AUTOMOTIVE

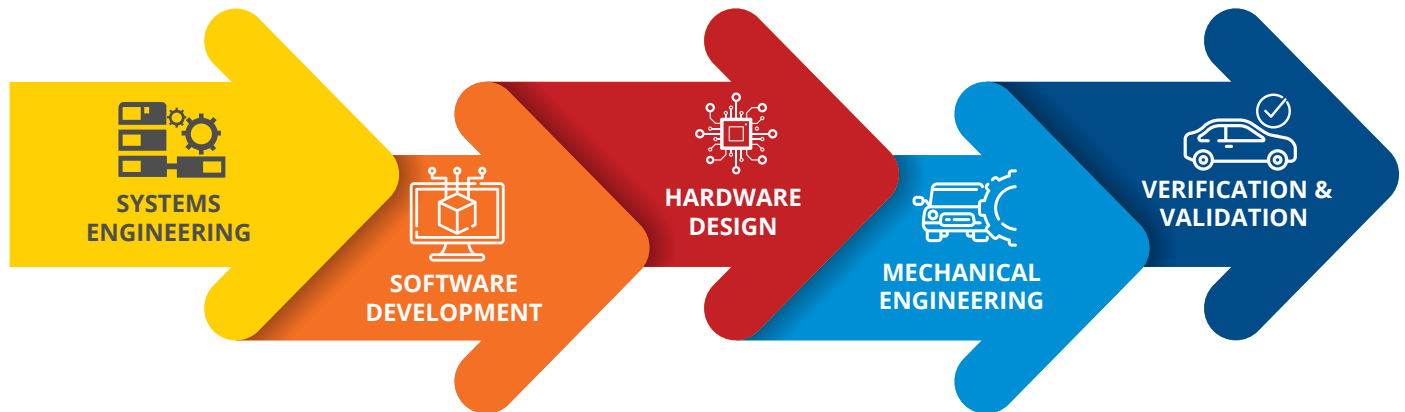## Engineering Next-Gen Solutions for the Auto Makers & Ancillaries

Connectivity and digitalization are reshaping the contours of the automotive industry. With consumer interest shifting from traditional vehicle models towards driverless cars, technologies such as advanced driver assistance systems (ADAS), mobility, and natural user interfaces are gaining buy-in. Advances in telematics and connected solutions are being made to support the evolution towards a distraction-free driver experience.

L&T Technology Services (LTTS) has over two decades of exemplary record of building products for leading OEMs and Tier 1 suppliers globally. Our expertise spans across telematics and connectivity, advanced driver assistance systems, infotainment, body and chassis electronics, powertrain, body engineering, and end-to-end product design and development of the automotive components.

WHAT WE OFFER

SERVICES ACROSS THE ENTIRE PRODUCT DEVELOPMENT LIFECYCLE

SYSTEMS ENGINEERING → SOFTWARE DEVELOPMENT → HARDWARE DESIGN → MECHANICAL ENGINEERING → VERIFICATION & VALIDATION

Embedded System & Applications

- End-to-End Product Lifecycle Support
- Reengineering & Product Obsolescence Management
- Compliance Management
- New Product Development
- Test & Test Automation

Mechanical Engineering

- Industrial Design
- New Product Development
- Mechanical Design & Simulation
- Manufacturing Engineering
- Value Engineering, Teardown, Benchmarking, and Sourcing
- 3D Printing & Prototyping
- Homologation & Country-specific Blue Sky Initiative Management

SEGMENTS WE COVER

Body & Chassis Electronics

- Chassis & Vehicle Dynamics
- Body Electronics and Comfort Systems

Powertrain & Alternate Propulsion Systems

- Powertrain
- Battery Management Systems
- Converters & Inverters
- Electric Vehicle Drive Systems and Motor Control
- Charging Electronics
- Engine Management Systems

Infotainment & Driver Information Systems

- Infotainment
- Rear Seat Entertainment
- Telematics
- Instrument Cluster
- Head Up Display

