



TATA ELXSI Automotive Overview

Date: 16 September 2025



TATA Group -- India's most valuable brand

Leadership with trust for 150+ years

10 Industries

26 Listed Companies

\$ 180 B+ Revenue

1 Million+ Employees



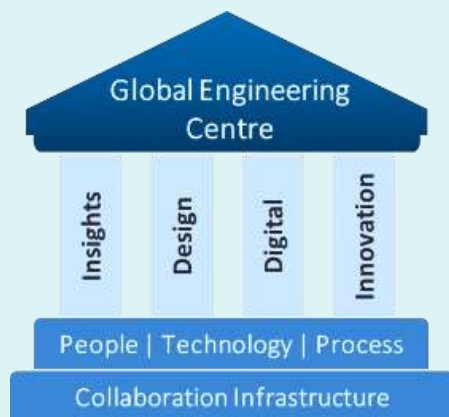
Business

Technology	Media & Telecom	Automotive	Industrial	Infrastructure	Consumer and Retail	Tourism & Travel	Financial Services	Aerospace & Defence
Tata Elxsi Tata Consultancy Services Tata Digital Tata Technologies	Tata Communications Tata Play Tata Teleservices	Tata Motors Jaguar Land Rover Tata Autocomp Systems	Tata Steel	Tata Power Tata Projects Tata Consulting Engineers Tata Realty & Infrastructure Tata Housing	Tata Chemicals Voltas Titan Tata Consumer products Infiniti Retail Trent	Indian Hotels Company Air India Ltd	Tata Capital Tata AIA Life Tata AIG Tata Asset Management company	Tata Advanced Systems

