticated designs, crafted by VinFast and Torino Design. Both models will be available with Eco and Plus versions.

The VF 6 is an all-electric vehicle positioned in the small crossover segment, with a maximum range on a full charge of 248 miles (WLTP target) for the Eco version, 174 horsepower and 184 lb-ft torque. The Plus version has a maximum range on a full charge of 237 miles (WLTP target), 201 horsepower and 228 lb-ft torque. In-car entertainment applications will be displayed on a 12.9-inch touch screen.

The VF 7 is slightly larger than the VF 6 and has a maximum range on a full charge of 280 miles (WLTP target) for the Eco version, with power checking in at 201 horsepower at 228 lb-ft of torque. The Plus version with its standard 2-motor AWD system has a maximum range of 268 miles (WLTP target) and provides a peppy 348 horsepower with 368 lb-ft of torque. The VF 7 Eco will also be equipped with a 12.9-inch touch screen while the Plus will increase to 15.0 inches.

Both models will be equipped with level 2 ADAS features for all Eco and Plus versions and modern technology features such as virtual assistant, mobile application - C-app, etc. creating an exhilarating experience for every journey.



VinFast\_VF6

## Peugeot reveals Inception concept

PEUGEOT has unveiled the INCEPTION CONCEPT. Featuring an exterior and interior design, including the next-generation PEUGEOT i-Cockpit® and innovative Hypersquare control system with steer-by-wire technology, the INCEPTION CONCEPT will inspire PEUGEOT's future products from 2025, with the goal of bringing most of its innovations to production.

Based on the STLA Large platform, the fully electric INCEPTION CONCEPT is powered by a 100kWh battery providing a range of 497 miles. With two electric motors, the INCEPTION CONCEPT produces almost 680hp and accelerates from 0-62mph in under three seconds. The model also features 800V technology, enabling it to add 93 miles of range in just five minutes, and is capable of wireless induction charging.

### Design

The PEUGEOT INCEPTION CONCEPT introduces a new, simpler and more refined design language for the brand, which will be introduced on future models from 2025. At the front, it features an all-new light signature incorporating PEUGEOT's distinctive claw design, which is merged with the front grille to create a single object that also houses the sensors. This is made up of a single piece of glass with the logo in the centre, magnified by the 3D luminescent effect.

A TECH BAR runs horizontally through the door layer. This flush screen emits different messages to the outside of the car when the driver and passengers approach it. The artificial intelligence equipped on the PEUGEOT INCEPTION CONCEPT makes it possible to recognise the driver in order to set up the comfort settings (seat posture, temperature, driving mode and multimedia preferences) desired by each occupant. In addition, the TECH BAR also displays the battery charge level and houses many sensors and radars, leaving the bodywork completely smooth.

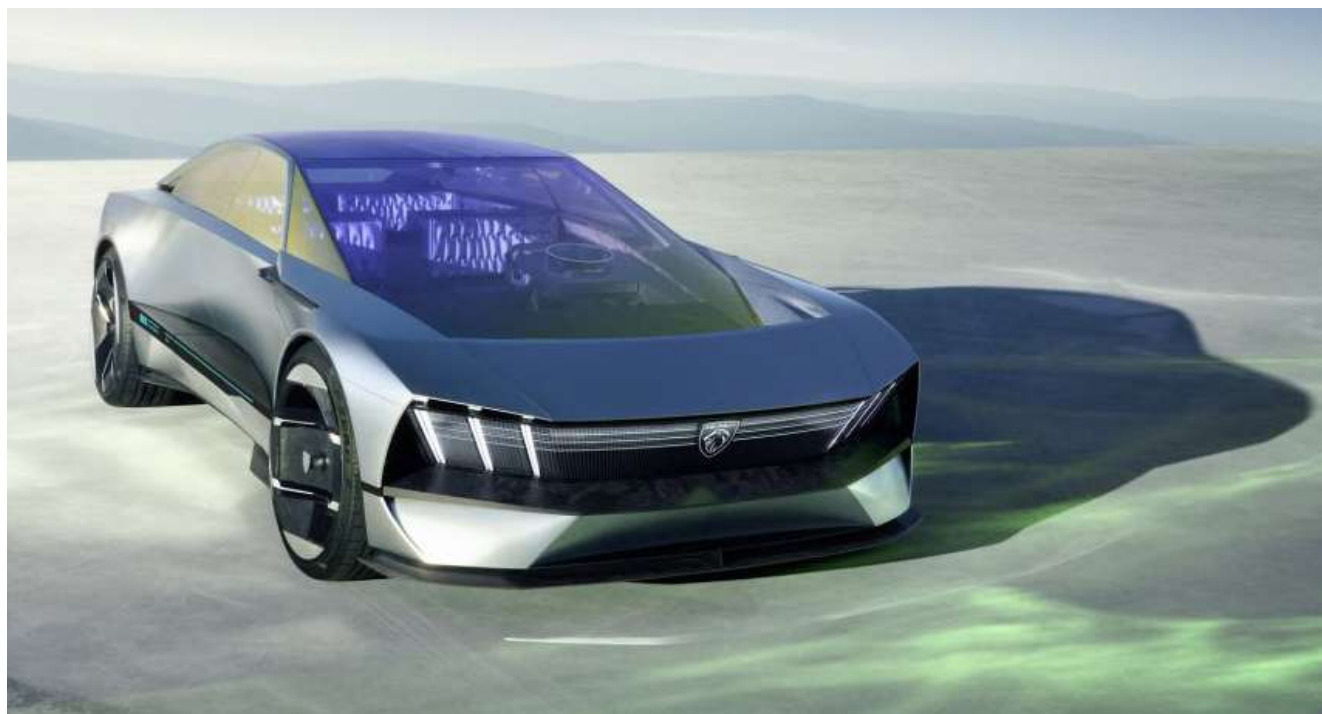
The INCEPTION CONCEPT's bold design incorporates 7.25m<sup>2</sup> of glazing to create a glass capsule for the passenger compartment that plunges to the driver and front passenger's feet. All the glazing (windscreen, side windows and quarter windows) is made from glass designed for architecture. Adapted to the PEUGEOT INCEPTION CONCEPT, it retains its exceptional thermal qualities and benefits from a multi-chrome treatment (treatment with metal oxides), a process initially used for the visors of astronauts' helmets by NASA.

Completing the car's unique design is an exclusive body colour, which highlights the shapes in the bodywork and interacts, like the glazing, by tinting according to the external environment. The paint is single-coated, meaning far less energy is consumed during its application.

### 'BEV-by-design' platform

The INCEPTION CONCEPT has been given the silhouette of a low (1.34m) and efficient saloon and is 5m in length. It is based on the STLA Large platform, one of four future Stellantis Group "BEV-by-design" platforms. The arrival of this new range of platforms from 2023 will revolutionise the PEUGEOTs of tomorrow. Specifically created for electrification, they offer major differences in terms of architecture which enabled designers to completely reshape the PEUGEOT INCEPTION CONCEPT's passenger compartment.

The new "BEV-by-design" native electric platforms will also introduce technological modules powered by artificial intelligence: STLA Brain, STLA SmartCockpit and STLA AutoDrive. Like the INCEPTION CONCEPT, future PEUGEOT models will be equipped with STLA Brain artificial intelligence and will be fully connected.





### Powertrain

The 100% electric PEUGEOT INCEPTION CONCEPT is equipped with 800V technology. Its 100kWh battery enables it to travel 497 miles on a single charge, with extremely low consumption of just 12.5kWh per 100 km. The INCEPTION CONCEPT is capable of adding 19 miles of range in one minute, or 93 miles in five minutes, and can also be recharged wirelessly by induction.

Two compact electric motors, one at the front, the other at the rear, make the PEUGEOT INCEPTION CONCEPT a four-wheel drive vehicle. The combined power is close to 680hp (500kW), enabling it to accelerate from 0-62mph in under three seconds.

### Next-generation i-Cockpit®

With its new Hypersquare control system, the PEUGEOT INCEPTION CONCEPT offers an agile driving experience and an all-new, more intuitive i-Cockpit®. Inspired by video games, the Hypersquare control system does away with the conventional steering wheel in favour of digital electric controls and steer-by-wire technology.

The centre of the Hypersquare is a tablet-type screen dedicated to the distribution of control information. The pictograms for the different features (air conditioning, radio volume, ADAS etc.) are displayed on the two side panels to facilitate access to the chosen control. The latter is located inside the circular recesses and can be accessed by moving the thumb only, without taking your hands off the steering control.

The next generation i-Cockpit also includes the Stellantis STLA SmartCockpit technology platform and STLA AutoDrive, enabling Level 4 autonomous driving. When driving is delegated, Hypersquare retracts and a large panoramic screen slides out from the floor to offer a new passenger compartment experience.

PEUGEOT's goal is to introduce the Hypersquare on a next generation vehicle in the range before the end of the decade.



### Interior

The PEUGEOT INCEPTION CONCEPT features a minimal cockpit dedicated to the driver alone, which does without a dashboard, crossbar and the bulkhead, providing a completely open view of the road.

Sustainable 'moulded textiles' are also used throughout the interior. Scraps of 100% polyester fabric from the design centre's prototyping workshops or from suppliers are re-used to make load-bearing or trim parts. The seats are covered with a velvet made from 100% recycled polyester, which extends onto the floor and features 3D patterns to act as a floor mat.

### Electrification strategy

The PEUGEOT INCEPTION CONCEPT is a showcase of the new techniques PEUGEOT will introduce to reduce its carbon footprint by more than 50% by 2030 in Europe and to become fully Carbon Net Zero by 2038.

Over the next two years, PEUGEOT will launch five new 100% electric models and by 2030, all PEUGEOT cars sold in Europe will be electric.

## ECARX and smart reveal automotive digital cockpit computing platform powered by AMD

ECARX and smart have unveiled their co-developed digital cockpit computing platform powered by AMD technology at CES 2023.

The next-generation digital cockpit, set to feature in the smart brand's all-electric production vehicles to be launched from 2024, is in-vehicle computing platform designed and developed by ECARX using AMD technology, following their global strategic collaboration announcement in August 2022.

Utilizing AMD Ryzen™ Embedded V2000 Processors and AMD Radeon™ RX 6000 Series GPUs, the digital cockpit will offer advanced computing power and game console-grade visual graphic rendering capabilities. The platform combines AMD hardware with ECARX's innovative product design and software capabilities, and was engineered from the ground up for performance and display capabilities.

## HERE introduces UniMap to revolutionize how maps are created, updated and used

HERE Technologies unveiled UniMap, automated mapping technology that enables rapid creation of digital maps and location products.

HERE has been developing the technology over the last three years in close collaboration with automotive groups including BMW Group. Primed for a rollout to selected customers in 2023 ahead of coming fully online for all HERE customers by 2024, UniMap is designed to deliver unmatched levels of map freshness, quality and coverage. The technology will produce the entire HERE map as well as enable customers to rapidly create their own private maps and customized location services.



UniMap is under-the-hood technology built on a new computing architecture that:

- **Automates map data processing and map creation wherever possible and logical:** For example, UniMap uses AI models to automate the processing of 500 million kilometers of vehicle probe and sensor data every hour, to extract map features such as 2D and 3D positioning of road signs, to validate speed limits and to build missing road geometry.
- **Conflates multiple types of data:** UniMap transforms data from a wide variety of sources into map content. Sources range from vehicle cameras and LiDAR to overhead imagery and IoT data.
- **Produces a unified map:** UniMap aligns all standard definition (SD), high definition (HD) and Advanced Driver-Assistance System (ADAS) data into one single semantically consistent digital representation of reality; in a first for the industry, HERE is offering seamless access to a unified catalogue of the data needed for navigation, automated driving and intelligent speed assistance (ISA). Different data types are aligned thanks to Map Object Model, an extendible unified map content data model.
- **Enables changes detected in the physical reality to become visible in the map within 24 hours**
- **Stores all data in a single environment, readily accessible for customers 24/7**
- **Enables customers to combine and connect data sets:** With UniMap, businesses can bring in their own location data and information from other sources such as crowdsourced content to create new products in just hours.

## Google launched new Android Auto update

Google announced the release of its latest Android Auto software. The redesign prioritizes navigation, communication and music -- for starters, Maps is now closer to the driver's seat, making it easier to view, and there's also a new quick launcher that lets you access the apps you need most, faster. A new split-screen layout adapts to your screen size and orientation, and Google Assistant provides smart suggestions like arrival time sharing, message replies and music or podcast reminders. If you have one of the latest Pixel or Samsung phones, you'll soon be able to make WhatsApp calls via Android Auto.







## Ram unveiled 1500 electric pickup truck

Ram unveiled the Ram 1500 Revolution BEV, fully electric pickup truck, at CES 2023. The electric truck is equipped with back-swinging suicide doors, three rows of seats, an AR display, an AI personal assistant and "themes" for the interior of the car. For example, you can enable party mode or relax mode -- each changes the seat positions and orientation, lighting, sound system and even the opacity of the skylight. But the most interesting thing about the electric truck has to be its "shadow mode" feature, which allows the truck to follow the driver around, sort of like a dog, when they're on foot.

### In-Cabin highlights

The 1500 BEV Concept from Ram introduces a feature: third-row jump seats, adding to the company's long list of features. Features for powered middle-row jumpable seats with a removable lower portion allow for a pass-through and into the trunk that can fit objects up to 18 feet long and allow for a variety of flexible seating combinations.

### Dashboard Screen

The vehicle has a dual, 28-inch screen display, a heads-up augmented reality screen display and a panoramic moonroof. Also, the second 14.2-inch dashboard screen is portable.

### STLA Frame

The electric truck is constructed on the new and revolutionary STLA battery architecture, for which Stellantis is investing in solid-state batteries and which will power Stellantis EVs in the future. With full underbody aero panels, an active diffuser, and a battery pack that is specifically incorporated for full-size electric vehicles, it will efficiently incorporate the battery pack.

### Range

It is equipped with an all-wheel drive and powered by two electric drive modules. With 800-volt DC rapid charging at up to 350 kW, the Ram 1500 Revolution BEV Concept can increase its range by up to 100 miles in just ten minutes.

### Steering

For improved vehicle mobility, the Ram 1500 Revolution BEV Concept has four-wheel steering with up to 15 degrees of flexibility.

### Shadow Mode

The driver remains connected to the car even when the driver is outdoors. The vehicle will literally follow the driver if they activate the Shadow Mode with their voice, which according to Stellantis may be advantageous in instances where the driver wants to move a vehicle. This option, according to Stellantis, may be handy in circumstances where the driver wants to move a short distance and doesn't want to get back in the truck, such as when picking up tools or equipment from a job site.

## Owl AI launches monocular 3D thermal ranger computer vision for ADAS & autonomous vehicle

Owl Autonomous Imaging announced the availability of an Evaluation Kit for their new Thermal Ranger™ ADAS & Autonomous Navigation Development Platform.

This hardware and software kit enables Tier 1 and OEM automotive companies to easily evaluate Owl AI's Thermal Ranger imaging solution for use in their Pedestrian Automatic Emergency Braking (PAEB) and other ADAS applications supporting L2, L2+ and L3/L4 requirements. Owl's monocular thermal camera solution enables 2D & 3D perception for object classification, 3D segmentation of objects, RGB-to-thermal fusion and highly accurate distance measurements.

The Monocular 3D Thermal Ranging Solution, the Thermal Ranger platform not only enables cars to see at night, it also enables the vehicle to know how far away the living object is and what it is. Owl's 3D Thermal Ranger currently provides VGA image resolution. However, in the near future, using our in-development HD imaging, Ranger will provide a 150X improvement in resolution and cloud density over other sensing modalities.

It operates day and night, in all weather, and definitively classifies vulnerable road users (VRUs) including pedestrians, cyclists, animals and vehicles, all the while calculating position and direction to enable safe autonomous and semi-autonomous vehicle operation.

When other cameras and perception sensors are blinded by the environment, thermal ranging cameras work.

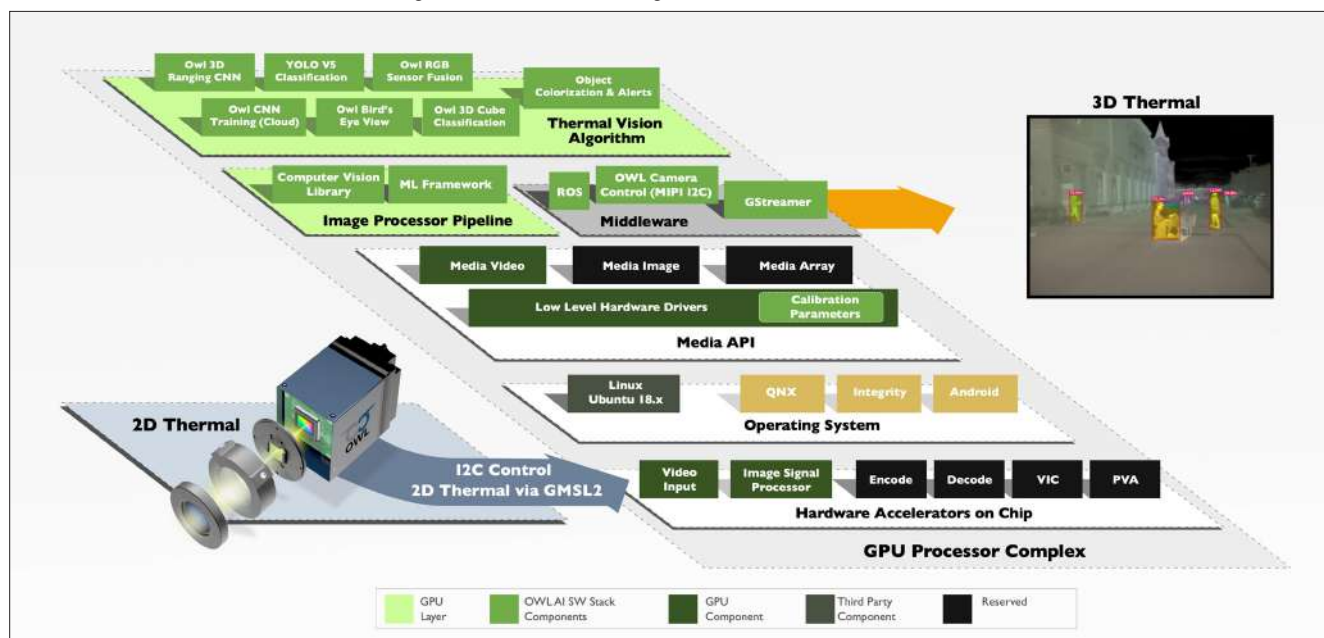


### The Thermal Ranger™ Platform:

The platform consists of a thermal imaging camera, an NVIDIA Jetson AGX Orin AI processor, and the Owl AI software suite including Convolutional Neural Networks (CNNs), ROS applications, AI/ML framework and drivers, and necessary cables and adapters. The CNNs operate on the thermal images to provide 3D Object classification and ranging information using the Robot Operating System (ROS) Publish/Subscribe interface. Several example ROS applications are also included.

All required software is supplied installed and ready for use. In addition to the software required for operation of the NVIDIA processor, the following modules are included:

- Owl AI/ML Neural Networks
- Autonomous Emergency Braking application
- 3D Birds-eye-view application
- Object segmentation
- Raw thermal video viewer
- Raw thermal video recorder
- Thermal with both 2D and 3D bounding boxes and colorized range data







Garmin's Unified Cabin includes safety, sensing, gaming, infotainment, navigation and more for future vehicles. Source: Garmin

## Garmin's Unified Cabin experience

Garmin's concept includes four infotainment touchscreens, an instrument cluster, a cabin monitoring system, wireless headphones, wireless gaming controllers, smartphones and more.