Advanced Driver Assistance Systems

- Perception and Object Analysis
- Vehicle Control
- Path Planning
- Machine Learning
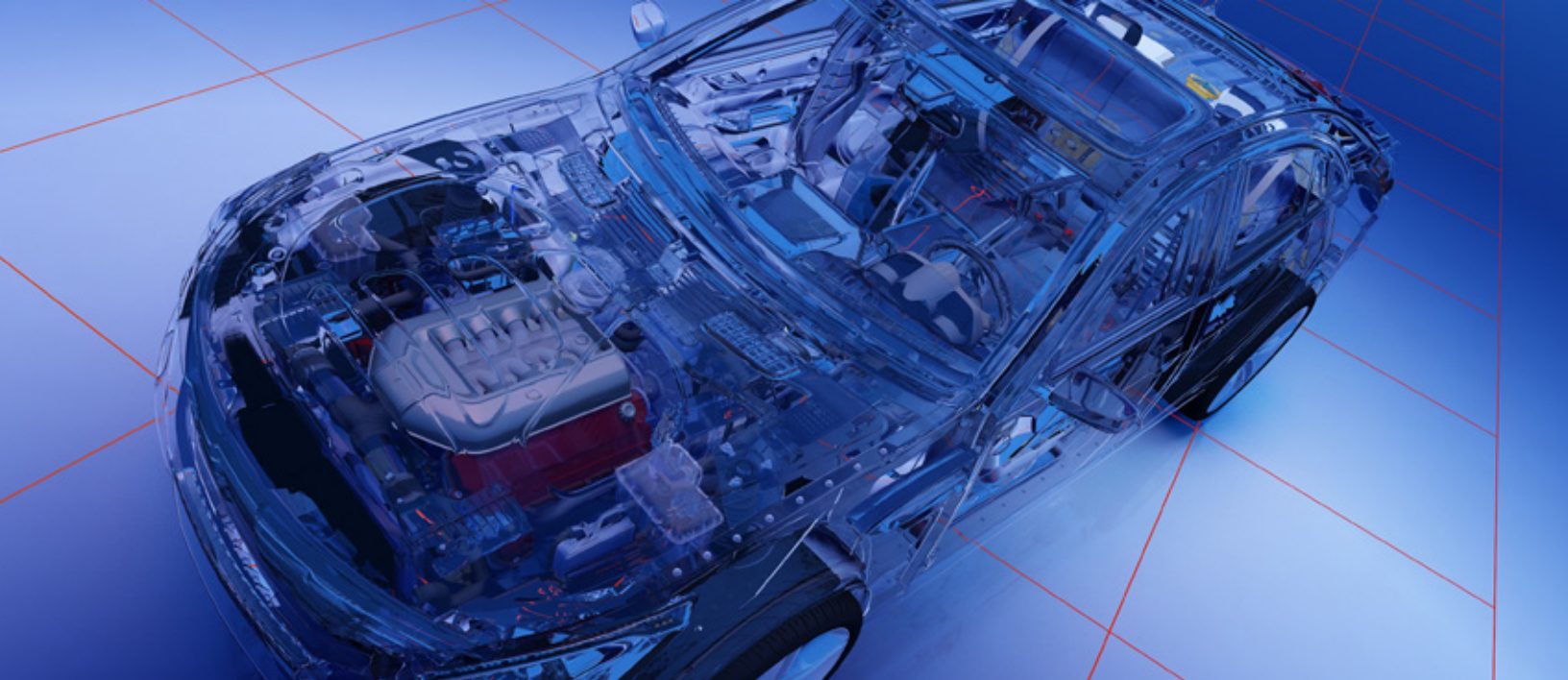- Vision, Lidar, and Radar Based Systems
- Sensor Fusion

