Tata Elxsi offers innovative solutions in emerging technologies

Works with OEMs and suppliers to bring Connected, Autonomous and EVs to their product portfolio.

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Tata Elxsi, a global provider of design and technology services for automotive engineering solutions, is working with the top OEMs and suppliers by providing technology consulting, new product design, development, and testing. It provides solutions in emerging technologies like IoT, big data analytics, cloud mobility, artificial intelligence, machine learning, augmented and virtual reality.

Tata Elxsi is also working with the OEMs that plan to bring Connected, Autonomous and Electric vehicles to their product-mix. It is working with them in their advanced EV programmes for development and validation systems. The company is a strategic partner of 14 of the top 20 global OEMs. Its work with car manufactures includes ECU specification development support, providing software ownership incorporating the latest model-based design techniques and AUTOSAR standards, and as a test house where it is providing component and system-level validation of ECUs. Technology-wise Tat Elxsi is working closely with OEMs for active safety and autonomous driving, advanced infotainment development and testing, helping OEMs in coming up with their V2X strategy and supporting in various electric vehicle programmes.

Tata Elxsi through its eCockpit solution is addressing the growing connectivity requirements of OEMs
by developing the software for
digital cockpit that incorporates
multiple features of traditional
infotainment, cluster and heads-up
display from single ECU controller
and OTA.

“Multiple active safety features
like lane keep assist, blind spot
detection, driver monitoring,
surround view camera etc along
with autonomous driving features
are being introduced by the OEMs.
Tata Elxsi is closely working with
them and the Tier-1 suppliers in
such projects. When electric
vehicle comes to the mainstream,
its testing becomes very important.
Our eMobility HILS framework
will help an OEM test the EV and
the associated components at
a faster pace at lower cost. We
are also working directly with
the commercial and agricultural
equipment manufacturers and
through their component suppliers
for various projects in telematics,
active safety and autonomous
programmes,” Shaju S, General
Manager and Head of Automotive
Business Unit, Tata Elxsi, told Auto
Components India.

Tata Elxsi follows the automotive
ECU development process and
standards warranted by all major
global OEMs in the design,
development, review and validation
of its products. “This process
ensures the robustness of our work
products to withstand all the harsh
conditions like snow, rain, wind
and hot climates. Each component
in a vehicle is designed to withstand
the extreme conditions in which it
will be used and this will be one of
the non-functional requirements
to the design team. All these aspects
will be considered during the
product development cycle and
will undergo a rigorous validation
testing to ensure the conformity.
Normally the prevention of mud
and dust particles entering into
the electronics is defined as an
IP (Ingress Protection) rating for
the box design. IP rating has
different levels and depends on the
mounting location of the ECU in
the vehicle,” he said.

Along with the manufacturing
plants, today most of the global
OEMs and suppliers have invested
in their own R&D facilities in India.
They are driving innovation teams
that come up with cutting-edge
technology products for global car
product-line as India is becoming
the cornerstone of innovation and
an exporter of automotives to the
global markets.

The Indian car market is poised
for tremendous growth as now
the consumers are increasingly
demanding for more safe and
consumer-friendly features in their
cars. This will lead to increased
demand and development of
electronics with intelligent
functions. Today advanced features
like telematics, driver assistance
like parking assists, along with
vehicle infotainment and enhanced
fuel efficiency etc, are introduced
in the Indian cars, thanks to the
growing electronics presence.
There is a wider adoption
of Electronic Control Units (ECU) by
car manufacturers and due to which
the overall software content inside
the car is increasing. This trend
will continue and Indian cars will
come with features equivalent to
the European or the US cars in the
near future.

“Our team works with global
OEMs on advanced harnessing
technologies, leading to weight
reduction. Our electronics software
and hardware design team enables
the OEM or supplier to consolidate
and reduce the number of ECUs in
the vehicle, thereby also reducing
the harnessing requirements.
Lightweighting is seen as a global
trend among car manufacturers
as this leads to improved fuel
efficiency. Tata Elxsi’s Electrical
Distribution system (EDS) team is
working with OEMs for vehicle
EDS design, development and
integration of electrical and
electronic architecture. We are
exposed to global programmes
and working with OEMs and
wiring harness suppliers for EDS
engineering support thereby helping
them optimise the wiring harness
and help reduce the overall vehicle
weight,” Shaju said.