The system is powered by Garmin's multi-domain computing module running on the Android automotive operating system. Garmin gathered numerous automotive OEMs to participate in the Unified Cabin including:

- Xperi's DTS AutoSense platform using machine learning and a single camera for safety and in-cabin sensing.
- Xperi's DTS AutoStage for audio streaming that can switch between over-the-air radio signal to IP stream when out of range.
- Mapbox for navigation, search and virtualization.
- Atari for embedded gaming.
- Blackberry QNX Hypervisor for safeguards against malware and cybersecurity breaches.

## Sony and Honda showcase Afeela electric car brand, to launch in 2025

Sony Honda Mobility has unveiled a new 'Afeela' electric vehicle brand. The company aims to develop the production model based on this prototype, and plans to start taking pre-orders in the first half of 2025.

Afeela's exterior features a "Media Bar" which allows intelligent mobility to express itself to surrounding people using light, enabling interactive communication between mobility and people. In the Afeela electric vehicle, the company aims to use chipsets from Qualcomm Snapdragon Digital Chassis and develop Level 3 automated drive under limited conditions and to enable Level 2+ driver assistance in even more situations such as urban driving.

The car is equipped with a total of 45 cameras and sensors inside and outside the vehicle. In-car cameras and Time-of-Flight (ToF) sensors detect the driver and car's situation to help avoid accidents.

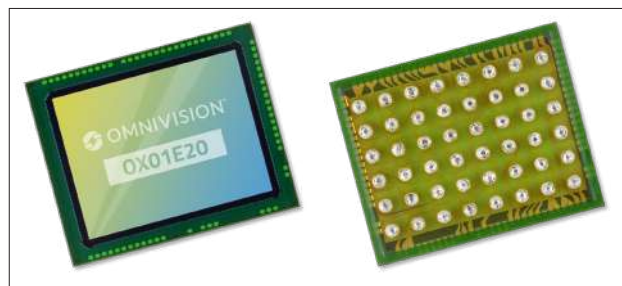
When it comes to the cabin, the Afeela comes with a gentle rounded tone. Sony claims that the car has been designed to be as simple as possible, minimizing distracting ornamentation and colors. "Our initiatives in new services will evolve and grow through continuous software updates via the 5G network," Sony said.



## OMNIVISION's new 1.3-megapixel (MP) OX01E20 SoC

OMNIVISION announced its new 1.3-megapixel (MP) OX01E20 system-on-chip (SoC) for automotive 360-degree surround view systems (SVS) and rear-view cameras (RVC). The OX01E20 brings top-of-the-line LED flicker mitigation (LFM) and 140db high dynamic range (HDR) capabilities to the OMNIVISION product portfolio of automotive single-chip image sensor and signal processor solutions.

The OX01E20 provides imaging performance for SVS and RVC across a range of challenging lighting conditions, along with the most compact form factor and lowest power consumption. In a single 1/4-inch optical format package, the OX01E20 features a 3-micron image sensor, an advanced image signal processor (ISP), and full-featured distortion correction/perspective correction (DC/PC) and on-screen display (OSD), enabling designers to achieve a small form factor with excellent low-light performance, ultra-low power, and reduced cost, while also improving reliability by using only one printed circuit board.



Key attributes of the OX01E20 that set it apart from competing solutions:

- Industry-leading 140dB HDR and LFM simultaneously
- HDR and LFM performance over the automotive temperature range
- Advanced ISP that includes DC/PC and OSD
- Use of a-CSP technology for the smallest possible solution
- Low power consumption
- Built on OMNIVISION's PureCel®Plus architecture, which is renowned for its low-light sensitivity and provides the industry's best signal-to-noise ratio performance





## Innoviz launches new LiDAR

Innoviz unveiled the Innoviz360, a cost-effective and high-performance LiDAR that will support a range of non-automotive applications such as smart cities, logistics, maritime, heavy machinery, and construction, in addition to Level 4-5 (L4 and L5) autonomy applications. Loxo, a zero-emission autonomous vehicle provider for last-mile delivery, has partnered with Innoviz to use the InnovisOne LiDAR. Deep-tech company EXways, which works in 3D LiDAR processing, has also partnered with Innoviz to leverage the technology for multiple applications.

Innoviz has previously formed partnerships with major automakers such as BMW and Volkswagen, as well as tier-1 supplier Magna. At CES, Innoviz also showcased the InnovizTwo LiDAR, which it claims offers a 30x performance improvement over the InnovizOne and a 70% cost reduction. With the growing adoption of autonomous vehicles, LiDAR technology is expected to be high in demand as major auto OEMs including Mercedes-Benz, Nissan, BMW, Stellantis, Volkswagen and Volvo plan to use it.

## Basemark brings advanced AR graphics to MediaTek automotive SoC

Basemark, the automotive AR company, showcased its automotive AR and HMI graphics software at CES 2023, which is now validated for MediaTek's latest MT2715 automotive infotainment platform.



As the demand for more advanced automotive in-cockpit experiences and driver assistance systems is growing rapidly, Basemark is the optimal choice given their forerunning automotive AR and HMI development and deployment software, Rocksolid AR. MediaTek provides high performance, automotive-grade platforms that are capable of powering Basemark's advanced software.

MediaTek, the world's 4th largest semiconductor company, and provider of innovative SoCs, for a wide range of products, recently launched its MT2715, offering best-in-segment performance, power efficiency, integrated capabilities, and cost-effectiveness. The collaboration with Basemark allows MediaTek to immediately offer a complete AR and HMI authoring solution for automakers to accelerate attractive new in-vehicle infotainment designs to market.



## BMW unveiled color-changing, talking car at CES

BMW announced the i Vision Dee electric sport sedan at CES, a concept car. The i Vision Dee uses some Amazon voice-recognition technology, but primarily showcases BMW's own software-first approach to next-generation vehicles with features designed to pre-emptively tackle tech companies like Apple that are seemingly on the brink of entering the auto industry. BMW has offered over-the-air software updates for millions of its vehicles since 2019, and going forward, it says it is focused on data protection, guiding developers, and seamless digital integration.

In the i Vision Dee, drivers can choose from five different levels of information to display using a "Mixed Reality Slider" on the dashboard, including augmented reality directional cues and social media notifications. The entire windshield functions as a large projected display. BMW's next-generation voice assistant, called Dee, can provide driver assistance, recognise the identity of the driver, open the doors automatically, and more.

It also features 240 individually-controlled e-ink paintwork segments that can change the car's entire color and display patterns. The i Vision Dee will be available as soon as 2025 as part of the launch of a wider software-led vehicle platform.

The car is now expected to launch in 2026, but it could be announced sometime in 2025, especially as it will need to undergo regulatory approval and widespread testing for some time ahead of its public release to consumers.



Off-the-shelf 190° lens developed to address automotive low-light in-cabin requirements for safety and comfort

## Immervision announces automotive grade lens for in-cabin vision systems

Immervision, a developer of advanced vision systems combining optics, image processing, and sensor fusion technology, introduced its off-the-shelf 190° lens developed to address the specific low-light in-cabin requirements for safety and comfort in the automotive industry at CES.

The wide-angle Panomorph lens technology, Immervision continues its technology with this ultra-wide Field of View (FoV) lens, offering complete coverage inside the cabin to meet the needs of both driver and occupant monitoring applications. The lens distortion profile is designed to generate image quality and a pixel density targeted for crucial applications to enhance gaze tracking, passenger identification, and hands on wheel tracking.

The broadband support, from visible to near-infrared (VNIR), and the lens exceptional capability to capture quality images in low-light, offers versatility for complex monitoring features such as eye tracking through eyeglasses, determining safety hazards such as driver fatigue and improving passenger classification and object detection at night, without external illuminator sources.

The flexibility in vehicle design afforded by offering the lens in a smaller footprint, means carmakers now have more complete coverage inside the cabin with fewer cameras. It also enables manufacturers to offer new capabilities to optimize comfort, such as passenger classification to automatically manage preferences and new entertainment features such as video chat or video conferencing.



## HL Klemove partners with Sonatus to develop next-gen electrical component for connected vehicles

HL Klemove, a self-driving solution wing of South Korea's Halla Group, partnered with Sonatus, an American vehicle and cloud solution developer, to cooperate in the development of electrical components and software for next-generation connected vehicles.

Sonatus is a California-based vehicle technology solution company that builds solutions for software-defined vehicles that add functions, manage operations, and enable new features primarily or entirely through software.

HL Klemove signed a cooperation agreement with Sonatus at the Consumer Electronics Show held in Las Vegas on January 6. The two companies will join hands to develop electronic components, systems, and architecture for software-defined vehicles.

"We will thoroughly prepare for the future mobility market that will be represented by software-defined vehicles established by the next-generation electronic component architecture," HL Klemove CEO Yoon Pal-joo said during a press briefing.



**From left to right:** Sung-guk Kim Director of Sale Center, HL Klemove, Hyung-jin Kang CTO, HL Klemove, Pal-joo Yoon CEO, HL Klemove, Jeffrey Chou CEO, SONATUS, John Heinlein CMO, SONATUS, Chris Yang Korea Country Manager, SONATUS

## Nvidia, Foxconn partner on self-driving vehicle partnership

Nvidia and Foxconn have announced a partnership to develop automated and autonomous vehicle platforms.

Under the terms of the agreement, Foxconn will produce electronic control units (ECUs) for the global automotive market that are based on Nvidia's Drive Orin system-on-a-chip (SOC).

Drive Orin is a high-performing SoC that achieves up to 254 trillion operations per second and can handle large numbers of applications and deep neural networks simultaneously, helping to enable autonomous driving functionality.

Foxconn also confirmed it will build its own electric vehicles (EVs) with automated capabilities that feature the Drive Orin ECUs and Nvidia's Driver Hyperion tech – a suite of sensors that includes cameras, Lidar, radar and ultrasonics.

The Taiwanese company does not currently sell any vehicles under its own branding, although last year it was confirmed it would manufacture the PEAR electric vehicle for California-based Fisker at a new facility in Ohio. Indeed, in the West, Foxconn is arguably better known for making iPhones for Apple than any achievements in the automotive sphere



## VINFAST - NXP STRATEGIC PARTNERSHIP ANNOUNCEMENT - CES 2023



### VinFast partners with NXP in developing EVs

VinFast and NXP® Semiconductors have announced their collaboration on VinFast's next-generation of Automotive applications. The collaboration supports VinFast's goal in developing smarter, cleaner and connected electric vehicles.

Under the collaboration, VinFast seeks to leverage NXP's processors, semiconductors and sensors. VinFast and NXP will engage in the early development phases of new VinFast automotive projects, leveraging NXP's rich portfolio of system solutions for innovative applications.

Additionally, NXP will share its robust partner ecosystem with VinFast, bringing its top-notch solutions to accelerate time-to market, together the companies will establish a joint, expert collaboration dedicated to developing solutions based on NXP's renowned reference evaluation platforms and software layers with the purpose of designing and building leading-edge electric vehicles.

As a member company of Vingroup, the collaboration between VinFast and NXP will realize the group's ecosystem of product and services to leverage cross-over group connected benefits for its customers. As such, other companies in the group will also be able to leverage NXP's smart solutions to advance their Smart City applications.

### LG, Magna to Collaborate on Self-Driving Cars, infotainment solutions

LG and Magna have again joined hands to develop solutions for automated driving by leveraging their areas of expertise. LG and Magna already have a JV that manufactures e-powertrain and other hardware like inverters, motors and onboard chargers for EVs. The new JV will explore the ADAS and AV market to develop "executable" automated driving and infotainment solutions to enhance customer experience by addressing the toughest challenges. LG's vehicle component arm has been eyeing new openings in the automotive market and believes the increased connectivity of cars of the future presents new opportunities.





# ASIA'S LARGEST AUTOMOTIVE SHOW - AUTO EXPO 2023



## Auto Expo 2023 – Components: How to get there

Pragati Maidan in New Delhi has excellent access to the metro and roads. The distance between the domestic and international airport and Pragati Maidan is 18 kilometres and 23 kilometres, respectively. There are several gates for entering Pragati Maidan, and shuttle services are free at all of the entrances. Gate #10 for direct admission is about 5 minutes' walk from the Pragati Maidan Metro Station.

## Auto Expo 2023 – Components

## Auto Expo – 2023 Components: Where, When, and What to Expect

Auto Expo – 2023 Components is the Asia's largest automotive show jointly organised by Automotive Component Manufacturers Association of India (ACMA), Confederation of Indian Industry (CII) and Society of Indian Automobile Manufacturers (SIAM).

The 2023 Auto Expo Component Show is driven by Technovation; it serves as a global hub for innovation and cutting-edge technology. The event is essential in exhibiting the most recent innovations in automotive components for cars, trucks, electric vehicles, bearings, garage equipment, and spare parts in many markets. However, due to difficulties caused by the Covid - 19 epidemic, the biennial automotive expo did not take place in 2022. The expo is now prepared to resume in January 2023 after a brief hiatus.

It is anticipated that innovative and advanced technologies in the components sector, in both greener and cleaner energy-saving formats, would be unveiled at the next Auto Expo 2023 - Components. Here is the

important event information you should be aware of before the Auto Expo 2023 Components begins.

## Auto Expo 2023 – Components Venue

With a strong concentration on automobiles (Auto Expo 2023— Vehicles) and auto components (Auto Expo 2023 - Components), the Auto Expo is now held at two different locations. The India Expo Mart in Greater Noida will once again serve as the location for the Auto Expo - The Motor Show. At Pragati Maidan in New Delhi, there will be an Auto Expo - Components event.

## Auto Expo 2023 – Components Date and Time

The Auto Expo - Component is slated to take place from January 12 through January 15, 2023. Business visitor hours are 1000–1800 on January 12–14 and 1000–1300 on January 15, while General Public hours are 1330–1700 on January 15, 2023. Entry to the exhibition halls closes every day 30 minutes before closing time, while entry to the event venue closes one hour before closing.

## Participating

The automotive component industry is anticipated to introduce a wide range of new innovations at the Auto Expo 2023 - Components, as well as cutting-edge technologies in automobile, truck, two-wheeler, and three-wheeler segments.

The Electric Vehicle category of the Auto Expo will also include some extremely intriguing and cutting-edge innovations. Along with the REA Pavilion, a focused pavilion has been planned for ACMA innovation, ACMA Safer Drive, Bearing, Garage Equipment, EV Components, and Start-ups. At the event, more than 800 exhibitors display the technology and services they have to offer this market.

The Auto Expo Components event has always included interactive forums as a key component. In contrast to earlier editions, a conference has been planned together with a buyer-seller meetup and matchmaking activities in an effort to maximise the event from a commercial perspective. National pavilions are built for France, Germany, Japan, Poland, South Korea, United Kingdom, and many others to display global technology and innovation in the automotive sector.





**GK SENTHIL**  
CEO  
TOYOTA CONNECTED INDIA

### **Can you share your views on technological change or transition in the automotive landscape over the last decade?**

Certainly! Change in the auto industry has accelerated over the last few years, with the need for sustainability, safety, hyper-personalization, and assistive technology as a priority. Moreover, we step into an era where connected mobility is not just a requirement but an experience consumers crave.

These priorities are being accelerated by adapting an ecosystem play with tight integration to vehicle hardware over the provision of the individual or siloed apps and services as was the trend in the initial days. This is not just from the perspective of Connected services, but the entire lifecycle of vehicles like manufacturing, sales, service, and the “used car” life beyond the first buyer.

What might significantly impact this transition? Marrying predictive, AI/ML-based technology to provide contextual services for efficient, eco-friendly, convenient, and safe driving, if not fully autonomous is the transition that we have already started experiencing – this should accelerate quite steadily in the next few years.

In EVs, we must innovate around Smart and flexible charging and

## **Path toward vehicle autonomy may be longer but will be fruitful**

Excerpts from discussion with GK Senthil, CEO, Toyota Connected India. He is a hands-on technology leader with versatile experience in software-based product development and operations. GK has been a part of Toyota Connected North America in the USA since its inception and moved to India in mid-2019 to be a part of Toyota Connected India.

energy management systems to ensure sustainability.

### **How do you see the in-vehicle infotainment system/device evolving in the coming years?**

Moving forward, it is better to think about the cockpit as a whole rather than the infotainment system in isolation. Advancements in display technologies and increased processor capabilities are now paving way for integrated cockpit systems that display relevant information in concert across instrument clusters and the head unit (and even the heads-up display).

With voice, gesture, and touch controls, sophisticated digital clusters, heads-up displays, wider screens, and tighter integration to vehicle hardware like cameras and other sensors the best safety features and most relevant content for the occupants can be made available.

While smartphone-based Infotainment systems provide convenience and a lower cost option for customers, lack of integration to vehicle hardware limits the capabilities of those systems. It is very critical to have a unified view of the vehicle environment (traffic, weather), vehicle state, and the driver's inputs (destination, route, music, etc.) to provide the best driving experience.

### **What are your views about the connected vehicle ecosystem in India?**

Though the penetration is quite low, the connected vehicle ecosystem is evolving beyond basic services such as location tracking, emergency management, and remote diagnostic, and convenience services like the remote start. We see the tech being adopted rapidly to efficiently manage a Fleet of vehicles through features such as trip management, fuel accuracy, driver behavior monitoring, and micro-billing systems. With the rising number of electric vehicles, we also see EV connect, charge, and control management picking the pace in India. I expect the integration of the vehicle-connected ecosystem into 3rd party services to advance rapidly in the next few years.



Toyota Global Hackathon

### **How do you see leveraging data for utmost safety and convenience in the coming years?**

Data is of course, the fuel for connected cars. As carmakers, we are optimizing the use of data to drive our customers' capabilities. For example, given access to the video from vehicle's camera feed, the infotainment system can tell exactly which of the upcoming turns to take – reducing complexity while improving safety. We can solve host of complex challenges by leveraging AI and ML technologies. Detecting drunk driving, Accurate directions with AR based navigation systems, detecting micro collisions for insurance purposes, determining exact fuel left, understanding driving behaviour etc. are all possibilities to enhance driving and ownership experiences for both personal and fleet vehicles. And these would rely on continuous data streams of vehicle and environmental states, combined with powerful algorithms that are processed mostly on the Edge.

### **Any product that you would particularly want to talk about?**

With our innovation hats on, we set out enhance customer experience at the vehicle dealerships. Leveraging advanced Computer vision algorithms, we developed a product, we call "Gatekeeper". This AI-based license plate recognition enables dealer associates to quickly identify the incoming vehicle and associate it with appointments for much faster service. It is now live in more than 150 dealerships across India who are quite happy with how this product improves

customer service. And as of Dec 2023, we have processed more than 2.3M license plates while extending the solution to even opening the facility gates automatically further reducing manual interventions.

### **What are your views about the path toward vehicle autonomy?**

Over the last decade, most have realized that the dream of a fully self-driving vehicle (not requiring any human intervention) is not as close to reality as we once thought. Despite that, forms of autonomy have come to fruition in several smaller yet useful forms from basic features like adaptive cruise control to advanced conditional automation that has vehicles handling steering, braking, acceleration, lateral control, and navigating intersections! That's quite exciting indeed. There have been significant changes in technology strategy where most players are now moving away from long-range lidar to a combination of camera & radar systems (or even adapting additional ultrasonic) thanks to rapid increments in computer vision accuracy over the last few years via advancements in Machine learning techniques.