Telematics and Connected Cars

- V2X & Driver Assistance
- Cloud & Back End Services
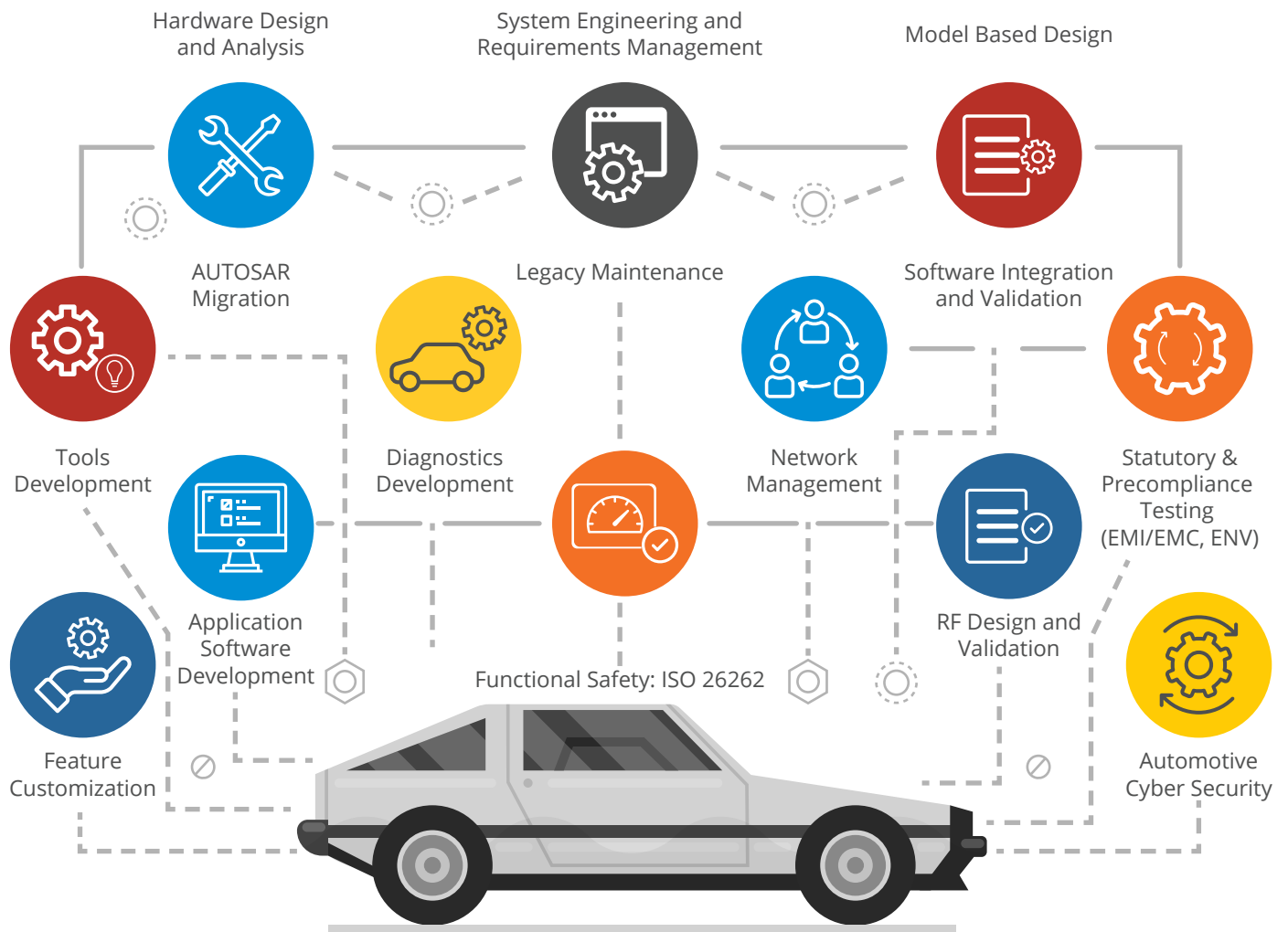- Remote Monitoring & Control
- Cybersecurity

Body Engineering, Safety & Restraints

- Body Engineering
- Interiors and CAB
- Chassis and Suspension

BODY AND CHASSIS ELECTRONICS

Hardware Design and Analysis

System Engineering and Requirements Management

Model Based Design

AUTOSAR Migration

Legacy Maintenance

Software Integration and Validation

Tools Development

Diagnostics Development

Network Management

Statutory & Precompliance Testing (EMI/EMC, ENV)

Application Software Development

Functional Safety: ISO 26262

RF Design and Validation

Feature Customization

Automotive Cyber Security

POWERTRAIN & ALTERNATE PROPULSION SYSTEMS

AREA	OFFERING	HORIZONTAL OFFERINGS ACROSS ALL AREA		
• Engine • Exhaust & After Treatment	• Software Development • Systems Engineering • Hardware & Software Design, Verification & Validation, and Sensor • Interface & Diagnostics Fault Loggers • Battery Management Systems • Converters, Inverters, and Drive Design • Calibration • Plant Modelling and HIL Testing	• AUTOSTAR Compliance	• ISO 26262 Compliance	• Model Based Development

DEVELOPMENT EXPERTISE

MODEL BASED DESIGN

- Migration of legacy code to executable specification
- Shelf conversion of requirements to executable specification
- Re-architecture of existing models
- AUTOSAR compliant code generation
- Manual production code development