Energy efficiency
The ECU power consumption is
dependent on the vehicle battery
and is managed by the various
power modes like Run mode,
Sleep mode and Deep sleep mode.
The power consumption for the
Run mode will be the maximum
and the ECU will be in Run mode
only when the engine is in start
condition and the vehicle alternator
is on. The Sleep mode or Deep
sleep modes will be defined when
the engine is in off condition
and will have stringent power
consumption in micro amps range
(e.g 100uA or so). “Our design
looks for the lowest possible
quiescent current for the ECUs we
undertake to design,” he said.

Tata Elxsi looks also into the
costing aspect of the ECU since
cost is a challenge for the Indian
market. As the number of ECU
features increases, the cost will
also go high, as the system design
will be complicated. Scalable and
robust platforms are required to
meet the cost pressure from OEMs
and customisation with minimal
changes for future requirements
needs to be done. Functional safety
standards demand more protection
and hence more cost.

Safety
Tata Elxsi is experienced in the
development of safety critical systems across multiple automotive domains. The functional safety team of the company works with the automotive players helping them in addressing the possible hazards caused by malfunctioned behaviour of E/E safety-related systems by providing ISO26262-compliant software and hardware development and consultations.

On the safety front, Shaju said, “We are working on both passive safety systems like locking controls, airbag controllers, passive entry, passive start etc. On active safety, we work on both camera and sensor-based systems for providing advanced safety solutions. Some of the works include surround view camera, proximity warning, cruise control, and driver monitoring.”

The size of software present in a modern day high-end car will be well over 100 million lines of code. Moreover, technology is moving towards driverless cars and hybrid electric vehicles. In this way, electronic systems have become an increasingly large component of the cost of an automobile. Electronics are prone to failure; hence, it is very important to upgrade offerings to provide fail-safe safety technologies which ensure the passenger/occupant safety.

Electric vehicles
Electrification of vehicles is an area where Tata Elxsi is heavily involved in providing software development, system development and validation for battery management system (BMS), charging systems, hybrid control units, range extenders, DC-DC converter, inverters and more. It has also developed modular and scalable BMS software with optimised cell-balancing system that can address all the future electrification needs.

As many countries are bringing in regulations and investing heavily to phase out fossil fuel vehicles between 2025 and 2040, Tata Elxsi is developing a unique test infrastructure coined as eMobility HILS that allows OEMs or suppliers to test rapidly the EV and other associated ECU components at a faster pace and at less cost. It has also own battery management software IP which can be readily used for any EV programme.

Wide acceptance of electric vehicle over IC engines would lead to introduction of newer vehicle models with EV. This would require OEMs to have a quick and efficient validation of systems within vehicle. Interconnectivity of electric system with other vehicle systems plays a critical role in terms of safety and reliability. Customers would be looking for more efficient electric vehicle with more range/charge. Cost of the complete testing infrastructure would be extremely high and huge investments required for tools, frameworks, hardware and software. Testing of EV components, interconnected with ADAS/autonomous, infotainment and telematics sub systems, requires enormous test scenarios.

Tata Elxsi’s innovative solutions also address the areas of connected cars, and autonomous driving. For connected cars, its focus is on in-vehicle infotainment, and telematics and V2X. It has also developed an integrated eCockpit solution, which enables ECU consolidation. The company is also working on advanced concepts like Software Over the air updates, multimodal HMI and also bringing in AI-enabled vehicle remote diagnostics and prognostics.

“We have been working on a driverless car solution for quite a few years and have now developed our own intelligent autonomous middleware platform, Autonomai – based on AI and Deep-learning algorithms. We also have ready-to-deploy ADAS algorithms such as 3D-surround view system, camera monitoring system and driver monitoring system and more, which address the current need of L1, L2 and L3 levels of autonomy,” Shaju said.