Automotive giants and start-ups alike are now more focused on solving narrow-range scenarios (like portions of a town, closed-loop shuttles, deliveries, etc.). I believe that's probably the most viable path since scaled adoptions even in constrained environments provide significant learning to improve the technology which in turn will help solve additional constraints. In essence, the path may be longer than expected but will be a fruitful one to be sure.

# SOFTWARE DEFINED VEHICLE - A PERSPECTIVE

ASHWIN RAMACHANDRA

Tata Elxsi

## Background

Automotive architectures have seen rapid evolution since 2020. Let us examine the factors playing out in this evolution:

1. Traditional functional domains like Body, Chassis, Powertrain, Engine, etc. are seeing a remarkable increase in software (SW). Simple ECUs that were required to control these domains are no longer sufficient. Increased complexity in these domains have led to higher SW compute power requirements.
2. As technology in cars has evolved, we have seen newer domains like AD, advanced ADAS functionalities, V2X, and EV.

Each of these domains has significant SW components with minimal sensor and HW. This adds to the overall SW compute requirements from the previous point.

3. Newer domains interacting with each other leads to an exponential increase in integration complexity at both the HW and SW levels. At the HW level, the conventional approach leads to several ECUs and interconnects. At the SW level, the conventional approach leads to real-time interactions at a massive scale.
4. Increase in SW and complexity inevitably leads to potential bugs in production SW.

This will mean that SW in production cars will continuously need to be updated. This requires a FOTA/SOTA approach. Legacy architectures would require significant recalls to fix and flash new SW updates.

5. OEMs are tending to move to a subscription model for enabling features. This would mean that a feature can be activated and deactivated, remotely and over the air, upon subscription or cancellation. This cannot be done with a traditional architectural approach. In legacy architectures, automobiles once sold, would not get any feature updates.

6. Emergence of the Cloud as a compute location. Legacy architectures would only focus on realizing features in the embedded computing space of the car. The total compute power on the vehicle is limited to the sum of the ECUs already installed and is almost never shared across functional domains.

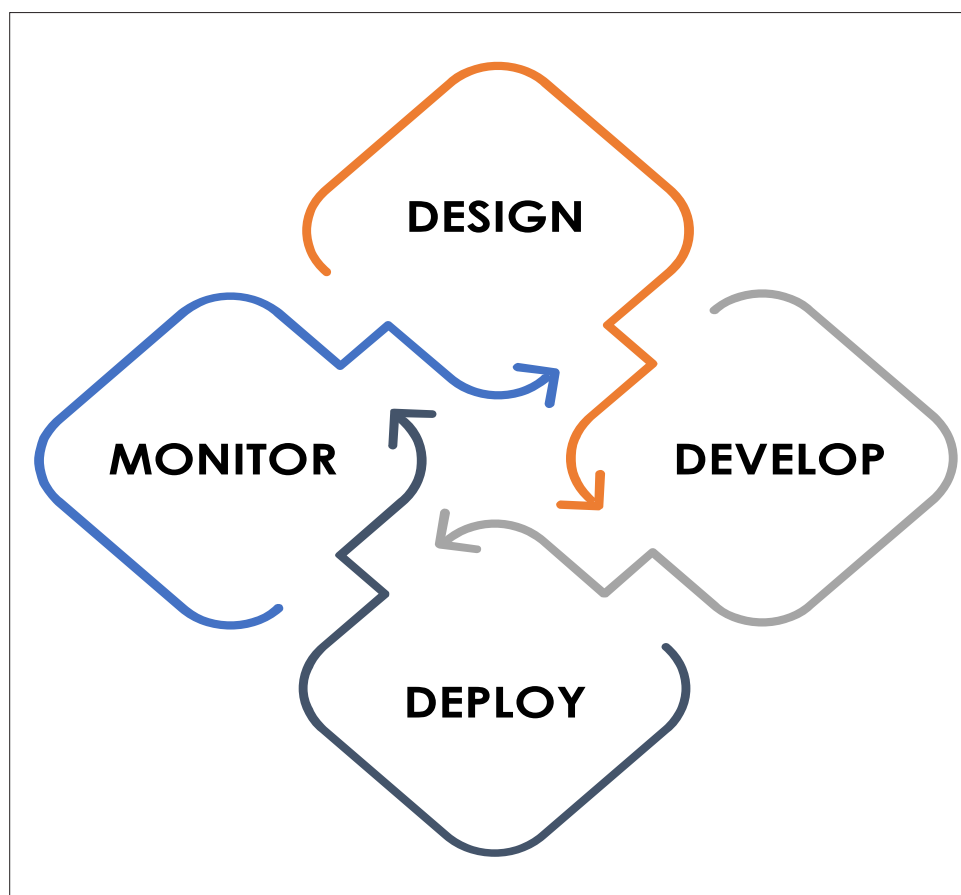


Figure 1: Continuous Design, development, Deployment & Monitor Cycle for SDV

## Vectors of Evolution

Vehicle Architectures had to evolve to mitigate the challenges identified in the previous section. There is evidence of an evolutionary approach by incumbent OEMs and a revolutionary approach with new-age OEMs. However, both approaches seem to use the following principles to define a Software Defined Vehicle (SDV).

### Consolidation of Compute

The first key principle seen is the consolidation of compute resources. In legacy architectures, there are 50-100 separate ECUs used to realize the functionalities of the Vehicle. This leads to



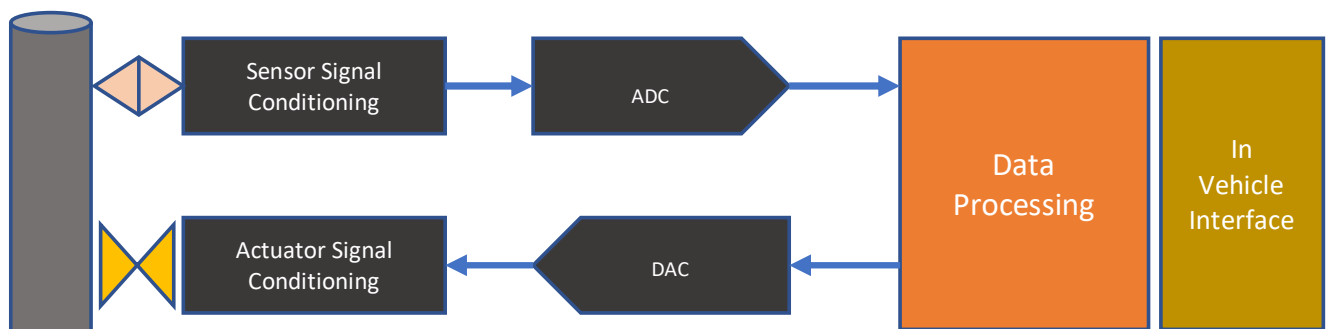


Figure 2: Compute & Decision Making Tier

incredibly complex HW designs, long and buggy integration cycles, and maintenance of specific SW for each of these 50-100 ECUs. Consolidation of compute is a natural outcome of the desire to simplify the ECU-heavy legacy architectures. The levels of consolidation vary depending on the design philosophies of the OEM. However, the clear trend across OEMs is a reduction of ECUs and not an increase. ECUs are consolidated into larger compute processors. The 3-tier architecture in the subsequent section:

### Frameworks to enable Reuse

Consolidation of Compute alone does not provide the necessary foundations for simplification. In legacy architectures, each ECU could host just one functional workload. The safety and criticality of the workload are ensured typically by using a Classic AutoSAR approach. However,

upon consolidation, the new compute resource will now need to host multiple functional workloads of varying criticality. To make sure safety and performance criticality is ensured, Adaptive AutoSAR is the way forward. It will be very normal to expect the presence of a Hypervisor enabling multiple independent workloads. Classic AutoSAR implementations would be seen as highly critical functional workloads. A combination of Classic AutoSAR, Adaptive AutoSAR, and Linux-based environments along with a Hypervisor enables the framework for the reuse of functional workloads across families and model years.

### Updates to Innovate

Over-the-Air updates are becoming a mandatory feature of evolving architectures across all domains. This is true for the Automotive sector as well.

Given the significant increase in SW content in the car, bugs are bound to be present, and addressing these bugs and providing patches in a timely and regular manner will become extremely important. A robust FOTA/SOTA ecosystem (server + client) will need to be part of a new-gen SDV architecture.

### Subscriptions to Enrich

OEMs are keen to activate recurring revenue channels post-sales. These are not from service and spare parts, but from newer features that can be developed, tested, and deployed post-sale of the vehicle. Subscriptions could be one-off, like an enhanced performance mode for a road trip, or recurring, like preferential and discounted access to charging facilities. To enable the subscription model, the FOTA/SOTA feature above is a mandatory foundational feature. In addition, there

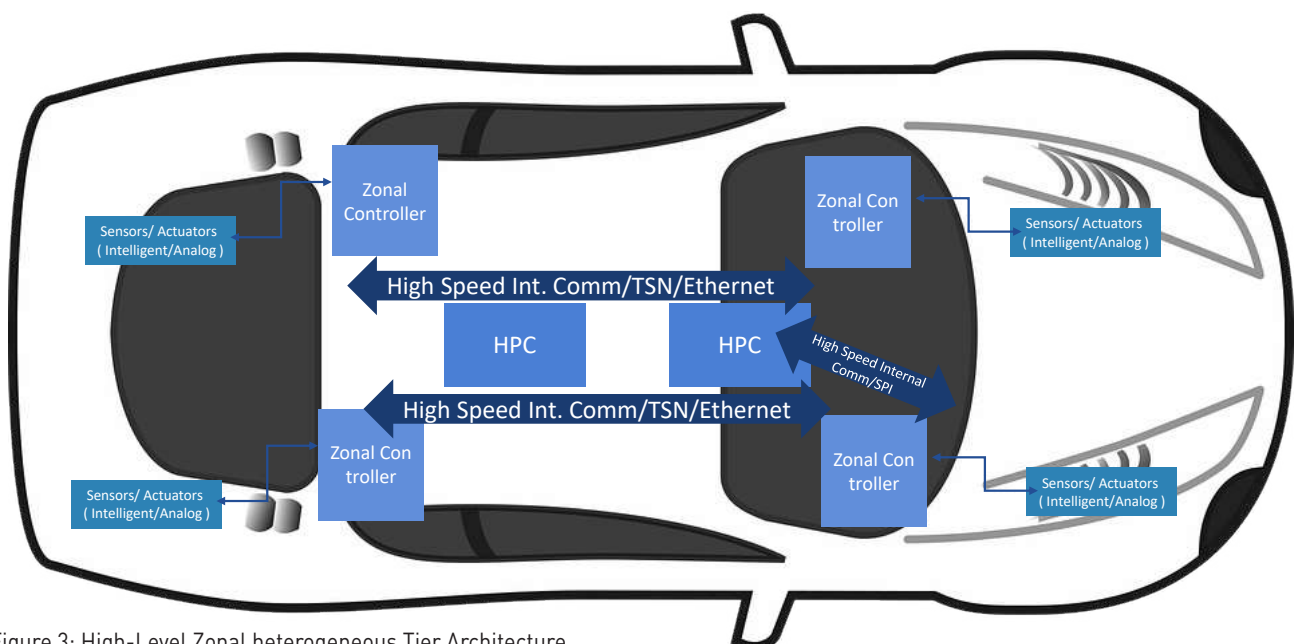


Figure 3: High-Level Zonal heterogeneous Tier Architecture

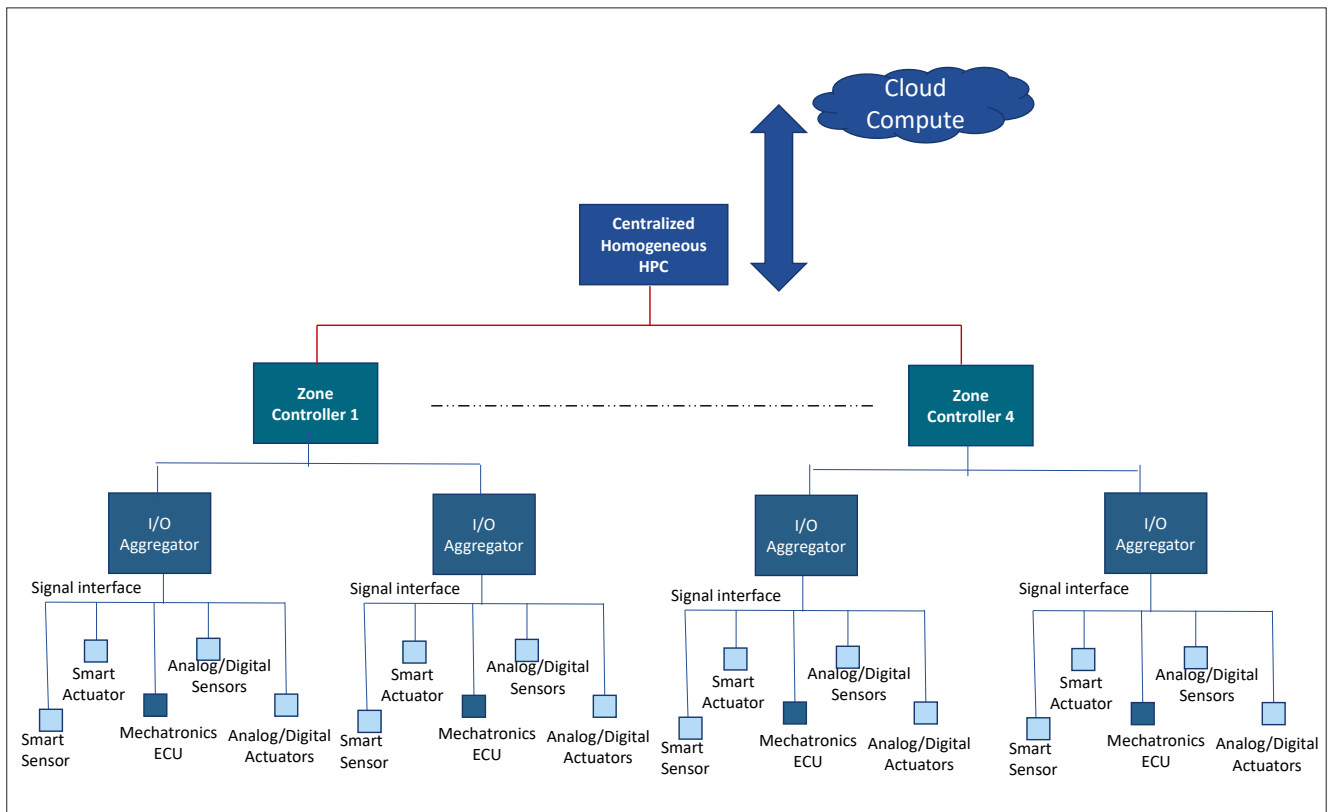


Figure 4: Central homogeneous Tier Architecture

needs to be additional cloud-based infrastructure to manage customer preferences and subscriptions. Thus, the new-gen SDV architecture will require a significant cloud/digital implementation.

### Perspective on the new-age development model for SDV

Traditional development lifecycles will also change with the evolution into an era of SDV. The earlier approach of “Model-Year” development cycles will become archaic. While Vehicles will continue to have a “Model-Year” led design cycle, the SW-enabled feature set will no longer be restricted to one “Model-Year”. Features will continue to be developed and deployed into Production vehicles on the road.

This will require SW to change into a Design-Develop-Deploy-Monitor cycle. The Deploy and Monitor aspects are relatively newer paradigms in the Automobile segment. Deploy will require features being developed to be tested on potential vehicles already sold and on the road. This will require extensive testing

across several platform and model car configurations. A conservative view will mean testing new features on vehicles that have been on the road for as long as 3 years. This will see increased validation costs for new features, that will have to be offset by subscription models within OEMs.

Upon Deployment, the Monitor phase needs to be continuously active. The key objectives here are to monitor features deployed across vehicles on the road and look for performance inconsistencies. An additional task will be to monitor the fleet for potential Cyber Security breaches, given all SDV-based models will be connected. Upon being alerted on a performance inconsistency or a security threat, the Monitor phase will need to isolate the incident, triage, and provide a fix in a timely fashion. Also given that there will be several vehicles carrying the same version of SW, timely FOTA/SOTA campaigns will need to be scheduled.

Having covered the Deploy and Monitor stages, it is important to point out that the traditional Design stage will also undergo changes. The key changes are to

envision a feature implementation across the Vehicle and the Cloud. Earlier, feature realization was restricted to the capabilities of the Vehicle. Now the Cloud can be used as an adjunct to realize a feature. Further, connectivity can be taken as a given. So, the ability to realize a feature can also take advantage of cloud computing.

### Perspective on 3-tier Architecture for SDV

We evaluated several approaches for a common approach to SDV. The following is a short description of a 3-tier Architecture proposed by Tata Elxsi. The 3-tier approach has the following components (*see the table*).

#### Smart Sensors / Actuators Tier

Certain functions involve electro-mechanical aspects that involve Actuators and possible High-Current conversions. Examples are Electronic Power Steering, Rain-sensing Wipers, etc. In these cases, having decision-making at a Zonal or Central level would translate to a subsequent transmission of a High Voltage/Current across longer physical distances. This leads to adverse impacts on EMC and the field

	Traditional approach	Tata Elxsi's SDV approach
Complexity	Traditional approaches have seen a huge increase in smaller ECUs. It takes over 100 ECUs to realize a luxury car leading to a tremendous increase in complexity.	Clearly a tiered approach of compute zones provides for simpler EE architecture and interconnects.
Scalability	Scaling traditional architectures to accommodate the staggering increase in SW makes it hard. Each time a new ECU is added newer stability issues arise. Also deriving multiple segments of vehicles from the same base implementation is extremely difficult.	An elegant approach to scaling the compute zones is presented. For low and mid-tier segments, the 2-tier approach, without the Central Homogeneous compute will provide cost-efficient solutions. For high-end and luxury segments the Central homogeneous compute provides a pragmatic scalable method.
Time to Market	Each model year and platform refreshes require a complete ground-up piecing together of ECUs. Further outdated components will need to be replaced, further increasing development times.	Scalability helps significant re-use of SW. Features can be disabled by SW to have more rapid times to market.

leading to significant cross-signal impacts. These situations require decision-making (compute location) and subsequent high Current / Voltage transmissions close to the mechanical aspects.

### Zonal Heterogeneous Tier

We expect that most SDV implementations will evolve to a Zonal paradigm. Zonal compute will include a combination of regular Compute cores, Neural Processing Units (NPUs), and Graphic Processing Units (GPUs) along with associated fast-access memories. The Zonal Computes will typically host functions like Body, Chassis controls, regional Video/Camera processing, Infotainment, etc.

### Central Homogeneous Tier

For most vehicles, a 2-tier Architecture

will suffice. However, for the highest-end segment, a central Homogeneous compute zone is anticipated. This will typically have multiple High-Performance Compute Cores, hosting very similar OS and Memory configurations. This zone is expected to host common functions like Gateway,

Telematics, etc.