VERIFICATION & VALIDATION SERVICES

- Model based calibration
- Customize off-the-shelf conversion of requirements to plant models, HIL testing
- Unit testing tool - RTRT, Engine valve controller 2.9.748
- Integration testing and calibration tools -ETAS Labcar, INCA, dSpace Control Desk, NI Labview, Trace32 simulator, and ETAS LABCAR

INFOTAINMENT & DRIVER INFORMATION SYSTEMS

INFOTAINMENT AND DRIVER INFORMATION PRODUCT

- Application development
- Integration of third party telematics/ infotainment components
- HMI (EBguide, Altia, QT, QML, HTML5) system validation testing

SOFTWARE EXPERTISE

- NX, Linux, Android, Vxworks, WinCE, ThreadX, GenIVI, OSEK, AUTOSAR, iOS, Windows, and proprietary Linux
- CAPL and PYTHON scripting NI TestStand

PLATFORMS

- Freescale: i.MX5x, 6x series
- TI OMAP, J5, J6
- NEC V850, Dx series
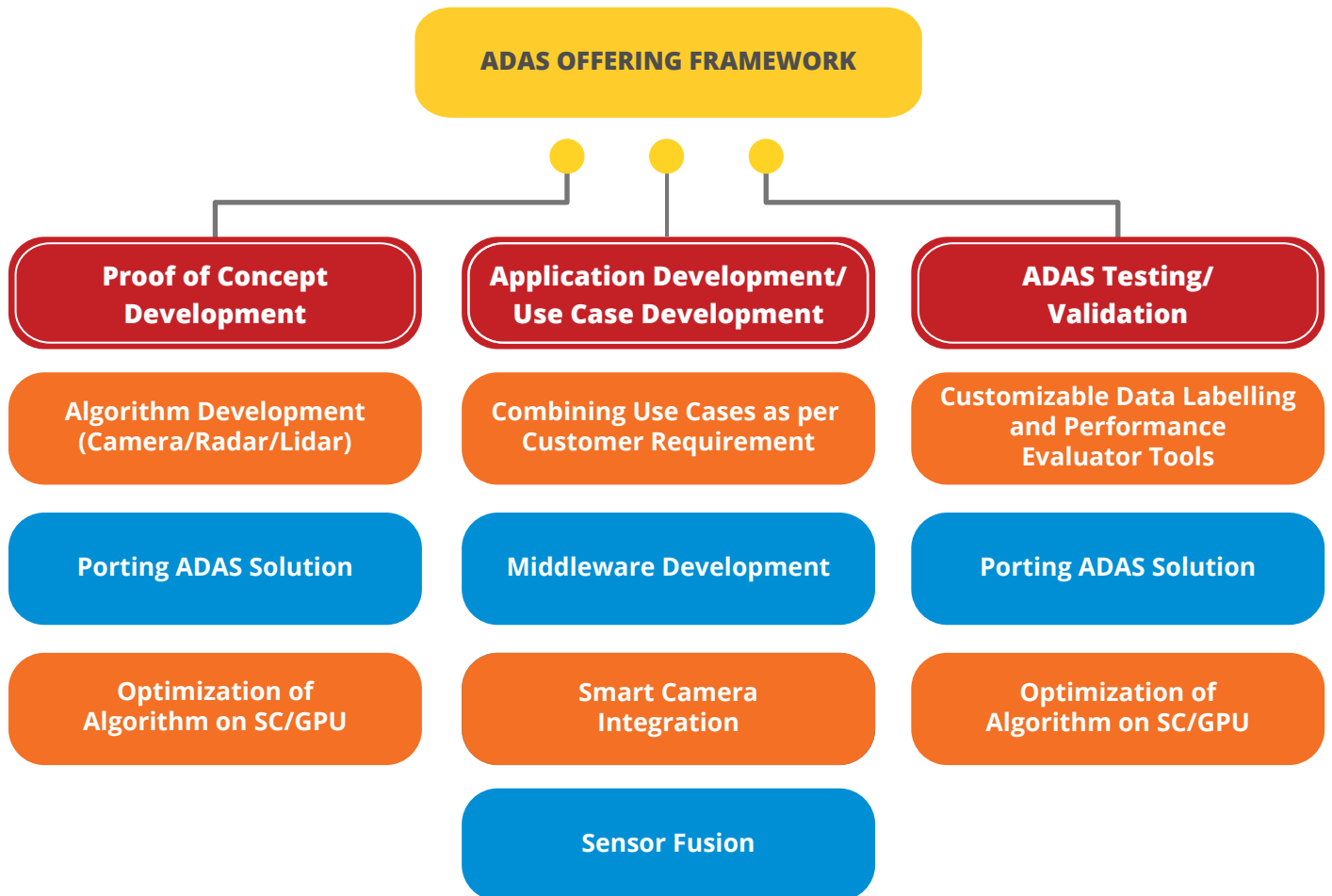- ARM 9, 11 and Cortex-based SOC
- Qualcomm MSM 7K and 8K series