SERVING THE COMMUNITY WITH HEALTH, ENVIRONMENT , EMPOWERMENT & EDUCATION PROGRAMS

Tata Elxsi Business Overview

Home to a Billion Possibilities



35+
Years in
Business

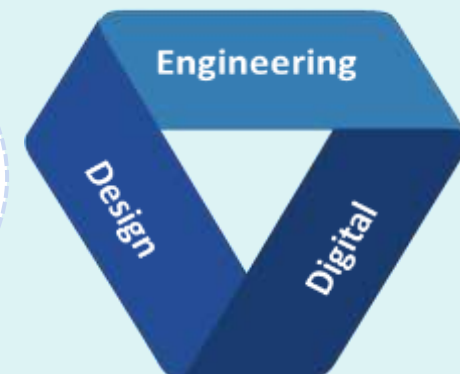
13,000+
Engineers

Annual
Revenue
\$435
Million
FY '25

12%
Transportation
YoY Growth
FY'25

33
Cities
Worldwide

CORE SERVICES



Transportation

AUTOMOTIVE | OFF HIGHWAY

- User Experience
- Connected & Autonomous
- Electrification



AEROSPACE | MARINE | RAIL

- Embedded & Industrial
- Service design
- Rolling Stock



Media & Communication

BROADCAST & MEDIA

- OTT Streaming
- RDK, Android TV, CPE
- QoE, QoS, Customer Experience



COMMUNICATIONS

- 5G, SDWAN
- Network Transformation
- Digital Transformation



Healthcare

MEDICAL DEVICES

- Product Design
- Systems Engineering
- Regulatory Compliance



PHARMACEUTICALS

- Safety
- Packaging & Labelling
- Pharmacovigilance



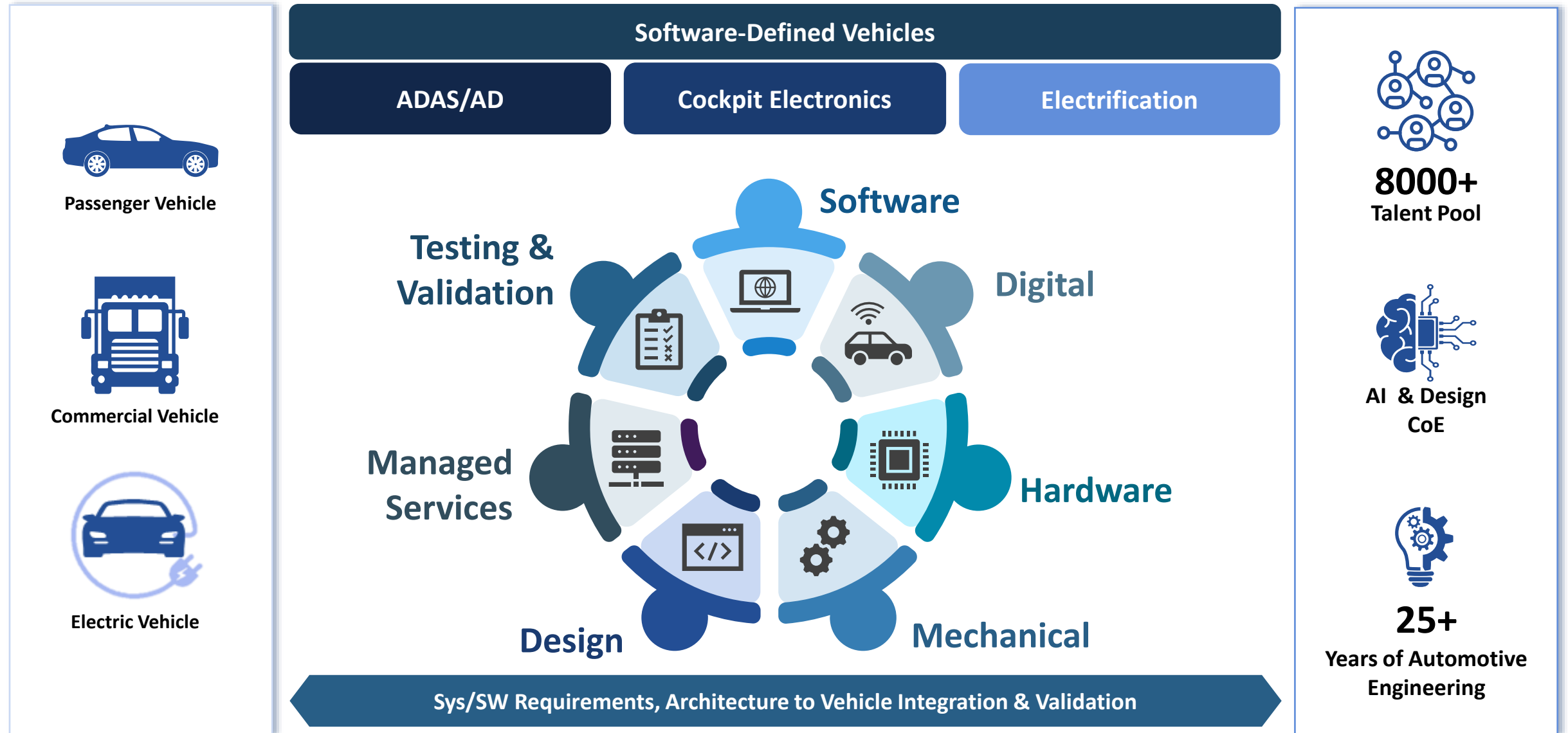
Established 1989



Global HQ Bangalore

Tata Elxsi Automotive Practice Aligned to Address Future Mobility Solutions

Leading Global Automotive Design & Engineering Service Provider for SDV and C.A.S.E



Tata Elxsi's Global Presence: Best of India Scale + Global Near Shore Proximity

Automotive Service Provider with Domain-specific Capability & Capacity at Scale



 Global Engineering Centres  Sales Offices  Headquarters  Development centres located in India

Automotive Service Offerings

Leading Global Automotive Design & Engineering Service Provider for SDV & C.A.S.E



C.A.S.E

Software Defined Vehicle



Ready to use SDV Framework
Porting OEM Applications
Middleware to OS & BSP bring-up
Virtualization,

Autonomous Driving



ADAS/AD, Sensor Fusion
Vision system, Image/Video
processing, Algorithm
development

Electrification



BMS, DC-DC Converter
Inverter, Motor controls
Charging systems
Energy Management

Connected Car



V2X, Telematics, Shared Mobility
IVI, Digital Cockpit
Big Data Analytics,
HuD, Cybersecurity