### Advantages and Summary

As we see vehicle architectures evolve to an SDV-centric view, Our approach provides for a scalable path forward. We summarize with the comparison of traditional architecture. □

#### AUTHOR

**ASHWIN RAMACHANDRA**  
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Tata Elxsi

Ashwin has over 28 Years of industry experience with a Master's degree in Computer Science from IIT Bombay. He has held Senior positions in product engineering, Technology & Strategy with P&L ownership. Ashwin is passionate about envisioning technology offerings on future vehicle electronics and architecture and how we need to prepare for the paradigm shift where the software's taking center stage in the automotive industry.





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# ABOUT US

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Illustrious and exploratory journey for new frontiers in road mobility by Telematics Wire dates back to 2011. Recognising the potential of emerging technologies in mobility space, GPS industry handbook and 'Vehicle Tracking and Navigation' conference & exhibition were then pioneer media initiatives taken by Telematics Wire in building up a connected ecosystem within the automotive industry.

Foreseeing emergence of connected vehicle technology in the horizon of Indian automotive industry, 2015 saw the landmark shift in the form of a focussed conference and exhibition 'Connected Vehicle 2015'. Rest is history. Connected Vehicle (CV) concept soon got aligned to connected and autonomous vehicle with consistent and continuous development of the annual forum of Telematics Wire with yearly International Conferences and Exhibitions.

As a top automotive technology media brand in India, Telematics Wire's aim is to create a highly engaging, knowledge-sharing and interactive business networking platform for all the industry stakeholders, thought leaders, decision makers and professionals, like you. Through our industry leading events, we have been providing a one-stop convening space for local as well as global industry players working in the area of connected, autonomous, smart, shared & electric mobility. Our events have developed over the past 11 years alongside the automobile industry, embracing new technology, promoting future innovation and fostering disruption. The industry participation and wider array of converging technologies, products and solutions one came across in our past events has spurred Telematics Wire in going for the next big frontier. We are now all set to take a giant leap with a vision to offer a massive opportunity for the entire CASE mobility ecosystem to showcase their products, technologies, concepts and trends transforming the automotive world while exchanging knowledge with industry experts and engaging in high-level deliberations.

With the above view, Telematics Wire is now launching Connected, Autonomous & Electric Vehicle Expo 2023 (CAEV EXPO 2023) at a scale to bring together automotive manufacturers and their ecosystem of partners who are continually inventing new business models as India is emerging as a global automobile manufacturing hub with the introduction of advanced features such as ADAS, connected car tech, digital instrument cluster, mobile app-based controls, etc.

The CAEV EXPO 2023 will witness new launches, vehicle displays, trade dialogues and large scale participation of professionals from across the globe. The event venue (KTPO) has a huge hall with a total of 6000 sq mtr covered exhibition space and large parking facility. Along with the exhibition, the event will host a two-day long conference that will feature keynote sessions, lead talks and high-level panel discussions. More than 60 Indian and international speakers, over 200 sponsors and exhibitors, 5000+ delegates and visitors will come together to give us a glimpse into the future of mobility.

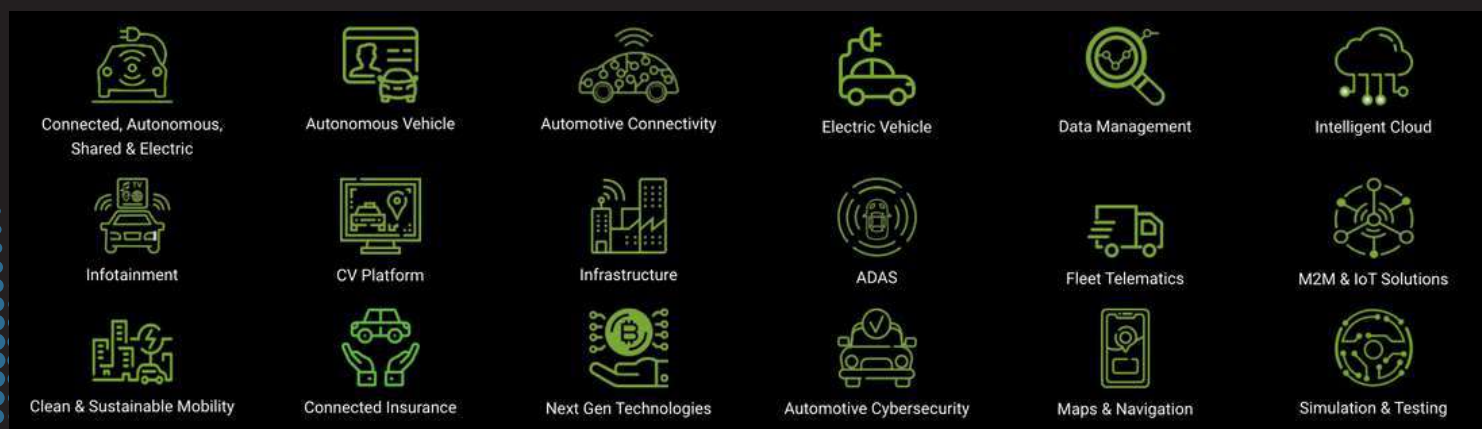
CAEV EXPO 2023 is the strategic meeting place for the new, expanded automotive ecosystem: the AutoTech industry. The primary themes of CAEV EXPO 2023 are autonomy, connectivity, mobility, and electrification. These themes will support industry discussion throughout a range of sessions, networking opportunities, vehicle displays and award ceremony centred on the applications of automotive technology in these areas, as well as the strategic opportunities and challenges created by them.

Come, join us in knowledge-sharing and experience the Asia's Biggest CAEV Expo!

For more information, please visit expo website [www.CAEVEXPO.in](http://www.CAEVEXPO.in)



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## WHO SHOULD ATTEND?

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Automotive OEMs  
Mobility Service Providers  
Tier 1, Tier 2 & Tier 3 Suppliers  
IT Companies  
TSPs  
Chip Manufacturers  
Semiconductors

System Integrators  
Software/Hardware Providers  
Insurance Companies  
Lighting Companies  
Map Providers  
Content Providers  
App Developers  
Cloud Service Providers

Telecom/Wireless Carriers  
Big Data Analytics  
Component Manufacturers  
EV Manufacturers  
Government Bodies  
STCs  
Policy Makers  
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**& VISITORS**

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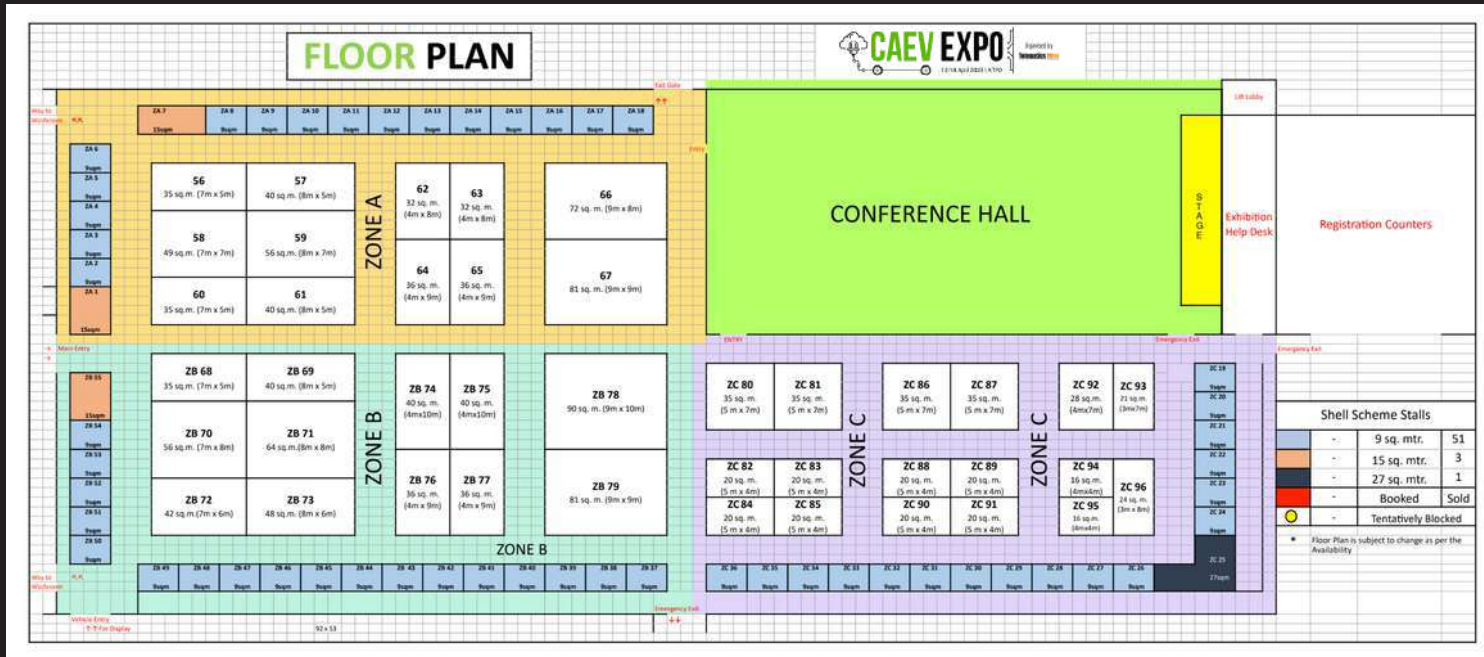
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# FIVE TRENDS FOR LOCATION INTELLIGENCE IN INDIA THAT ARE SHAPING 2023

▲ HARPREET SINGH & ANIMESH SAHAY

HERE Technologies

India's economy is demonstrating resilience despite global headwinds slowing growth. Across the world, consumer optimism about economy recovery is one of the highest in India, where activities such as shopping, entertainment, travel, and social gathering are returning to pre-pandemic levels<sup>1</sup>.

As the Indian economy continues to recover, global challenges will mark their impact on the automotive and logistics industries, and location technology will play a key role as a driver of change. Let's have a look at five trends that will play up the importance of location intelligence in India in the coming year.

## More initiatives to transform India through geospatial knowledge and infrastructure

Over the years, there has been increasing focus to establish a quality geospatial ecosystem in India. From the democratisation of Indian geospatial ecosystem to the launch of the National Logistics Policy, these moves by the government seek to spur domestic innovation and increase competitiveness of local products. This enables Indian companies to compete in the global mapping ecosystem and realise the dream of 'Atmanirbhar Bharat' or Self-sufficient India, and power the Make in India initiative.

According to the union minister of state for Science and Technology Jitendra Singh, India's geospatial economy is expected to cross USD \$7.7B by 2025, growing at a rate of 12.8%<sup>2</sup>. More Indian IT companies are also starting to see the value of location-powered solutions and data, further encouraging the government to strengthen its policies that will help build global

unicorns in India.

In 2023, we are likely to see continued government initiatives and involvement when it comes to geospatial data. While this encourages homegrown businesses to develop their own mapping systems, it also creates the opportunity for foreign mapping firms to work in tandem with Indian entities in the geospatial sector to build state of the art solutions for Indian citizens. As such, for India to truly be a leading geospatial and mapping economy globally, the National Geospatial Policy must establish fair and equal market practices to ensure continued investments and innovations by both Indian and foreign players.

## A bigger developer community in India

With 5.8 million developers in India, the country has undoubtedly the largest developer pool in the world; this figure is expected to hit 10 million by 2023<sup>3</sup>. As a result of favourable government policies, India's startup and developer communities are being empowered to develop location-based software and applications that offer data analytics and services that directly impact innovation.

Start-ups like Transo, LocTruth, Transerve, RoadCast, and Intents Mobi among many others are partnering with HERE Technologies to enrich their applications and solutions with HERE Map data and location services, addressing multiple business challenges for organisations in India and across the world. Some of these location empowered solutions include supply chain, geo-analytics, fleet management, emergency



management, market insights, mobility & transportation and smart city solutions.

We can expect more Indian startups to leverage location intelligence technologies in the coming year, as well as partner with larger geospatial companies to further prove the success of 'Make In India'.

## A boom in software-defined vehicles and connected user experience

According to Deloitte<sup>4</sup>, "Software-defined vehicles" refers to the state in which the quantity and value of software in a vehicle exceeds that of the mechanical hardware. It also reflects the gradual transformation of automobiles from highly electromechanical machines to intelligent, expandable mobile electronic devices that can be continuously upgraded.

The reason for this transformation is because software-defined vehicles enable automotive original equipment manufacturers (OEMs) to easily scale – building apps for the vehicles that can be rolled out over the air in new and older models, upgrading processes and reducing dealership visits. This means that customers will be able to receive wireless improvement updates for security functions, new infotainment system functions and more. During this process, software-defined vehicles will also facilitate the collection

of key data by automotive OEMs to gain continuous insight into every aspect of both the vehicle's operation and its performance.

As the demand for more intelligent and safer driving solutions continues to grow, connected technology is also increasingly taking centre stage in the Indian automobile market. The demand for connected technology is bringing rapid transformation – including the boom in software-defined vehicles – and connected cars will no longer remain a luxury but a necessity in India. In fact, India's connected car market is expected to grow by over 20% in the next few years, with the availability of connected services ranging from 20% to 70%, across different categories of OEMs<sup>5</sup>.

## Increase in electric vehicle usage across industries

In India, data from the Federation of Automobile Dealers Association of India has shown that retail electric vehicle (EV) sales have gone up nearly 185% year-on-year in October 2022<sup>6</sup>. This is attributed to the rise in fuel prices, entry of new manufacturers, development and enhancement of tech-related EVs, subsidies from central government, and more.

For the same reasons, including growing concerns around vehicle emissions, consumers are increasingly attracted to electric two-wheelers (E2W) due to their lower environmental impact, and the fact that 2Ws provide an easier way to navigate India's congested roads; by far, 2Ws are India's dominant mode of transportation – including to fulfil last-mile deliveries in the country as e-commerce usage rates rise.

On the other hand, trucks are the backbone of the Indian logistics industry, but they also contribute significantly to pollution. While trucks comprise only about 2% of on-road vehicles in India, they are responsible for about 40% of emissions and fuel consumption from road transport<sup>7</sup>.

There is currently a lack of financial incentive for businesses in India to tap into electric truck usage. As India's EV market continues to expand, technology and software will play a huge role in the EV ecosystem, bringing about better EV experiences that come with enhanced safety and connected features – all of which should

encourage the move towards electric trucks. Policies and regulations by governments pushing for smart and sustainable cities will also have a strong influence on the development and adoption of EVs across industries.

## Visibility is the holy grail of logistics

The Indian supply chain network is vast and complex and still relies on traditional supply chain methods. However, the pandemic and the rise in e-commerce have prompted the industry to embrace technology so as to remain competitive and resilient, thus better serving consumer demands.

For instance, businesses are now demanding real-time updates, end-to-end supply chain visibility, warehouse automation and asset management to create a holistic network. There is now a better understanding among companies that full supply chain visibility is necessary for operational resilience.

As an economy booster, the Government of India launched the National Logistics Policy in 2022 with the aim to reduce logistics cost from 13-14% of India's gross domestic product (GDP) to a single-digit figure in the next five years<sup>8</sup>. This policy sets the roadmap for India to reduce logistics costs via digitisation, standardisation, new digital systems, infrastructure development and improving existing logistics operations.

For the Indian supply chain ecosystem to take flight, a solid supply chain infrastructure foundation coupled with strong technology that connects data together to enhance visibility is key. While government is building a Unified Logistics Interface Platform (ULIP), its successful use by the supply chain industry will depend on the availability of quality location data and services from multiple service providers and sources. This is going to be extremely valuable in creating a sustainable supply chain and logistics ecosystem in India in 2023 and the years to come. □

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# CYBERSECURITY ASSESSMENT FOR EV ECOSYSTEM - END-TO-END APPROACH

▲ ATANU NIYOGI & SUDIP PRAMANIK

L&T Technology Services Limited

The emergence of electric vehicles (EVs) is helping reduce carbon emissions by driving a shift away from fossil-fuel burning vehicles. A consequent aim of enabling a higher number of people adopting EVs depends on not only the easy availability of charging infrastructure but also on the overall reliability of the EV ecosystem.

An implementation of EV Infra helps create connections between transportation systems and electrical grid - a phenomenon that is not common with users in a gasoline-powered vehicle environment. Researchers agree that new targets for attackers and the potential for

new vulnerabilities have been created with the rise of this connected ecosystem.

The security of the information lying in the EV or EV Charging system is a mandatory requirement for all EV participants to be accepted widely. From an attacker perspective, it is important to understand each step of the process before executing the attack, because targeting such highly sophisticated system requires a high level of expertise of the process itself.

The automotive cybersecurity environment is dynamic and is expected to continuously change over coming years. With the global automotive sector moving toward a software defined vehicle paradigm, the information revolving in and

around the vehicle become an important factor. This has enabled attackers to exploit and use these new features for malicious intents.

2021 saw 56.9% of attacks carried out by black-hat actors, up from 49.3% in 2020[4].

## The Challenges of the EV Ecosystem: A Cybersecurity Perspective

Currently, the key challenges of the industry with respect to EV Cybersecurity center around:

- No comprehensive cybersecurity approaches for EV scope,

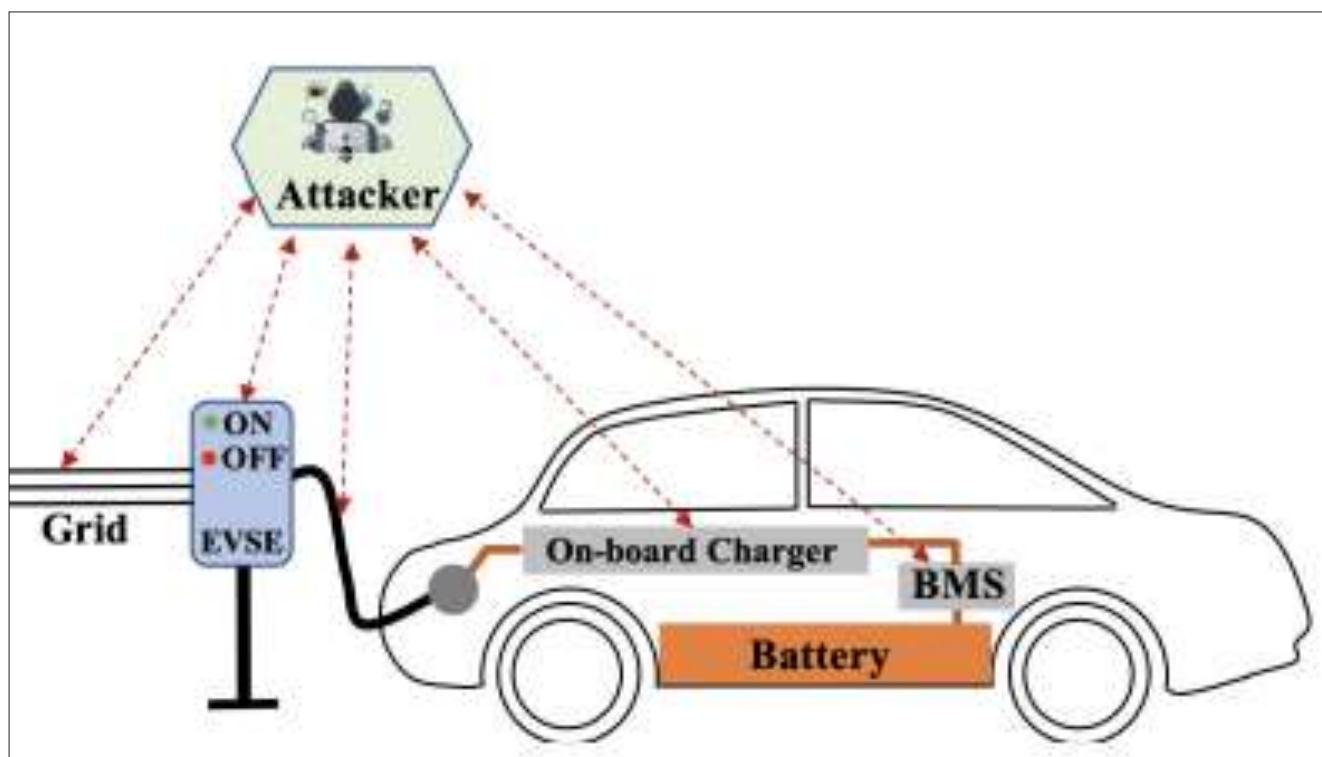


Figure 1: Security of EVSE and EV[1]



Dimension/Assets	Attribute	Item Questions
Sensing	Authenticity	Is the battery parameters display reliable?
	Availability	Is Battery Charging/Discharging Current and tolerances within limits?
		Is Battery Voltage and tolerances within limits?
		Is Battery Temperature and tolerances within limits?
	Integrity	Is Cell and Pack Voltage Sensor Measurements accurate?
		Is Temperature Sensors/ NTC Thermistors Measurement accurate?
		SOC Estimation accurate?
		SOH Estimation accurate?
Communication Channels	Availability	Intra-network (CAN/LIN) control and access limited?
		Resilient from attack on other intra-network systems?
	Authenticity	Scheduled or Real-Time Data Storage on a server or an IoT device secure?
Software and Hardware	Authenticity	On-board source code secure, maintained and updated?
		Connected to ISO 26262 compliant parts?
		Sensors are Secure?
		Die and other components packaging intact and secure?
	Availability	Intrusion Detection Capability enabled?
		On-board source code role-based access control restricted?
	Confidentiality	Analog Inputs from sensors restricted?
		Controlled Analog Output?
		Controlled Digital Output?
Access	Authenticity	Human-Machine Interface Module Secure?
		Battery Identity Checked?
		Battery Swapping Station Security Enabled? Any leakage of data?
Software, Hardware, and Access	Availability and Authenticity	Auxiliary components security in-place?