CONNECTIVITY

- Carplay, Android Auto, and Mirror Link
- Telematics: Bluetooth, Wi-Fi, GSM, GPRS, 3G, 4G, LTE, DLNA, DSRC
- Home automation
- Vehicle gateway and in-car Wi-Fi hotspot solution

ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS)

ADAS OFFERING FRAMEWORK

Proof of Concept Development	Application Development/ Use Case Development	ADAS Testing/ Validation
Algorithm Development (Camera/Radar/Lidar)	Combining Use Cases as per Customer Requirement	Customizable Data Labelling and Performance Evaluator Tools
Porting ADAS Solution	Middleware Development	Porting ADAS Solution
Optimization of Algorithm on SC/GPU	Smart Camera Integration	Optimization of Algorithm on SC/GPU
	Sensor Fusion	

TELEMATICS AND CONNECTED CARS

SOFTWARE

- System engineering and requirements management
- Platform software
- Application development
- Integration of third-party telematics/ infotainment components
- Android, Linux, QNX- based telematics
- DSRC
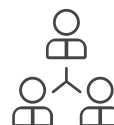- Integration of ADAS
- System integration and validation

MOBILITY

- Cloud implementation and consulting
- Cloud integration
- PaaS and SaaS
- Platform migration support
- Companion app development
- Data analytics
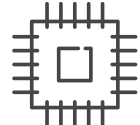- Augmented reality and fleet application

SECURITY

- Secure in-vehicle networks
- Authentication and authorization
- Secure OTA
- Firmware & Software updates
- Penetration testing

CONNECTIVITY

- Driver development and integration
- Functional and certification testing
- Middleware and distributed communication frameworks
- 4G/LTE/3G
- Telematics gateway design

HARDWARE

- System Engineering
- Board Design
- Layout Design
- WCCA and simulation
- EMI/EMC pre-compliance testing
- Prototyping support
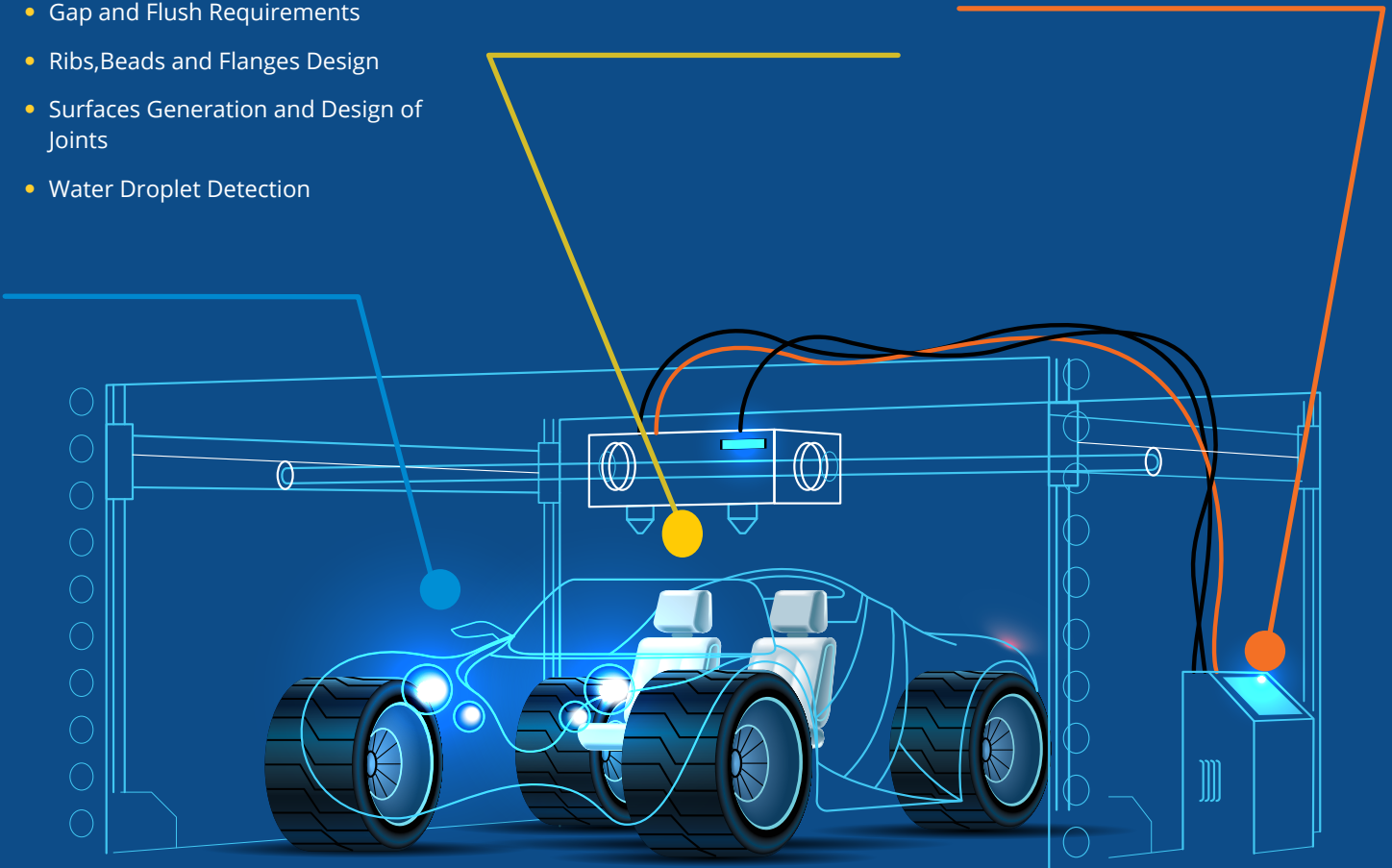
BODY ENGINEERING, SAFETY & RESTRAINTS