Design and Vehicle System

Body & Chassis



Brakes, Steering & Suspension,
Seat, HVAC, Sunroof
Door controls, Lighting, BIW
Development, Concept styling &
surfacing,

Conventional Powertrain



Engine Systems
Transmission & Driveline
Torque Converters, Axles
Benchmarking & Teardown
analysis, Electrical packaging

User Experience



Design Research & experience
Mobile App & HMI Design
Concept Styling & Surfacing
Sales Experience - AR/VR/XR



INTEGRATED SERVICES

Testing



System Testing & HILS
Functional/Diagnostic/Network
testing
Robotic testing, Automation
frameworks

Cybersecurity



Process compliance ISO 21434
ECU level security services
TARA analysis
Security testing

AI/Gen AI Services



Data analytics
Cognition / Self Learning
Vehicle Prognostics
Test Case Generation

Systems Engineering



AUTOSAR- Adaptive, Classic
Hardware Engineering
Model Based Development
Model Based System Engineering

Partnership & Alliances

Communities, consortiums and Technology Partners

Consortiums



Technology Partners



Academic Collaboration



Indian Institute of Science, Bangalore
(AI/ML, Deep Learning, Data Analytics, Cybersecurity)



Indian Institute of Technology – Madras
(EV – Advanced Course)



Visvesvaraya National Institute of technology, Nagpur
(EV – Power Converter Control Design)



Indian Institute of Technology, Guwahati
(EV – Motor Current Signature Analysis/Design Consultancy)



National Institute of Technology, Calicut
(EV – High Voltage Lab, Motor Control Framework Projects)

Driving Innovation Through Strategic Collaboration

Tata Elxsi's partnerships with global leaders shaping next-gen mobility solutions



SDV Development with Virtualization & SiL

Tata Elxsi and Synopsys collaborate to accelerate Software-Defined Vehicle development through advanced ECU virtualization capabilities.

The collaboration provides customers pre-verified, integrated solutions and services that simplify designing and deploying virtual electronic control units (vECUs) for efficient software development and testing in SDVs.



Accelerating SDV Adoption on Snapdragon Platforms

Tata Elxsi partner with Qualcomm to accelerate SDV adoption on Snapdragon Automotive virtual and physical platforms

To enable OEMs and Tier-1 suppliers to develop and deploy software-defined vehicle applications efficiently, with Tata Elxsi acting as an Authorized Design Center for Qualcomm vSOC development



EV Systems & Mobility Solutions

Tata Elxsi and Infineon collaborate to jointly develop ready-to-deploy EV systems for key mobility segments.

The partnership targets two-wheelers (2W), three-wheelers (3W), passenger vehicles (PV), and commercial vehicles (CV), enabling integrated EV systems and faster deployment of mobility solutions.



Intelligent Validation & Test Automation

Tata Elxsi and NI (Emerson's Test & Measurement group) partner to develop automated validation frameworks for the transportation industry.

The partnership focuses on developing state-of-the-art validation frameworks and solutions for the transportation sector. Together, the **Tata Elxsi–Emerson NI Mobility Innovation Centre (TENMIC)** was also established to enable early validation, automated testing, and shift-left development

Driving Innovation Through Strategic Collaboration

Tata Elxsi's partnerships with global leaders shaping next-gen mobility solutions



End-to-End Battery Lifecycle & Traceability

Tata Elxsi and Minespider partner to launch MOBIUS+, an end-to-end Battery Lifecycle & Traceability Platform.

The platform delivers actionable insights for efficient, compliant, and sustainable battery management, leveraging Minespider's blockchain expertise for secure, transparent, and traceable data across the entire battery lifecycle.



SDV Solutions on Arm Processors

Tata Elxsi partnered with Arm to offer advanced solutions on the latest Arm processors.

To help Automotive OEMs and Tier-1s fast-track their transition to software-defined vehicles with high-performance computing and scalable software solutions.



Open, Cloud-Native SDV Architecture

Tata Elxsi partnered with SOAFEE to co-develop and support open, cloud-native architectures for Software-Defined Vehicles.