Table 1: Reference Questions [2]

- Limited best practices as a standard, and
- Inadequate understanding of the attack surfaces, interconnected assets, and unsecured interfaces.

A significant number of cyber-Software-Physical components are part of this ecosystem.

While inside the EV vehicle, EV onboard chargers comprise of Battery Electronic Control Module with Battery Management System. On the other hand, an EV charging station comprises of the

Off-board EV Controller with the Backend system. The scope of this system is huge, and many standards can be introduced to create custom frameworks, hence, the breadth of the current study has been restricted to achievable targets.

Electric Vehicle Supply Equipment(EVSE) is a relatively new infrastructure and multiple researchers pointed out the lack of understanding of the risks and necessary controls. As a result, significant attention and efforts

are being devoted to the development of threat models.

Reliable threat models are needed to help determine what risks exist and what controls might mitigate such challenges. Without threat models, it is difficult for manufacturers, users, and the Government and regulatory authorities to make risk-based decisions on the controls needed.

To articulate the requirement, a security professional must first ask questions. These questions (in the below table) are the first

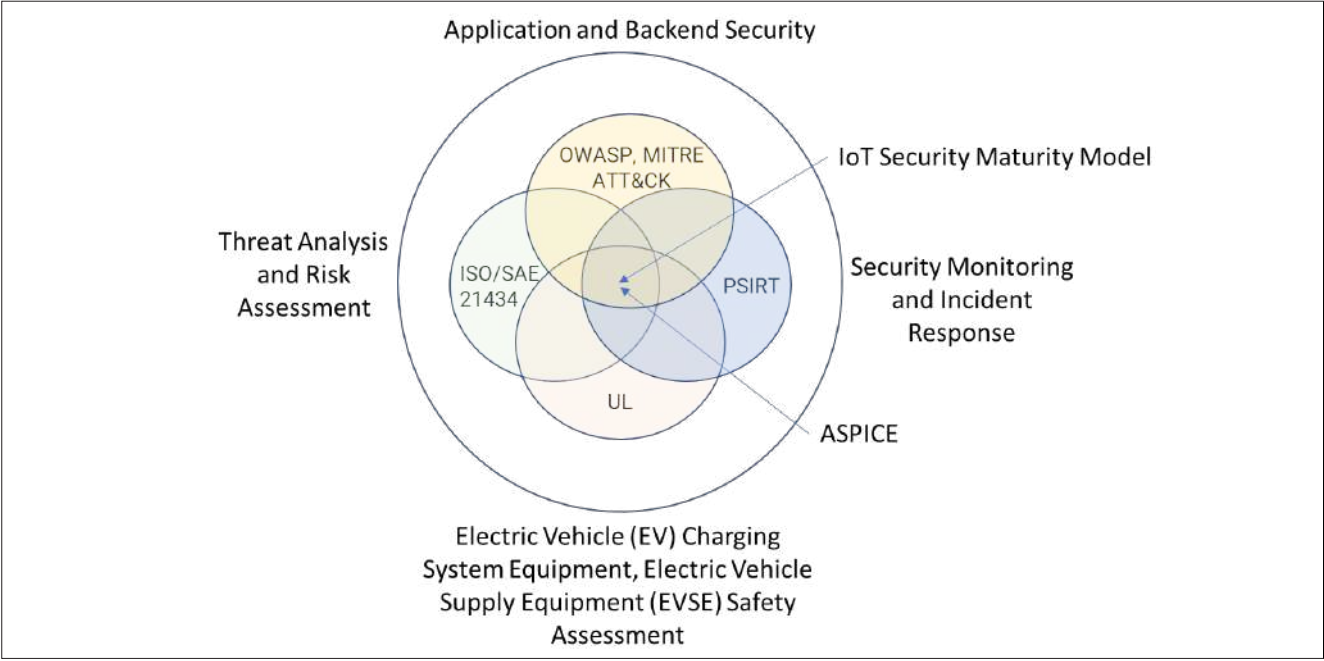


Figure 2 : Custom Framework

step of defining the items, a well-known process in the ISO/SAE 21434, helping recognize the scope of the project.

The ISO/SAE 21434 standard relates to components, spare parts, and accessories for production vehicles. Practitioners might argue that infrastructure outside the vehicle is not actually covered by the standard.

However, in order to protect the cyber ecosystem and reduce the cyber risks from attacks, it is necessary to formulate prevention plans for the charging infrastructure as a linked part of e-vehicle infrastructure. A security-oriented mindset is essential here.

However, in such complex architecture of network, software, and cloud

infrastructure, ISO/SAE 21434 alone cannot cover all the pillars.

A customized framework provides the necessary guidance to cover all aspects of product and service security in the defined use case. ISO/SAE 21434 defines different clauses to cover the vehicle cybersecurity, whereas IoT SMM and ASPICE covers the EV ecosystem and Software Development scenarios. It is important to correlate the TARA process and Reports, which can be used by the cybersecurity experts and the monitoring team in PSIRT, and the Project teams to cover the whole lifecycle of the project.

The framework suggests use of TARA (Threat Analysis and Risk Assessment) methodology in the EV ecosystem and

discover and document the cybersecurity risks, instead of limiting it to the vehicle level. A similar approach can be taken to produce and identify gaps in the EV charging Platform hosted in Cloud, mapping with WP.29(R155 and R156) regulations.

In ISO/SAE 21434, Cybersecurity assurance levels (CAL1,2,3,4) and methods to arrive on assurance levels. There is no doubt that this standard is complex, however, It provides ample facility for the implementers to identify the cyber security maturity levels and define strategies accordingly. This will simplify the cybersecurity implementation activities and help them to manage the system in an effective way. A detailed IoT SMM Practice

ISO/SAE 21434 Clause 15 Work Product	Description	IoT SMM	ASPICE for CS
WP-15-01	Asset Identification	<ul style="list-style-type: none"><li>• Domain: Governance</li><li>• Subdomain: Threat Modeling</li></ul>	MAN .7 <ul style="list-style-type: none"><li>• Identify, prioritize, and analyze risks damages</li><li>• Define risk treatment and management strategy using a TARA technique.</li></ul>
WP-15-02	Damage Scenario Identification		
WP-15-03	Threat Scenarios		
WP-15-04	Impact Rating	<ul style="list-style-type: none"><li>• Domain: Governance</li><li>• Subdomain: Risk Attitude</li></ul>	
WP-15-05	Attack path analysis		
WP-15-06	Feasibility Rating		
WP-15-07	Risk Determination		
WP-15-08	Risk Treatment Decision		

Table 2: Standards Common Coverage

Sl. No.	UNECE Reference	Asset/ Components	Risk assessment analysis	Attack Vector (STRIDE)	Impact (CIA)	Expected damage Scenario	Risk Level
1	R155	Network Channel between Mobile, Charge Point App and APP GW	The attacker manipulates request/ response data	Tampering	Integrity	False data may be delivered to the user	High
2	R155	EVSE APP GW	Attacker manipulates routing config and deny manipulation	Repudiation	Integrity, Availability	Attacker may manipulate and deny change of routing configuration	Medium
3	R155	EVSE Micro-Service Gateway	Attacker sniffs safety and security critical data on communication channel	Information disclosure	Confidentiality	Attacker may sniff personal and safety related data of the user or vehicle and attempt to impersonate user	High
4	R155	EVSE DB server	Attacker sniffs safety and security critical data on communication channel	Information disclosure	Confidentiality	Attacker may sniff personal and safety related data of the user or vehicle and attempt to impersonate user	Medium
5	R155	DSO Services	External attacker accesses data from a different user/ admin.	Escalation of privilege	Confidentiality	External attacker may access confidential data of other users/ admin	High
6	R155	Cloud VPN Gateway	External attacker sends multiple packets to the same service causing delay and failure in processing requests.	Denial of service	Availability	External attacker may overload service due to lack of rate limiting causing Denial of Service	High
7	R155	EVSE Services	External attacker may attempt to brute force authentication	Spoofing	Confidentiality	External attacker may gain access to API without valid credentials	High
8	R156	CPO Server	External attacker attempts to connect to CPO VM	Elevation of privilege	Confidentiality	Attacker is able to access VM local data files, services and host a connection over the internet	High
9	R156	CPO Server	Attacker sniffs channel used for firmware transfer	Information disclosure	Confidentiality	Attacker is able to capture firmware transfer over network	High
10	R156	CPO Server	Attacker flood communication channel	Denial of Service	Availability	CPO services deny firmware update request from vehicle(s)	High
11	R156	CPO Server	Attacker abuses firewall config to attempt SSRF	Spoofing	Integrity	SSRF allowing attacker to gain access to local and remote files	High

Table 3: Threats (Limited) in EV Backend infrastructure

and ISO 21434 section wise mapping to be established with relevant Compressive level. Similarly, relevant cloud and application security benchmarking process to be adopted and mapped with this framework for assessment of the backend Infra and hosting platform. OWASP, MITRE. A similar approach can be taken for Electrical/Electronic assessment of EV Charging module with UL 2202, UL2504 etc. for EVSE certification.

The table below provides a mapping between different Standards in discussion.

IoT Security Maturity Model which provides a strong industry accepted guidance to reach desired the desired maturity level. This is especially true since the EV ecosystem is nothing but a large domain centric IoT System, and IoT SMM provides an overall guidance to reach the target level of maturity.

### Charting the Future: Driving Reliability and Trust

The increasing popularity of electric

vehicles has prompted Governments to fund the growing demand for electric vehicle charging stations across the world. However, these stations may pose an invisible danger. Since all EVs are going to connect to national PowerGrid via these Charging Stations, so a bad-actor EV could be enough to bring down the power distribution system of a country.

According to industry experts, while EVs are now protected to an extent via regulations, public EV chargers are still vulnerable against physical attacks and





could easily be used in the same way hackers target ATM machines to steal data.

Public EV charging is mostly enabled through the Open Charge Point Protocol (OCPP). OCPP coordinates communication and power flow between charging points, control center, the EVs and the grid. OCPPv1.6, by design, introduces several threats to the EV public charging system. These threats arise from the fact that OCPP communicates information in clear text.

However, in the presence of TLS, OCPP is subject to impersonation attacks where an attacker pretends to be charging participant,

to request or acquire private data regarding the charging transactions performed by the different EVs.

Here is a sample list of potential threat scenarios that may occur to different components in the EV backend Infrastructure.

ISO 15118-2 specification creates the requirements for the network and application protocol layers of the V2G communication interface between the EV, the EVSE, and one or more Secondary Actors (SAs). The ISO 15118 PKI that provides the authentication Certificates is anchored by the V2G Root CA[3]. This

requires framework to assess the attack vectors to this certificate management system which is part of EV Backend Infrastructure.

We are proposing that the ISO/SAE 21434 standard be adopted as a base for Assessment approach and be mapped with various best practices from IoT, cloud and software processes to make it robust. The framework covers every phase of the life cycle of EV and EV infrastructure – from development through incident response to discontinuation. It also requires cyber security methods to be applied to all electronic systems, components, software, and all external connections.

The custom framework built to cover cyber security would also be applicable throughout the supply chain. The individual standards mapped in the proposed framework are not exclusive, and we can add other relevant standards to cover every potential cybersecurity vulnerability based on use cases.

The primary goal of the cybersecurity assessment is therefore not just to comply with a given checklist, but think like a hacker and fill in the security gaps for driving reliability and trust. □

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# ELECTRIC VEHICLE CHARGING SYSTEM: A BITTERSWEET ENTRY FROM TESLA

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There's been a lot of buzz among the dwellers in Automotive Electrification in the last month, especially among people keen on EV Charging System. In November 2022, Tesla made a not-so-expected move by opening their proprietary charging connector design (North American Charging Standard (NACS)) to the automotive industry [1]. They invited charging infrastructure operators

and vehicle manufacturers to integrate Tesla charging connectors and ports into their systems so that seamless usage of Tesla's own charging infrastructure can be assured.

The automotive world is still debating over this benefaction to the industry. The question is "Whether NACS is helpful in progressing forward the industry or is it a mere gimmick to ensure the market presence? Let's look at the aspects.

## What's there for Charging Infrastructure Operators

Until now the Charging Station (Electric Vehicle Supply Equipment) manufacturers were not offering any Tesla charging capability and Tesla vehicles needed to be charged from Tesla's own charging facility. (Recently Tesla started selling charging adaptors so that their vehicles can charge from other stations using the adaptor). This situation can be avoided if EVSE manufacturers start integrating Tesla Plug as the de facto standard along with others (CCS2/CHAdeMO etc.). For EVSE manufacturers this addition will not be a technically demanding problem, moreover, they will get a chance to expand the customer base with Tesla vehicle also under the radar. On the other hand, Tesla can ensure their vehicle will get wider charging facilities even if they are not under the purview of Tesla's charging infrastructure. Needless to say, it's a win-win situation for both parties.

## What's there for Vehicle Manufacturers (OEM)

Tesla's Supercharging network has 60% more NACS posts than all the CCS-equipped networks combined. For all other OEMs, this is a treasure trove lying there unutilized. So having a NACS charging capability will be an additional benefit. And for Tesla, their standard is getting accepted across the industry and they have full control over it.

For detailed understanding let's see how the battery charging system works in Electric vehicles.

### A) Charging Types

**AC Charging:** AC Input is provided to

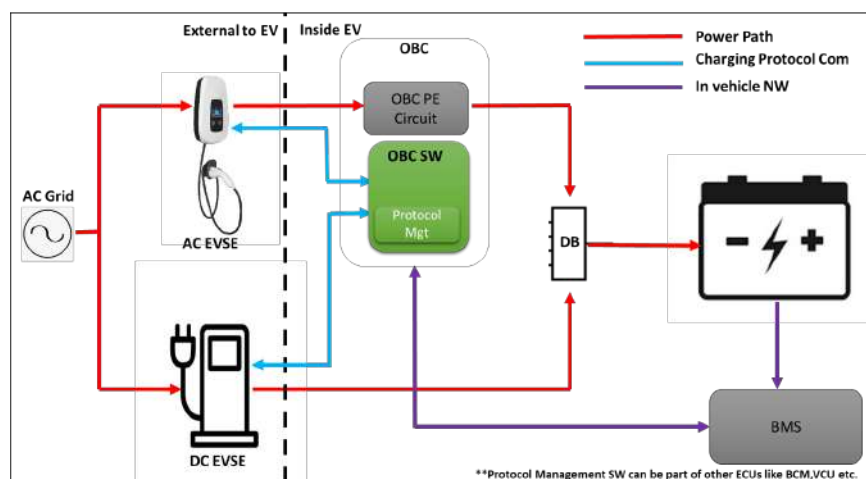


Figure 1: EV Charging System High Level Overview

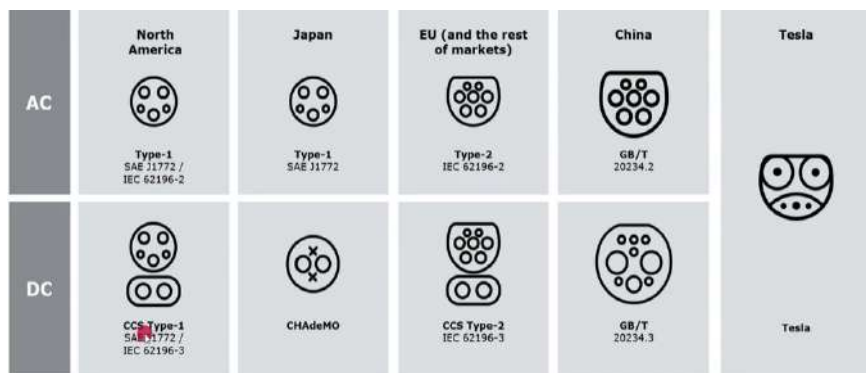


Figure 2: Different Type of Charging Plugs (courtesy: <https://www.vector.com/int/en/products/products-a-z/software/vsecclib/#c178624>)



the vehicle inlet and an On-Board charger (OBC) will convert this AC to DC power and charge the Battery. Along with OBC, there can be multiple ECUs (BMS, VCU etc.) in action so that the battery is protected against any malfunction and other vehicle functions are managed properly. SAE standards classify AC Charging into Level 1 & Level 2 based on the voltage and power rating. As per IEC Standard, based on the connection method, this can be Mode 1, Mode 2 or Mode 3 Charging.

**DC Charging:** The power conversion from AC to DC takes place outside to the vehicle in the charging station. The charging station supplies DC power to the vehicle to charge the battery. Here OBC has no role to play since power conversion takes place outside of the vehicle. This method can be referred to as Level 3 charging as per SAE and Mode 4 as per IEC.

## B) Charging Protocols & Connector

**Charging Plugs:** Physical connection between EVSE and EV happens through the charging plugs. This is where things get complicated and interesting. As with every new technology, stakeholders involved went on with their ways of designing its proprietary connectors and protocols to align with their goals and requirements. We can see this in figure 2.

**Charging Protocols:** Along with the power transfer, communication between the vehicle and the charging station is having crucial importance. This is where different protocols jump in and define the methods. We can see that like the connector diversification, protocols also differ based on geography. (e.g., ISO, SAE, IEC, CHAdeMO, GB/T). In the course of time, the industry ended up with assorted connectors and protocols, making it difficult for a single ubiquitous charging method.