The challenges
Tata Elxsi is a technology-led design services company and is in the forefront of innovations. “Still there are challenges, which we are not yet fully scaled up in-house to address. This applies to areas like cyber security, which is becoming an advanced requirement for most OEMs. As the software content is increasing, the ECU is becoming increasingly exposed to malicious hacks from external parties. Making the ECU secure is a challenging task and for addressing this we have entered into a partnership with Irdeto, leader in cyber security who provides secure in-car display systems for automakers. Technology Partnerships is a key initiative from our side to bring in more synergy and address our global customer requirements efficiently. We have taken these steps to be able to provide a seamless and ideal solution to our customers, and this is what makes us an industry leader and preferred partner for our clients in this industry,” he said.
INTERACTION
“We work with key players to produce futuristic, intuitive solutions.” Shaaju S, GM and Head of ABU, Tata Elxsi.

Q: How does Tata Elxsi’s partnership with DISTI Corporation Florida, USA, perform?
Shaaju: We announced this partnership in 2017 to deliver DISTI’s GL Studio products with Tata Elxsi software services especially on the eCockpit demonstrator. We had a joint showcasing of this demo in multiple global events like Consumer Electronic Show and Embedded World 2017. There are interactions happening between DISTI and Tata Elxsi on how we can scale up the offerings and we have opportunities where both can work together for various customer projects. We are certainly confident about this partnership since there are more advancements happening in the areas of digital cockpit, and HMI will continue to play a key role.

Q: Is there any upcoming interface solutions providing futuristic HMI design?
Shaaju: We have designed and developed an innovative next-gen eCockpit powering both instrument cluster and infotainment and developed complex multi-modal HMI like voice, touch / gesture-enabled interfaces, to designing concept car HMI’s showcased at various auto shows globally for international OEMs and Tier-1 suppliers. We are continuing to work with the key players for bringing futuristic and intuitive solutions.

Q: What’s the update on your prototype project for a driverless car?
Shaaju: The development of Autonomai, an AI-based solution and our trademark software stack, was initiated three years ago. This was when we decided to invest in our own software. It is a fully autonomous middleware platform, which was launched last year and has been licensed to one of the top five automakers globally. We are making rapid progress in enhancing the capabilities of Autonomai and making it more robust.

Q: Do you plan to test Autonomai on Indian cars and public roads?
Shaaju: ‘Autonomai’ is the result of our work on driverless car solutions for the past few years. It is an intelligent, autonomous vehicle middleware platform, an AI-based solution. This platform’s sensor fusion algorithm combines inputs from Lidar and other sensors and leverages AI and deep learning to come up with various use-case scenarios of driverless cars. We have licensed this software to a leading global OEM and field trials are going on in Europe.

We have also deployed the same software stack along with camera and different sensors on Indian-made cars. The car is tested in a closed track with simulated road conditions within our premises.

Currently testing of features such as traffic jam assist (Stop & Go, Distance keep), On-road obstacle (Static/Dynamic avoidance (Safe stop and Lane change), etc are completed. The autonomous test vehicle speed is limited to 50kmph as per the traffic and road regulations for urban driving. Considering safety as the priority, for Indian cars and roads the features such as Traffic Jam Assist, Collision Avoidance, and Adaptive Cruise Control (ACC) are very crucial and once the necessary legal clearances are in place, we can test these features on open Indian roads.

Q: What is your target market for this mobility service?
Shaaju: We are in constant touch with the global OEMs. They can readily deploy our Autonomai solution for their R&D programmes.

Today’s cars are connected and smart machines on the move. There is also the V2X (vehicle to vehicle and vehicle to infrastructure), which makes driving more hassle-free, and autonomous. “Among the many challenges, the most prominent one is how to address the requirements for a new set of sensors and sensor configuration. Equally challenging is how fast we can test various driving scenarios before we rightly say that the car is safe to drive autonomously. This also means that the software content inside the car will increase and is making the car vulnerable to potential hacking which can be life-threatening. Connected cars are generating staggering amount of data enabling data analytics, image processing, voice recognition etc to churn out meaningful and useful information and OEMs have to ensure that the generated data is not getting into any wrong hands,” he said.

“As EV is coming to mainstream, the range anxiety it creates is larger. People today need fast charging and sufficient range on one full charge. It needs to be seen how the car manufacturers will meet the growing urban demands on mobility efficiently,” Shaaju said. ACI