1

- Styling Support During Concept Development
- Body Panels and Assembly Design
- Packaging Study and Ergonomics Consideration
- Gap and Flush Requirements
- Ribs,Beads and Flanges Design
- Surfaces Generation and Design of Joints
- Water Droplet Detection

2

- Assembly and Manufacturing Feasibility
- Welding, Forming and Stamping Feasibility
- Manufacturing Drawing Creation

3

- Stiffness Analysis and Bending, Torsion
- Joint Stiffness Analysis
- Formability Analysis

PROPRIETARY TOOLS

VANGEN™

ADAS-EVAL™

COGMATION

SAFEX™

Video Annotation Generator Tool

Algorithm Performance Evaluation Tool

Test Automation Tool & Framework

Functional Safety Framework

WHAT MAKES US DIFFERENT

- **Security Center of Excellence (CoE)** for connected vehicles

- **Faster time to market** enabled by in-house solution accelerators and proprietary tools

- **Global Partnerships** with CISCO, Freescale, Renesas, Xilinx, Mentor Graphics, Siemens, Texas Instruments, and National Instruments

- **AUTOSAR Membership** aligning methodology, basic system functions, and functional interfaces with the vehicle network

- **Robust Lab & Testing Infrastructure** with state-of-the-art facilities for infotainment and ADAS, electric vehicle power, optics and lighting, tear down, and reverse engineering

- **Certifications** such as ISO26262 for functional safety and membership of the Indian Value Engineering Society (INVEST)

- **Global Delivery Footprint** with multiple engineering teams and delivery centers located across the globe

SUCCESS STORIES

Developing Mature Algorithms for Autonomous Driving
- Enabled Lane Detection, Blind Spot Monitoring, Forward Collision Warning, and Park Assist
- Over 95% accurate distance, 3D LiDAR point cloud data, and sensor fusion integration
- Reduced time to market, improved quality and reliability, and optimized operational costs

Accelerated Human-Machine Interface (HMI) Validation Framework
- Conducted feature system testing and application functionality test on emulator and physical devices
- Integrated NI vision-based HMI test system with IOT (Android) device to test automotive infotainment system
- Set up predictive maintenance that helped minimize damages and downtime
- Developed common framework to provide scalability and support to a variety of test areas

Design, Development, Testing, and Validation Services for Automotive Safety Critical Sub Systems
- Developed plug and play architecture for new feature implementation
- Developed platform-independent modules with AUTOSAR compliance
- Reduced 30% of validation cycle through accelerated validation environment
- Delivered 5+ ASIL B & D compliant modules successfully

L&T Technology Services

ENGINEERING **THE CHANGE**