Automotive development is known for its slow but robust development life cycle due to the importance of safety involved. For an OEM, Chassis re-design, components sourcing, supply chain management, internal wiring modification and prolonged hardware validation to add an additional charging inlet is not going to be a near-term achievable goal. Is there any alternate path they can go with? Can OEM go forward

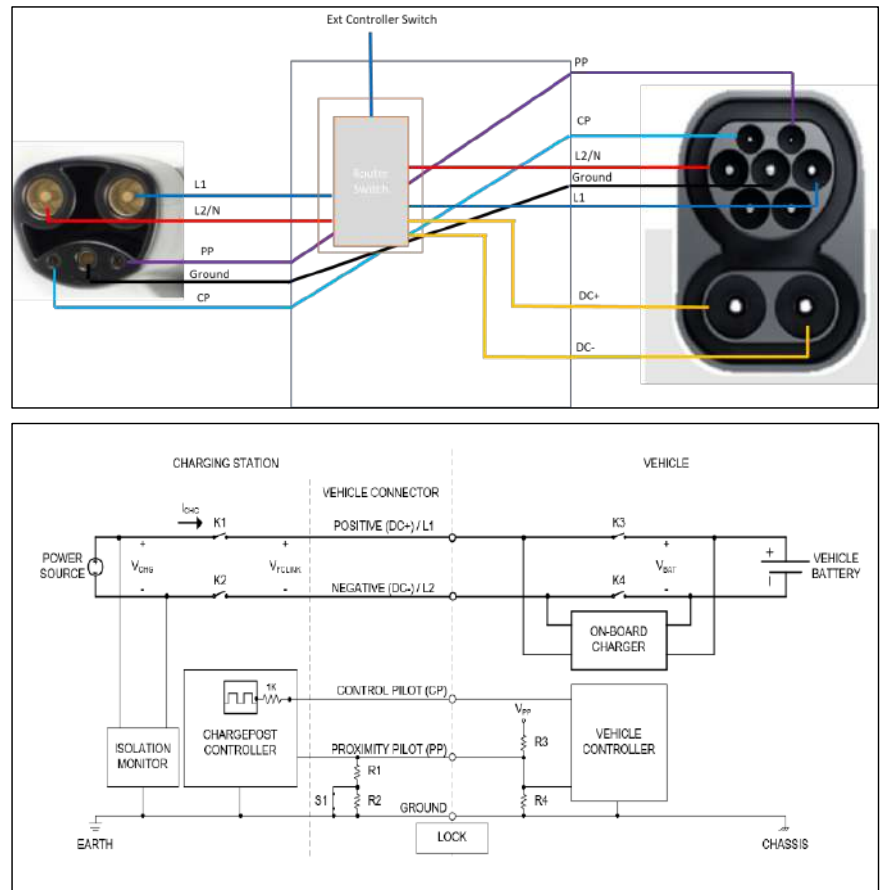


Figure 3: Tesla Plug to CCS2 Plug mapping & Connection diagram from Tesla

without any physical modifications and yet utilize the charging infrastructure offered? Let's contemplate.

**Can OEMs start to think of using a charging adaptor as an amicable solution?** i.e., without any modification in the vehicle hardware, using an external adaptor will this be possible? Let's examine the likely hood assuming the situation vehicle have a CCS2 compatible charging inlet and would like to charge with a Tesla charging station.

### a) Interfacing the charging Connector

Tesla follows North American standard J-1772 for the connector design with the same pin functionality but with modifications in the design and hardware pin placement. Also, in CCS 2 connector AC charging is compliance with SAE J 1772. This ensures an adaptor can directly map the Tesla pin to respective CCS2 pins.

For DC Charging as a deviation from the normal standards Tesla uses the same pins for AC charging whereas in CCS2 there are separate pins allocated for AC and DC

Charging. Mapping can be achieved with an external switch which can route input power lines to output AC or DC lines based on the switch position.

### b) Vehicle Architecture

We can see from Figure.4 Tesla's charging architecture has only a slight difference from what other OEMs follow. In Tesla architecture, from the Charging Port power lines are routed to OBC and the DC charge selector switch. AC or DC charge will be determined by BMS by interacting with Charge Port Controller. BMS will then control the switch position and OBC to choose the preferred way of charging. For other OEMs, a remote distinction can be seen where the charge port controller is implemented or whether the master logic lies in BMS or VCU. But the functionality will remain the same.

### c) Protocol handling software

All the hardware interaction makes sense only when the software effectively comprehends the protocols and establishes the communication. On top of the

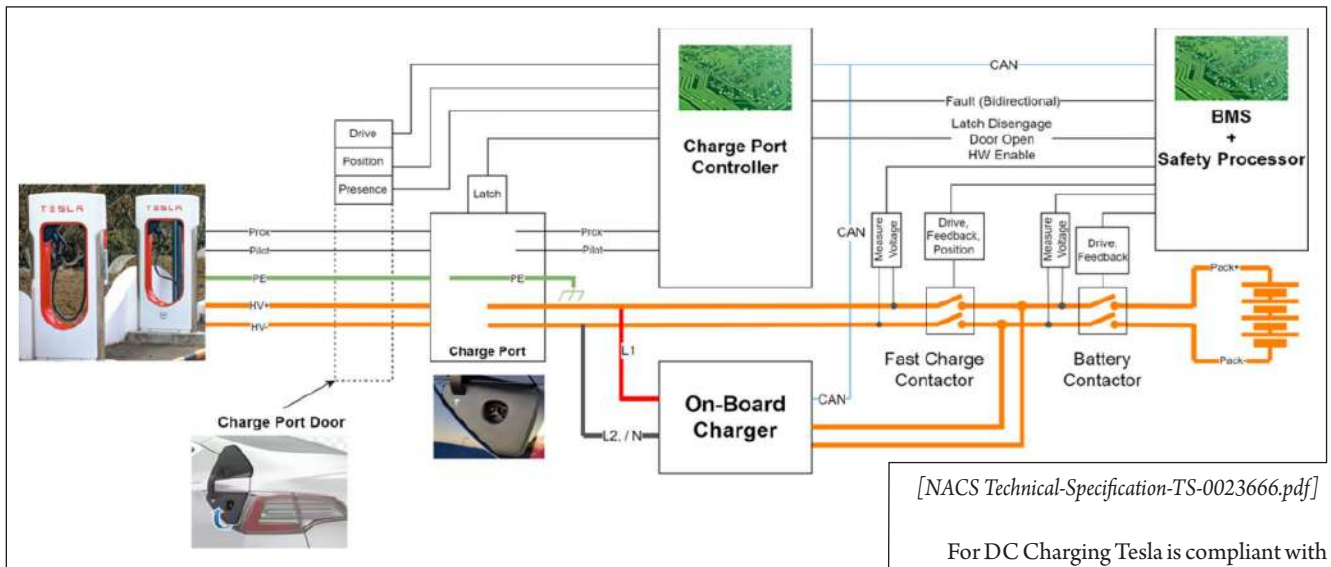


Figure 4: Tesla Charging Architecture

[NACS Technical-Specification-TS-0023666.pdf]

For DC Charging Tesla is compliant with DIN 70121 and uses PLC communication over Control Pilot Line. CCS2 is governed by ISO-15118 which is an evolved standard from DIN 70121. This ensures that CCS2-based vehicles can communicate with the Tesla charging station without issues in protocol management. DC Charging communication can also be taken care of without much effort. These aspects ensure with little tweaks in the existing software communication can be managed effectively.

Accelerated electrification adoption demands immense efforts from the industry players. Technology development process improvements will bear fruit only if they serve the purpose of the customers. One of the central issues in EV adoption reluctance arises from range anxiety. Battery technology improvement, fast charging and charging infrastructure ramp-up are the verticals industry is focused on nowadays. Along with providing enough charging station availability, it is foremost to ensure interoperability so that irrespective of the OEMs, vehicle owners get benefitted from the facility. Interoperable individual protocols under the hood of ubiquitous master charging protocols with higher level degrees of freedom for novice innovations choice should be something the industry can hope and strive for. □

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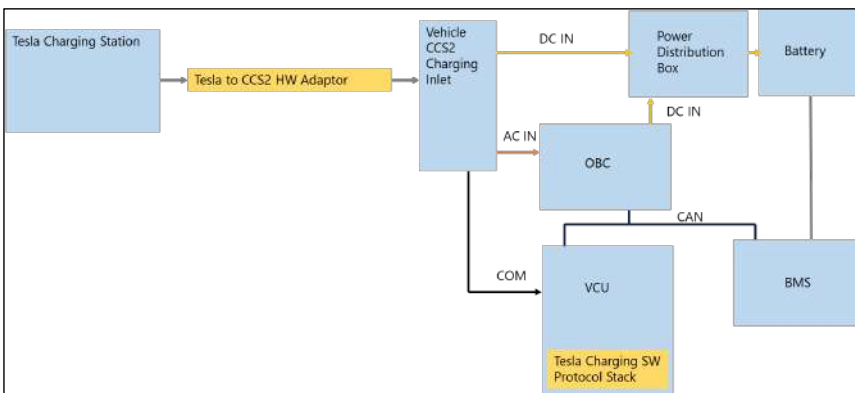


Figure 5: Proposed Architecture for using external adaptor plug for charging CCS2 from Tesla Charging Station.

hardware standards discussed standard protocol definitions are embedded so that bi-directional communication is possible between EV and EVSE.

For AC charging SAE J 1772 relies on IEC 61851-1/ IEC 61851-23 which is applicable for both Tesla and CCS2 handling.

- The proximity line provides information on the connection status
- By duty cycle modulation of control

pilot line type of charging and individual state information will be exchanged.

4.5.1 For DC charging, communication between the EV and EVSE shall be power line communication over the control pilot line as depicted in DIN 70121.

4.5.2 The North American Charging Standard is compatible with "plug and charge" as defined in ISO-15118.



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Sreeraj Arole has more than 11+ years of Automotive industry experience. He holds M.Tech in Automotive Electronics and B.Tech in Electronics and Communication. At present, he is working as an Architect in Automotive Electrification Centre of Excellence team at Wipro Limited. His Previous Publication includes SAE & Automotive Testing Expo Stuttgart. Present areas of interest are Electric Vehicle Architecture, EV Charging System & Software-Defined Vehicle.

# LTO CELLS: SHOULD WE USE THEM IN EV APPLICATIONS

**MOHAN SATYARANJAN**

Taqanal Energy

There has been a lot of discussion around suitability of LTO Cells in EV applications. In this article, we examine the pros, and cons of it:

- LTO has lower nominal voltage of 2.4 V compared to LFP(3.2V) and NMC(3.7V), which leads to a lower specific energy (about 30–110 Wh/kg) than conventional lithium-ion battery (For LFP it is 90-165 wh/kg and for NMC around 270 wh/kg) technologies. As a result of poor energy density, the amount of anode active material loading tends to be more and this increases the overall weight of the cell. The gravimetric energy density is more than Lead Acid batteries but lower than LFP batteries that use graphite anode. Poor energy density leads to substantially heavier, and bigger batteries, and hence not suitable for automotive application. Payload capacity of the vehicle has to be sacrificed (carry less passengers, or load) resulting in reduced earnings in commercial applications.
- As the price of the battery depends on the raw material used in it, due to higher raw material weight it becomes costlier than many of the others. It is not cheap.
- Vehicle fitted with unnecessarily heavy batteries end up spending too much energy just carrying the battery.. If you have an NMC battery instead (in a bus or truck), you can carry a few extra passengers or a few 100 extra kilos of cargo, and earn more: LTO kills your income if you are in the transportation business to earn a living.
- LTO charges fast, but that is of little use, as fast charging is expensive, and a large number of simultaneous fast chargers cannot be supported by the grid for foreseeable future (say a bus has 100 KWH battery, one hour charging itself will require 100 KW charger; even if the bus give 50KM with one charge, and a fleet of say 100 buses need to charge 3

times to deliver 150Km service each, we are talking of 100 KWH\*3\*50=15 MWH; If all of this has been delivered in one hour, you will need 15 MW connection). While there is a lot of hype, and expectations about fast charging, a number of facts need to be kept in mind:

1. Fast chargers are far more expensive. Consequently, the cost of fast-charging is much higher.
  2. Given the current state of the Grid, it will be a while before large number of fast chargers are available. Separate powerlines may need to be drawn from sub-stations, and may not be feasible in already populated areas. Users may have to drive extra to access fast chargers.
- LTO cells do give many cycles: 20-30K. It will practically last for several years – may be decades. It is good, and bad: No vehicle will last that long, and when the vehicle is being scrapped, will the vehicle owner get fair value for the battery? It is also possible that in 5 years much better technology will be available, and one may get stuck with an ancient, suboptimal technology.
  - However, one of the primary challenges is cell gassing due to operating in higher temperatures which can significantly limit life despite the excellent lifetime performance of LTO anodes. Gas evolution has been previously attributed to water impurities from the electrolyte, moisture trapped in the electrode, the breakdown of lithium salt forming hydrofluoric acid (HF), and/

or solvent reactions with the surface of the electrode. And the release of gas while cycling, resulting in the LTO battery pack swelling. If these happen, the high-cycle life expectation gets betrayed.

- As for the lithium titanate battery claimed to have an extended carrier existence, it's far extra to be really verified, and certified!
- It is an ancient technology, and there are newer, and better options available.

Because of the multiple fire-incidents, there is a general concern about the safety of EVs. There is absolutely no doubt that EVs have to be safe, and fire incidents do not happen.

We have to understand that, any concentrated source of energy is a risky item. Higher, the energy density, higher is the risk. Petrol/Diesel have much higher energy densities, and catch fire much easier. Coal was much safer compared to Petrol/Diesel, but the world did adopt Petrol/Diesel/CNG/LPG by handling these fuels in a safe manner.

In search of safe batteries, we should not go back to safe, but ancient, inefficient storage options. We should be building safe batteries with Advanced Chemistries. With proper instrumentation, electronics, and software, it is possible to build safe batteries. TESLA has been using the NMC Chemistry (substantially higher Energy Density than LTO) for a long time. There were some fire incidents in the beginning, but they were able to fix it completely. □

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Mohan Satyaranjan is currently an entrepreneur focused on developing technology to address barriers to EV adoption. Prior to turning an entrepreneur, Mohan spent more than 35 years in Networking & Telecom R&D. He built 'billion+ dollars a year' product lines, from scratch, at both Cisco Systems, and Juniper Networks. He has held director, and above positions at NetApp, Juniper Networks, and Cisco Systems.





# ROLE OF AUTOMOTIVE ETHERNET IN OFFROAD VEHICLES

**SWAPNIL SURESH TRAMBAKE**

John Deere India Pvt Ltd.

Offroad/ heavy-duty vehicle architectures are evolving day by day and getting smarter with increased use of various electrical and electronic components, thus increasing complexity and more and more software functionality running inside the vehicle. This modern vehicle architecture demands higher bandwidth with faster data throughput for In-Vehicle communication, an easily scalable network to adopt additions of new electrical and electronic components and more flexibility in integration with various services (cloud and

consumer products). Automotive Ethernet offers super-fast speed and high bandwidth, which is a must for next-gen off-road vehicles like Agriculture and Construction equipment to support high performance vehicle functions.

## Limitations with Other Automotive Networks

The current industry, the dominant technology for in-vehicle networking is CAN/CAN-FD/CAN-XL developed by Bosch has been a lifeline for all automotive companies. CAN Bus offers speeds up to

10 Mb/s (with CAN-XL) which is much less than what a new-age vehicle demands. CAN supports a limited fixed message size of 8 bytes with CAN, 64 bytes with CAN-FD and 2048 bytes with CAN-XL is not efficient for many applications as applications need variable data rates and different message sizes.

FlexRay is another in-vehicle network protocol which offers clock synchronization, built in redundancy and TDMA (Time Divided Media Access to avoid collisions) but only offers 10 Mb/s of bandwidth.

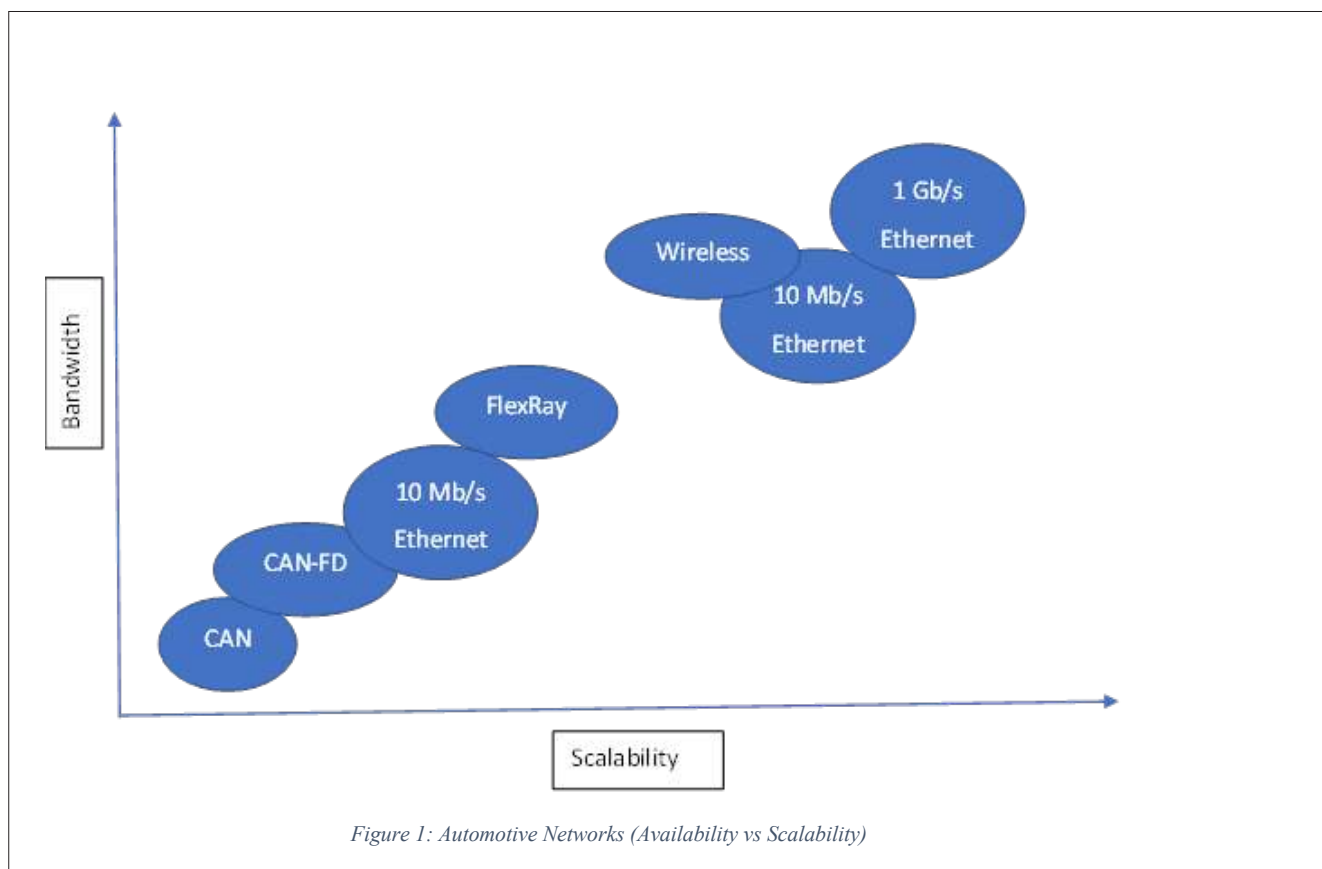


Figure 1: Automotive Networks (Availability vs Scalability)

Figure 1: Automotive Networks (Availability vs Scalability)

On the other hand, MOST bus offers synchronous communication with maximum bandwidth up to 150 mbps.

Figure 1 shows a comparison between automotive networks in terms of network scalability against bandwidth.

## Why Automotive Ethernet?

Automotive Ethernet is a physical network used to connect different vehicle components which fully meets automotive standards and IEEE 802.3 specification. The automotive ethernet is a single twisted pair of copper cables which is designed to meet automotive electrical requirements and regulations in mind. The automotive ethernet exists in many forms and with many performance levels ranging from 10 Mb/s to beyond 5 Gb/s. Currently, the main variant in the market is 100BASE-T1, 1000BASE-T1 used by many OEMs. One of the main advantages apart from speed is no collision of messages due to its full duplex nature, all traffic is bidirectional, which makes the ethernet the fastest electrical solution. This super-speed network helps machine critical applications & time-sensitive applications that need close to real-time message delivery.

Different topologies of Ethernet support easy scalability of the network, which means to expand the network we add ethernet switches which help add more nodes to the network. An Ethernet switch is an intelligent device that has capabilities of message routing, priority, scheduling and so on. So, the ethernet switch enables us to extend the vehicle network as we want. Also, arbitration is done inside the switch itself, hence we don't need to worry about link access arbitration.

Ethernet supports variable frame sizes ranging from 84 bytes (control messages) to large messages of 1500 bytes (camera streams and heavy payload transfer needs), which makes it ideal because different use-cases need different message sizes. The resulting latencies, considering 100BASE-T1 vary from 6.72µs for short messages to 122µs long messages and if we consider latencies for 1000BASE-T1 networks (which is a favorite amongst many OEMs) is much less and ideal for all high-performance applications.

Ethernet offers different communication

schemes; unicast, multicast and broadcast. Applications can be used as per their needs, so Ethernet is flexible.

Ethernet has multilevel protocol alternatives to choose from as per needs while implementing communication in vehicles.

## Applications of Ethernet in Off-road vehicles

Below are some use-cases of Ethernet in off-road/heavy-duty vehicles, but not limited to them, there are numerous applications we can think of using Automotive Ethernet.

### Diagnostics and Reprogramming

Diagnostics over the ethernet is much faster than traditional diagnostics over CAN. Diagnostics over IP i.e., DoIP (ISO 13400-2) is a standardized protocol used as a transport layer for Unified Diagnostics Services (UDS ISO 14229-5) unlike over Diagnostics over CAN (UDS 15765-2).

As the number of high-performance ECUs/VPUs are included in off-road vehicle architecture nowadays, reprogramming of the controllers (offline or over the air) is getting challenging due to relatively large size of software payload compared to the smaller payload of traditional ECUs. The faster reprogramming is needed for an hour and that really depends on the payload transfer rate onto end controller. The ethernet helps with faster payload transfer, thus ensuring fast re-programming.

### High Speed ISOBUS (HSI)

The Agricultural Industry Electronics Foundation (AEF) commissioned a 10th Project Team (PT10) to develop the next generation of ISOBUS to provide new capabilities well beyond CAN. High Speed ISOBUS (HSI) will pave the way for another major step into higher performance systems. The major backbone for the High Speed ISOBUS communications will be the automotive ethernet due to attributes such as communication speed, bandwidth requirements and control latency.

### Machine control/Machine Automation

There are various use-cases where new-age machines need to collaborate with various sensors to capture data and, after applying

intelligence, control the various parts/controls of the machine automatically while operating. As an example, in the agriculture industry, while planting the seed, planting at an accurate location with defined spacing between two seeds and within the farm boundary will need intelligent computation, taking various sensor data as input and controlling the nozzles of sprayer implement. This type of use-case needs super-fast communication throughout the vehicle network and the only way here is to use Ethernet backbone as networking.

### Operator Assistance

Offroad vehicles are usually of large size and work in harsh environments where the operator doesn't get a full view of the machine/operating area. Many vehicle manufacturers have many cameras installed in the vehicle for operator assistance; for example, precise maneuvering through the tightest space, machine control while performing work. These live camera streams are transferred to a PDU (primary display unit) in the operator station for operators to view and control machines (such as maneuvers, machine operation).

Functionalities like 360° surround views, bird eye view assist operator getting live streams to view the blind spots and make the decision. Using the automotive ethernet enables us to stream camera feeds onto display units (PDUs) without any extra wiring harness for cameras other than ethernet cable.

### Remote Monitoring

New age farm management typically works like a farm manager managing operations to be carried on on the farm and keep assigning a job/work to an operator. In order to monitor real time, the machine needs to gather the work data continuously while the work is being done and stream data to the server. This kind of use-case requires high throughput in communication because the data needs to reach TCU (Telematics Control Unit) with close to no latency.

### Perception-Based Solutions

Perception-based solutions are becoming popular in the off-road industry. Getting data from different sensors like GPS, cameras, engines and so on and running an algorithm to compute the next action for the vehicle to

take and ask the machine to take the action is typically called perception-based actions. These types of solutions are not limited to a single use-case, there are various use-cases that can be drawn to make machines autonomous / semi-autonomous. The need for perception-based solutions is essential nowadays due to the degree of complexity in the new age vehicles and more and more components to control while running an operation. Control systems with Ethernet as connectivity capability or Ethernet as a major backbone, with CAN as internal communication to the control system is seen more efficient and profitable.

### Machine to Machine Communications

In-field data sharing between machines is essential to share coverage maps between machines to ensure complete field coverage on display of a single machine (useful in low light or dusty conditions), eliminating application on already covered areas by another machine, monitor job done by another machine and sharing work history and shared work. These use-cases need wireless communication as the primary gateway and the ethernet as a backbone will improve the data latency in sharing data between vehicles.

### Extended cloud Connectivity

Ethernet as a backbone network enables us to extend the internet reach to all ethernet capable ECUs/VPUs/High-end computing devices from primary TCUs (Telematics Control Unit). This makes the controllers/devices independent of communicating with cloud services directly without the need to forward the data to middle-man.

### Time sensitive Application

As we have seen so far in the document, we understand that there are multiple flows of

data flowing on the Ethernet bus. Mostly there is no concept of "time" and cannot provide synchronization and precision timing.

Delivering data reliably is more important than delivering within a specific time, so there are no constraints on delay or synchronization precision. Network congestion is handled by throttling and retransmitting dropped packets at the transport layer, but there are no means to prevent congestion at the link layer. The new standard Time-Sensitive networking is becoming popular for deterministic quality of services (QoS) for point-to-point communication by synchronizing time (synchronizing the clock of all devices contributing to communication), scheduling, traffic shaping and communication path (path selection, path reservation and fault-tolerance) are used for time critical applications.

### Security in In-Vehicle Ethernet Networking

While addressing the demand for super-fast networks with high bandwidth, we also need to consider secure communication to prevent vehicles from cyber-attacks or protection against malicious attacks by humankind and considering aspects of confidentiality of data. As more and more use-cases of automatic machine control are becoming popular, protection against external attacks is very important. Attacks on the communication network can occur by deliberately inserting faulty messages or interfering with transmission messages (removing, delaying or modifying the message).

Generally, points of attack are external nodes such as OBD interfaces or wireless communication, but when the attack comes on the vehicle it can compromise

the security of all networks. Hence, securing network communication is very important.

Securing networks starts with restricting network access by using authentication

The next level of security is securing on-board communication by using data authentication using symmetric cryptography and data encryption using secret keys.

Application-level security is applied using application-level knowledge to verify and restrict received data depending on the sequence of values or the condition of the vehicle.

It is assumed that malicious attacks change known communication patterns. Periodic messages are suddenly received in an irregular pattern or the MAC authentication for a message repeatedly fails. An extreme case is the denial-of-service attack in which messages are sent repeatedly with the goal of causing an overload. This significantly impairs normal communication. The detection algorithm can be implemented in application software on selected devices to detect anomalies. If such anomalies are detected, several modes of defense can be applied as required.

### Things to watch

Adopting to the ethernet network has some costs involved, as for networking we need a switch as a separate hardware and the number of electrical or electronics components increases.

Multiple standards of ethernet communication need applications to make sure of compatibility between different versions of the standard.

Automotive Ethernet has a standard cable length of 15 meters; anything beyond 15 meters needs additional hardware repeaters. □

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He is a software professional with 13+ years of experience in embedded software product development. He has been working with John Deere since 2016, starting as Lead Engineer and currently serving as Solution Architect for overall vehicle network connectivity with Ethernet communication. He has worked as a software architect for various embedded controllers, majorly Telematics Controller, Display Unit, Gigabit Ethernet Switch etc.



## CerebrumX and Toyota team up to reduce fleet management costs with connected vehicle data

CerebrumX Labs Inc. announced its partnership with Toyota to provide valuable real-time insights aimed at making connected fleet operations safer and cost-effective. The partnership is focused on reducing the Total Cost of Ownership (TCO) for fleets by utilizing embedded telematics data from participating Toyota vehicles to promote data-driven decision-making and upgraded performance.

With the potential access to millions of vehicles and owner consented trips data, CerebrumX is currently working with fleet service providers across North America. The Augmented Deep Learning Platform (ADLP) collects and analyzes embedded data directly from participating Toyota-connected vehicles to give its fleet manager customers visibility into real-time streaming telematics, vehicle health data, collisions, service warnings, driver behavior and performance. ADLP further integrates this data with contextual information, such as weather, maps and traffic flow, to augment fleet managers' capabilities with customized analytics and business-driven insights.

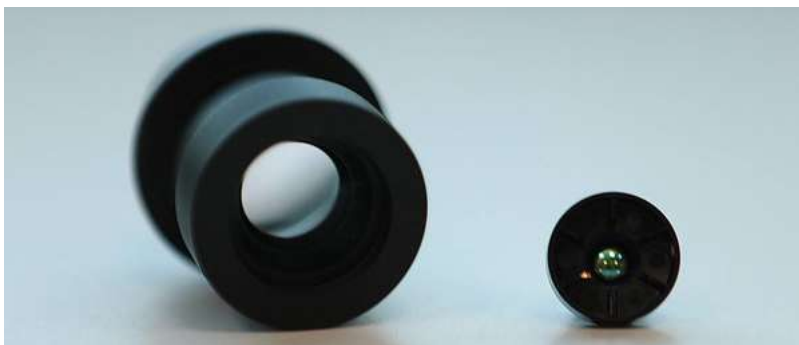
By leveraging the power of connected vehicle data, CerebrumX smart fleet management solution enables participating fleet managers to expand their vehicle portfolio to their Toyota connected vehicles and enjoy a myriad of benefits. Data allows easy identification of vehicle needs, optimal scheduling of maintenance appointments, management of fuel consumption, analysis of crash data, prevention of breakdowns, and more. While these insights bring down fleet costs significantly, it also directly impacts driver safety and overall productivity, enabling participating fleet managers to control real-time updates and reduce downtime to achieve lower cost of ownership.

## LG Innotek, developed two new hybrid lenses for autonomous driving

LG Innotek has developed new types of hybrid lenses for autonomous driving that have reduced size and thickness while increasing price competitiveness compared to existing products in the market.

The company said it developed new lenses for its driver monitoring system (DMS) and advanced driver assistance system (ADAS). What distinguishes them is that the company cross-applied plastic and glass inside the lens, while other lenses use only glass to prevent structural deformation due to alteration in temperature or external force. The company said it increased the performance of its new lenses to match all-glass lens that maintains consistent performance regardless of temperature.

LG Innotek expects the company will command an edge in the In-cabin camera lens market. The camera lenses employed in Autonomous vehicles are mounted in camera modules. They are key components of autonomous driving for driver assistance and driver recognition. In Europe, all vehicles are recommended to be equipped with DMS after 2025.



Hybrid lenses to be used in the Driver Monitoring system(right) and the in the Advanced Driver Assistance System(left).

## UltraSense Systems introduces In-Plane sensing technology

UltraSense Systems announced In-Plane sensing automotive technology, the ability to enable multi-mode sensing and HMI control in the plane of the SmartSurface (or A-Surface), reducing the size, weight, enabling modern designs and offering highly configurable optionality, that reduces part numbers and build complexity. This translates to advantages in sustainability and recyclability, increases driving range, and enables modern designs and new user experiences that were not possible before such as supporting controls for retractable steering wheels that require elegant slim form factors.

In-Plane sensing is a major step towards the ability to deliver a full HMI experience by enabling the thinnest possible space. This is more than a capacitive ITO layer, but as defined by offering sensor fusion and enabling multimode sensing, processing & algorithms, feedback control: illumination, audio, haptics, and secure connectivity. It is a recipe for transformational changes in reducing the size of existing automotive module depth. Combined with the TouchPoint family of HMI controllers, InPlane sensing enables designs that support all types of Smart Surface HMI interactions through the broadest set of materials, beyond capacitive plastic and glass. Smart Surfaces can now operate through natural materials such as wood and leather to metal and other soft surfaces.

InPlane sensing is a design structure and works with all TouchPoint HMI controllers and sensors, offering new thin designs as well as the traditional, thicker force pillar designs.

### All TouchPoint HMI controllers offer

- Multi-Mode sensing (CapForce, UltraForce, TapForce)
- Processing and AI Machine Learning algorithms
- Feedback control to drive Illumination, Audio and Haptics
- Secure Connectivity options to support industry protocols such as LIN and CAN as well as offering configurability – optionality, technology upgradability that is offered at production, dealership, or end-user Over The Air updating.

UltraStudio 2.0 is a HMI User eXperience design and human factors evaluation tool to help facilitate testing and comparing various settings of touch to feedback, including illumination, audio and haptics. It helps accelerate the product development phase of the HMI end user experience.

## ATrack launches a range of 4G telematics devices and asset trackers

ATrack Technology Inc. recently launched three new 4G products for fleet management and asset tracking, including the AK500 Telematics Gateway, AX300 OBD vehicle tracker and AS500 long standby asset tracker, will help logistics operators improve management efficiency and reduce operating costs.

### AK500 has all the features for all-round vehicle and driving management

The AK500 is a multi-functional telematics gateway that uses LTE Cat4 high-speed connectivity, with 2.4GHz/5GHz Wi-Fi sharing, Bluetooth and real-time positioning functions. It supports multiple communication protocols, and can read engine data of various commercial vehicles and trucks, including mileage, speed, fuel volume, fuel consumption, engine speed, idling time and other parameters. This can assist fleet management operators in conducting in-depth data review to help early detection of potential vehicle problems and order preventive maintenance. In addition, the AK500 has multiple interfaces that can be connected to various sensors, such as tire pressure monitors, ID card readers, temperature sensor, and more.



### AX300 can obtain Dual-CAN engine information for in-depth analysis of vehicle status

The AX300 OBD vehicle tracker supports multiple communication protocols, can meet the tracking requirements for both commercial vehicles and heavy machinery. Differing from typical trackers which can only read a single CAN bus on the vehicle, the AX300 can read two sets of vehicle CAN bus information simultaneously to obtain more detailed key engine data.

The combination of the AK500 telematics gateway and AX300 OBD tracker can not only help the logistics industry to determine vehicle status and improve vehicle dispatch efficiency, but also manage driving behavior, detecting negative driving behaviors such as speeding, harsh cornering, and idling, etc. to further improve efficiency.

### AS500 incorporates innovative technology, perfect for asset management

The AS500 long standby asset tracker incorporates a variety of innovative technologies. With the internal battery power supply and ultra power-saving design, it can operate for up to ten years without replacing the battery. In addition, it meets the highest waterproof and dustproof IP69K and IP67 design standards. The wide temperature range of -40°C to 80°C enables the AS500 to operate stably in extreme environments. It is highly suitable for the managing high-value unpowered assets including shipping containers, heavy machinery and other assets.

In addition to real-time position tracking, the AS500 can also be used in various other ways with software capabilities and accessories, for example motion detection. The built-in acceleration sensor can be used to determine whether the monitored object is moving or to calculate the work hours of machinery. Furthermore, the AS500 can be equipped with various sensors, such as a door opening detection magnet, to monitor whether the container door is opened at an inappropriate time or place. The AS500 can also be equipped with a tamper detection magnet, which will automatically send an alarm when the device is improperly removed, thus preventing important assets from being stolen.

ATrack notes that these new products, the AK500 Telematics Gateway, AX300 OBD Vehicle Tracker and AS500 Long Standby Asset Tracker, will help customers improve fleet and asset management efficiency and reduce operating costs via a cloud platform in order to alleviate problems caused by any manpower shortages.

## VSI launches the automotive industry-standard high-speed SerDes silicon

VSI, a developer of high-speed communication semiconductors for vehicles, have introduced the commercial serializer/deserializer (SerDes) solution that complies with the Automotive SerDes Alliance (ASA) standard. The VS775 provides a data transmission rate of up to 16 Gbps so that the ECU can quickly process high-resolution image data collected by vehicle image sensors, especially electric vehicles and autonomous vehicles.

Fully ASA compliant, the innovative VS775 provides a commercial camera link semiconductor solution that will resolve the bandwidth concerns associated with using more high-resolution image sensors in advanced autonomous vehicle designs for automotive OEMs worldwide. VSI demonstrated the performance and stability of its new product by conducting a live demonstration at EIPATD 2022 (IEEE Ethernet IP & Automotive Technology Day 2022) held in Yokohama, Japan in November.

### Data processing challenges

As the level of autonomous driving becomes more advanced, the number of sensors such as cameras and lidar (LiDAR) and radar (RADAR) mounted on vehicles increases, so the demand for real-time high-speed data transmission also increases. For example, it is expected that more than 20 sensors will be required for one vehicle at levels 4 and 5: the levels of complete autonomous driving that do not require driver intervention or do not require a driver at all. This is why high-speed data transmission technology for vehicles is essential.

Existing solutions have low bandwidth performance for data transmission and, crucially, offer limited interoperability because each supplier applies their proprietary technology. To resolve this, a standardization activity (ASA) for automotive high-speed link solutions was initiated and led by global OEMs. Various ecosystem members are participating, including OEMs, Tier 1 and Tier 2 parts suppliers, semiconductor companies, and testing companies. VSI has participated in the establishment of the “ASA Motion Link 1.01” standard from the beginning as a core technology partner.

### High speed solutions

The world's first sample of the VS775 SerDes chip designed to comply with this standard had 8 Gbps performance and was released in May 2022. This was soon followed by the introduction of the commercial chip, which doubled the transmission speed to 16 Gbps. In addition to high-speed data transmission performance, the VS775 features a low-power design that reduces power consumption by up to 50% compared to existing products. Its ultra-compact size means it is optimized for electric vehicles (EVs) and automotive camera modules with limited space.

### Further developments

Currently, VSI is in the process of supplying contracts for camera link solutions for Advanced Driver Assistance Systems (ADAS) with several global automotive parts suppliers (Tier 1). The company plans to expand the support range of high-speed bandwidth to 32Gbps and 64Gbps through the follow-up development of the VS775.

The live demonstration at EIPATD 2022 was conducted under the auspices of BMW, which leads the ASA. A provider of integrated electronic systems, AED performed the entire PoC (Proof of Concept) system setup using the VS775 high-speed SerDes from VSI. VSI will host another live demonstration at the Automotive Ethernet Congress in Munich, Germany in March 2023.



## China Automotive Systems launches new Electric power steering systems for BYD

China Automotive Systems, Inc., a power steering components and systems supplier in China, announced that it has introduced a new series of Electric Power Steering systems for the Chinese EV producer, BYD Auto.

After 18 months of preparation and close collaboration between both R&D teams, CAAS won design contracts for C-EPS, DP-EPS and R-EPS from BYD for all its series of products. Being the DP-EPS supplier to BYD, CAAS' R&D engineers used computer-aided design (“CAD”) and artificial intelligence to shorten the design cycle to 5 months, and successfully completed the integration of DP-EPS in the chassis general assembly for BYD's model, Tang. Due to its performance in Noise, Vibration, and Harshness (“NVH”) and driver experiences, DP-EPS is officially replacing higher cost R-EPS by BYD, especially for BYD's popular high-end vehicle models, Tang and Han. The mass production of DP-EPS has begun, with an annual volume of approximately 300,000 units, and the wide adoption of the Company's DP-EPS, R-EPS and C-EPS is expected in all BYD Dynasty series (“Tang, Han, Song pro, and Song Plus”), Marine Life series (“Dolphin and Seal”), Classic Ship series (“Frigate”), and the Denza series.





Face Recognition Sensor

## Genesis introduces keyless entry face recognition technology on 2023 GV60

Genesis has announced that the European version of the 2023 GV60 will introduce the market to Face Connect, its new facial recognition system, alongside an upgraded digital key.

The biometric system allows drivers to use their face as a key to lock, unlock, and access the EV. Upon entry, a built-in fingerprint scanner can then be used to start the car. To carry out these operations, Face Connect pairs a facial recognition sensor with a deep-learning image processing controller that identifies the user through a face scan. Shortly afterwards, an LED indicator on the B pillar provides visual feedback on the vehicle status – granting entry if the scan proves successful.

GV60 owners can set up Face Connect through the Genesis Connected Services App, using the car's physical key once to set up their profile and start the car with their fingerprint. Once this setup is complete, the user's biometric data is subsequently used to unlock and enter the vehicle. The Hyundai brand confirmed that this data is stored securely through encrypted in-vehicle software, where it is managed by the HMI. The data itself does not leave the vehicle once it has been captured, with Genesis further confirming that it will never be uploaded online or stored remotely.

In providing these technologies, Genesis is hoping to streamline the user experience of its vehicles by reducing user reliance on the electric SUV's physical key. The brand has also said that Face Connect will similarly relieve stress by providing its customers the option to leave their car keys behind. Here, a customer may wish to choose Face Connect over a conventional key if using the new GV60 in conjunction with outdoor activities, such as swimming, climbing, or running, where that key may be misplaced or get lost.

Face Connect will be provided as standard on the 2023 GV60 alongside an upgraded digital key system. Much like Face Connect, the system allows customers to use a compatible smartphone or smart watch to access, lock, or unlock the vehicle. The digital key also interacts with the SUV in a similar manner, with the puddle lamp turning on and its side mirrors opening as the user approaches it. Digital key sharing is supported with the new GV60, allowing owners to create three additional keys and share them with friends and family through their smartphone. When sharing a digital key, the owner is also able to set a limit on the number of times a shared key can be used to access their vehicle.

As well as the above technologies, the 2023 GV60 will also provide customers with new features and upgrades inside the vehicle. A new Air Purification System includes a premium air filter that regularly monitors the cabin's air quality, automatically activating if an increase in dust concentration levels is detected. In the new model, the Ergo Motion driver seat as well as the front- and rear-heated seats that were previously exclusive to the Comfort Seat Pack are now offered as standard. An electric adjustable heated steering wheel with a memory function will also become standard, as will a new ambient lighting configuration in the lower area of the cabin.

## Motional launches robotaxi service on the Uber network

Motional and Uber Technologies Inc announced the launch of their public robotaxi service in Las Vegas, NV. Uber customers are able to hail an autonomous ride using Motional's all-electric Hyundai IONIQ 5-based robotaxis. Motional and Uber are launching with vehicle operators now to lay the groundwork for a fully driverless commercial service, with the goal of launching the driverless service to the public in 2023.

This service is Motional and Uber's 10-year commercial partnership that will see Motional's Level 4 autonomous vehicles (AVs) deployed for ride-hail and deliveries on the Uber network in major cities across the U.S. The public robotaxi service will first launch in Las Vegas before expanding at a later date to Los Angeles, CA. The Las Vegas pilot arrives just a few months after Motional and Uber finalized the multi-year partnership, demonstrating that both companies are committed to entering new markets and introducing autonomous technology at scale to millions of Uber customers – all while making meaningful progress on leading the industry to zero emissions.

This announcement marks the second autonomous service launch from Motional and Uber this year. In May, Motional's AVs began conducting autonomous deliveries for Uber Eats customers in greater Los Angeles. The success of the service, which quickly expanded to additional restaurants, proves the market opportunity and the appetite among Uber merchants and customers for a driverless delivery option.

## MiX Telematics adds new updates in its Mix Vision AI dashcam

MiX Telematics, a SaaS provider of connected fleet management solutions, has announced an update to its video telematics offering. MiX Telematics has offered an integrated video and fleet telematics solution since 2014 and introduced a new MiX Vision AI dashcam solution in 2021 to provide advanced safety and fatigue solutions to customers across the globe. The recent updates include support for smaller dashcams that are quicker and easier to install, as well as new software features to enhance the user experience and provide even more flexibility to customers. The portfolio of AI-powered products now also includes the option of an advanced, multi-camera mobile digital video recorder that integrates seamlessly with MiX Telematics' premium fleet solutions, along with the smaller cameras.

## BMW adds Parkopedia's in-vehicle parking payments feature in Germany & Austria

BMW has introduced a new parking payments feature, which uses Parkopedia's in-vehicle Payment Platform to enable drivers to pay without leaving their car.

The new feature is activated by Over-the-Air (OTA) upgrade in Germany and Austria, without requiring any action from drivers. Once the driver chooses a parking location through the new feature, Parkopedia's payment platform interacts with the payable location and vehicle sensors, resulting in the car automatically displaying the payment function. In parking locations where billing is done by the minute, the transaction again automatically ends when the vehicle leaves the parking location.

Drivers must sign in only once to the BMW Parking Payment, either with their BMW ConnectedDrive account or BMW ID, activating the Park Payments service. Single Sign-On (SSO) technology offered by Parkopedia allows drivers to save their payment methods and eliminates the need for authentication at the point of purchase.

Parkopedia's technology also allows the creation of geofences, alerting drivers or enabling automated payment requests in a specified area or payment zone. This ability eliminates the need for mobile apps and parking payment machines.

BMW plans to gradually expand the new payment service to other European countries from 2023 after improving the service following customer feedback. Parkopedia offers connected car services in 90 countries worldwide, including payment services and developing detailed parking maps.





## Rohde & Schwarz and Löhnert present a robot-based solution for end-of-line measurement of automotive radomes and bumpers

Highly integrated measurement solution based on the R&S QAR50 impresses with precise measurements and maximum flexibility. (Image: Rohde & Schwarz)

higher throughput and yields as well as more flexibility to adapt to different DUTs, for End-of-line (EOL) measurements of bumpers and other exterior parts.

The imaging capabilities of the R&S QAR and R&S QAR50 allow for reliable and precise testing of large areas of the bumper. Both instruments are optimized for measuring automotive radomes and smaller exterior vehicle components. Due to their sheer dimensions, measuring bumpers and larger exterior parts comes with additional challenges. Up to now, it has been challenging to measure complex and physically large parts in production. In order to provide a more advanced solution to those challenges, Rohde & Schwarz and Löhnert Elektronik have developed with a new turnkey solution for measuring automotive radomes in all forms and shapes.

Based on the R&S QAR50 automotive radome tester, the R&S QAR50-R is able to measure the RF transmission, transmission phase and reflection of devices under test. Thanks to the electronic focusing, the instrument fulfills even the highest demands in terms of precision and accuracy in a production environment. The optionally available verification set allows radome and bumper suppliers trace the results back to national and international standards.

The R&S QAR50-R was designed with a focus on compactness and low weight in order to be compatible with standard 6-axis robots. Due to its design, the R&S QAR50-R reaches positions that could hardly be handled with other available test systems.

Löhnert Elektronik and Rohde & Schwarz has introduced a fully automated turnkey solution for bumper production radar transparency testing based on the successful R&S QAR50. The lightweight and compact setup of the R&S QAR50-R facilitates precise positioning of the measurement antennas, allowing faster, more accurate and convenient testing. This leads to

## Lion Electric to start production of lithium-ion battery pack at Quebec

The Lion Electric Company, a manufacturer of all-electric medium and heavy-duty urban vehicles, has completed production of its first lithium-ion battery pack at the company's battery manufacturing facility located in Mirabel, Quebec. Final certification of the first battery pack is expected in the first quarter of 2023, followed by a gradual ramp up of production in 2023. The first batteries produced in Mirabel will power the LionS truck and the LionAmbulance, expected to reach commercial production in the first half of 2023.

Lion's new Mirabel battery manufacturing facility, once fully operational, is expected to give the Company a key market advantage, with vertical integration providing more control of supply, technology advancement, and vehicle integration. Given the battery is typically the most expensive component of an electric vehicle, this new manufacturing capability should have a direct impact on Lion's development of medium- and heavy-duty electric vehicle platforms, while also offering important economic benefits.

At full scale, Lion's battery manufacturing facility is expected to have an annual production capacity of five gigawatt-hours of battery capacity.

## Oncor and Toyota collaborate to research vehicle-to-grid technology

Toyota Motor North America and Oncor Electric Delivery, an electric transmission and distribution company, have agreed to collaborate on a pilot project around vehicle-to-grid (V2G), a technology that allows vehicles to flow energy from their battery back onto the electric grid. The effort will be led by Toyota's Electric Vehicle Charging Solutions (EVCS) team, marking an important first collaboration with a public utility for Toyota in the U.S. around Battery Electric Vehicles (BEVs).

The results from the research will allow Toyota and Oncor to be better prepared to support the broader EV charging ecosystem in the United States. Further, these efforts will allow Toyota to elevate the customer experience for Toyota BEV customers, accelerate efforts in carbon neutrality and provide advances in business opportunities.

Initially, the two companies have agreed to a research project that will use Oncor's research and testing microgrid at its System Operating Services Facility (SOSF) in south Dallas, located just south of Toyota's nearby national headquarters. The SOSF microgrid is composed of four interconnected microgrids that can be controlled independently, but also operated in parallel, tandem or combined into a single, larger system. The microgrid and its subsystems also include a "V2G" charger, solar panels and battery storage for testing and evaluation. Toyota and Oncor plan to use a BEV along with the system to better understand the interconnectivity between BEVs and utilities.

Beyond this initial phase, a second phase of the project slated for 2023 will include a V2G pilot where testing will be conducted with BEVs connected at homes or businesses within Oncor's service territory, pursuant to all standard interconnection processes and agreements.

The collaboration will help provide both Oncor and Toyota insight into the current and future needs of its customers. Furthermore, it will provide Oncor with additional insight into the infrastructure needed to enable the rapid growth of electric vehicles and electric vehicle charging infrastructure, meet their needs and support electric vehicles and better understand the impact of V2G on the electric grid.



## Mercedes-Benz and Bosch driverless parking system approved for commercial use

Germany's Federal Motor Transport Authority (KBA) has approved their highly automated parking system for use in the P6 parking garage run by APCOA at Stuttgart Airport. This makes it the highly automated driverless parking function (SAE Level 4) to be officially approved for commercial use.



### The technology behind driverless parking

Drive in to the parking garage, get out of your vehicle, and send it to a pre-booked parking space just by tapping in a smartphone app – the Automated valet parking service has no need for a driver. Once you have left to spend the time just saved on doing something else, the vehicle drives itself to its assigned space and parks. Later, the vehicle returns to the pick-up point in exactly the same way. This process relies on the interplay between the intelligent infrastructure supplied by Bosch and installed in the parking garage and Mercedes-Benz automotive technology. Bosch sensors in the parking garage monitor the driving corridor and its surroundings and provide the information needed to guide the

vehicle. The technology in the vehicle converts the information it receives from the infrastructure into driving manoeuvres. This way, vehicles can even drive themselves up and down ramps to move between stories in the parking garage. If the infrastructure sensors detect an obstacle, the vehicle brakes and safely comes to a complete stop. Only once the route is clear does it continue on its way.

It was in 2019 that Mercedes-Benz and Bosch obtained the world's first special permit to operate Automated valet parking using development vehicles without human oversight in everyday operations in the parking garage of the Mercedes-Benz Museum in Stuttgart. The approval that has now been issued goes beyond this, allowing commercial operation with privately owned vehicles in the P6 parking garage at Stuttgart Airport. The basis for the approval is a law that came into force in Germany in July 2021, which permits driverless driving in accordance with SAE Level 4[1] for motor vehicles (BMDV – Germany will be the world leader in autonomous driving). Application of this law to the parking system was implemented in close coordination with the German Federal Ministry for Digital and Transport (BMDV) and the KBA. The AFBV (autonomous driving directive), passed by the German Bundesrat on May 20, 2022, clearly specifies the criteria of the German road traffic act that Level 4 vehicles must satisfy.

The companies plan to gradually roll out the driverless parking service in the APCOA P6 parking garage at Stuttgart Airport. From the day it is released for operation, the first customers with S-Class and EQS models built since July 2022 whose vehicle variants feature the INTELLIGENT PARK PILOT2 service as part of Mercedes me connect, and who have activated this service, will be able to use the function at the P6 parking garage. Once drivers have used their Mercedes me app to book a parking space in advance, they can leave their vehicle in a predetermined drop-off area. After all the passengers have exited the vehicle, the app starts the parking maneuver. The parking system checks whether the route to the booked parking space is clear, and that all the other technical requirements have been satisfied. If this is the case, drivers receive a notification in the app confirming that the intelligent infrastructure has taken control of the vehicle. They can then leave the parking garage. The vehicle starts automatically and finds its own way to its parking space. When the driver wishes to retrieve their car from the parking garage, they can summon it via smartphone command. Their vehicle then makes its own way to a predetermined pick-up area.

## Magna to acquire Veoneer's Active Safety business

Veoneer announced that it has entered into an agreement with Magna International Inc. Under the agreement, Magna will acquire Veoneer's Active Safety business from SSW Partners, a New York based investment partnership for \$1.525 billion in cash, subject to working capital and other customary purchase price adjustments.

Combining Veoneer's Active Safety competence and product portfolio with Magna's Advanced Driver Assistance Systems, ADAS, business will strengthen the combined business and provide customers in more geographical locations with a full suite of ADAS solutions.

In April 2022, SSW Partners acquired Veoneer in an all-cash transaction representing a total equity value of \$4.6 billion. Qualcomm Incorporated subsequently completed the acquisition of Arriver™ from SSW Partners for an undisclosed sum. With the announcement to sell the Active Safety business to Magna, Veoneer continues the process of finding the best long-term home for its Restraint Control Systems business.

The transaction with Magna is expected to close near mid-year 2023, subject to approval of applicable regulatory authorities and other customary closing conditions.



## Three Wheels United partners with Piaggio to procure 3,300 electric three-wheelers

EV-financing firm Three Wheels United (TWU) has partnered with Piaggio Vehicles for the procurement of over 3,300 electric three-wheelers, to be deployed over the next 18 months across the country.

As per the understanding, TWU will provide easy financing solutions for individuals as well as fleet operators who are switching to electric vehicles from conventional engines. Drivers will be provided affordable loans covering up to 100 percent of the cost of the vehicle without any collateral, the company said in a statement. TWU's driver app, which

provides details on the locations of charging stations, parking options, and vehicle maintenance, will offer constant support to drivers.

Additionally, the fintech firm will provide a buyback option that allows drivers to sell their existing pollutive vehicles that are older than ten years and purchase Piaggio's Ape Elektrik EVs by just paying a down payment of Rs 29,999.

Piaggio, on the other hand, will cater to the maintenance and service demands of the vehicles through its dealers network.

## Indian Auto Component industry grows 34.8 percent to Rs. 2.65 lakh crore (USD 33.8 billion) in first-half of 2022-23

Automotive Component Manufacturers Association of India (ACMA), the apex body representing India's Auto Component manufacturing industry announced the findings of its Industry Performance Review for the first half of fiscal 2022-23. The turnover of the automotive component industry stood at Rs.2.65 lakh crore (USD 33.8 billion) for the period April 2022 to September 2022, registering a growth of 34.8 per cent over the first half of the previous year.

Commenting on the performance of the auto component industry in India, Vinnie Mehta, Director General, ACMA said, "With vehicle sales and exports gaining traction, month-on-month, the auto component industry demonstrated a growth of 34.8 percent scaling a turnover of Rs.2.65 lakh crore (USD 33.8 billion) in the first-half of FY 2022-23. Steady growth was witnessed in all segments – supply to OEMs, Exports as also the aftermarket. Exports grew by 8.6 percent to USD 10.1 billion (Rs.79.03 lakh crore) while imports grew by 17.2 percent to USD 10.1 billion (Rs.79.8 lakh crore). The Aftermarket, estimated at Rs. 42,007 crore also witnessed a growth of 8 percent. Component sales to OEMs in the domestic market grew by 46 percent to Rs.2.23 lakh crore".

### Key findings of the ACMA Industry Performance Review for H1 2022-23:

- **Exports:** Exports of auto components grew by 8.6 percent to USD 10.1 billion (Rs.79,033 crore) in H1 2022-23 from USD 9.3 billion (Rs 68,746 crore) in H1 2021-22. North America accounting for 33 percent of exports, saw an increase of 12 percent, while Europe and Asia, accounting for 30 percent and 26 percent respectively also registered increase of 4 and 11 percent respectively.
- **Imports:** Imports of auto components grew by 17.2 percent from USD 8.7 billion (Rs.64,310 crore) in H1 2021-22 to USD 10.1 billion (Rs.79,815 crore) in H1 2022-23. Asia accounted for 65 per cent of imports followed by Europe and North America, with 26 percent and 8 percent respectively. Imports from Asia grew by 21 percent, from Europe by 6 percent and from North America by 29 percent.
- **Aftermarket:** The aftermarket in H1 2022-23 witnessed a growth of 8 percent to Rs 42,007 crore (USD 5.4 billion) from Rs. 38,895 crore (USD 5.3 billion) in H1 2021-22.



## Netradyne partners with B.D Dhalla Transport for fleet-wide advanced road safety tech

Bengaluru-based fleet safety and management solution provider Netradyne has signed a five-year pact with B.D Dhalla Transport, a transport company headquartered in Mumbai. As per this partnership, Netradyne will provide intelligence solutions to Dhalla Transport for its strategic fleet management decisions in the company's bid to mitigate on-road incidents.

The company selected Netradyne's AI-powered embedded technology to provide fleet management services to its customers. Netradyne's DriverIQ technology will provide clear insights into driving behavior through real-time monitoring systems and real-time driver coaching. An analytical report will also

be generated as part of the service, which will assist in devising effective improvement plans.

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