To combine automotive software, connectivity, and cloud expertise with SOAFEE's standardization for scalable, real-time automotive edge computing, enabling flexible and interoperable SDV systems.



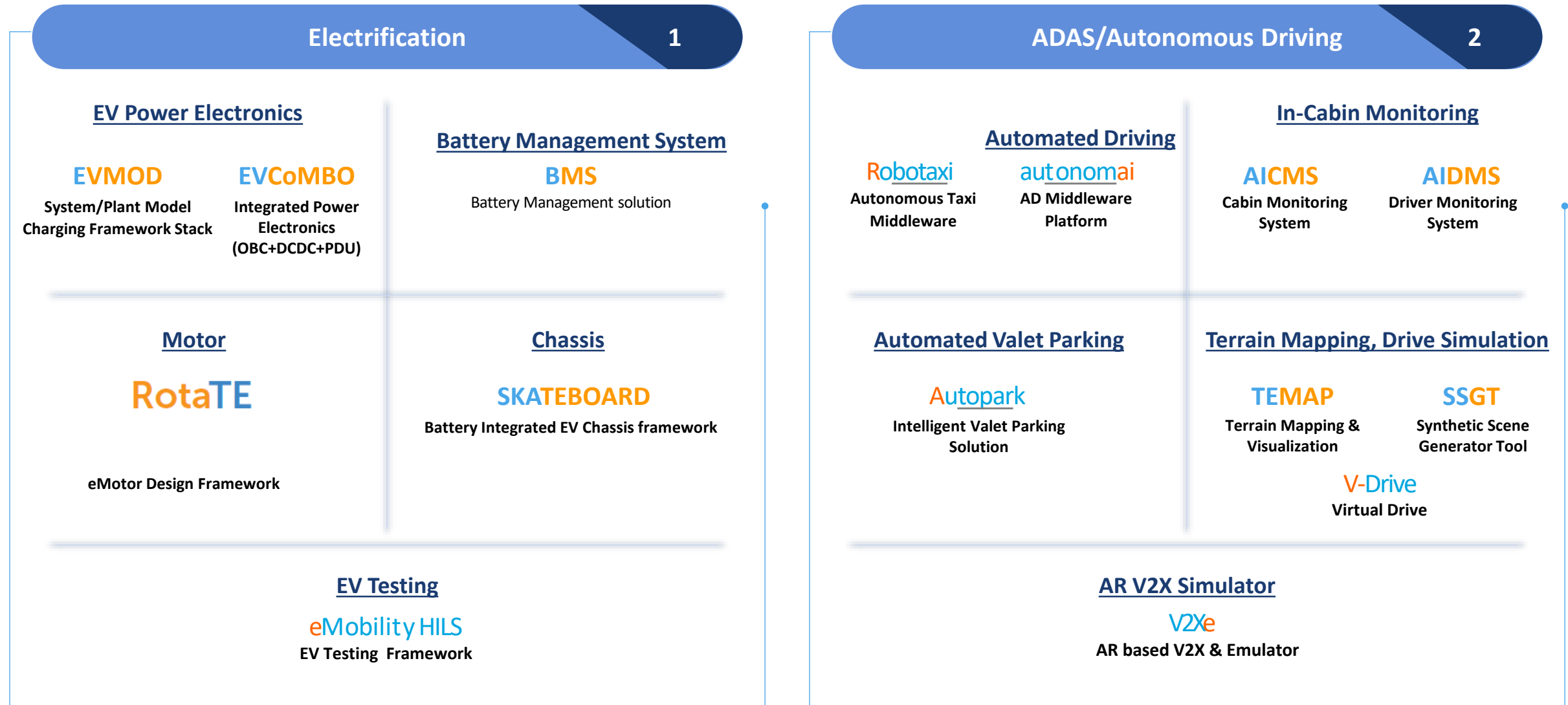
Interoperable OTA Technologies for SDVs

Tata Elxsi partnered with the eSync Alliance to support standards-based OTA technologies for SDVs.

To advance scalable and secure over-the-air update solutions for the automotive industry, leveraging Tata Elxsi's expertise in automotive software and SDV technologies

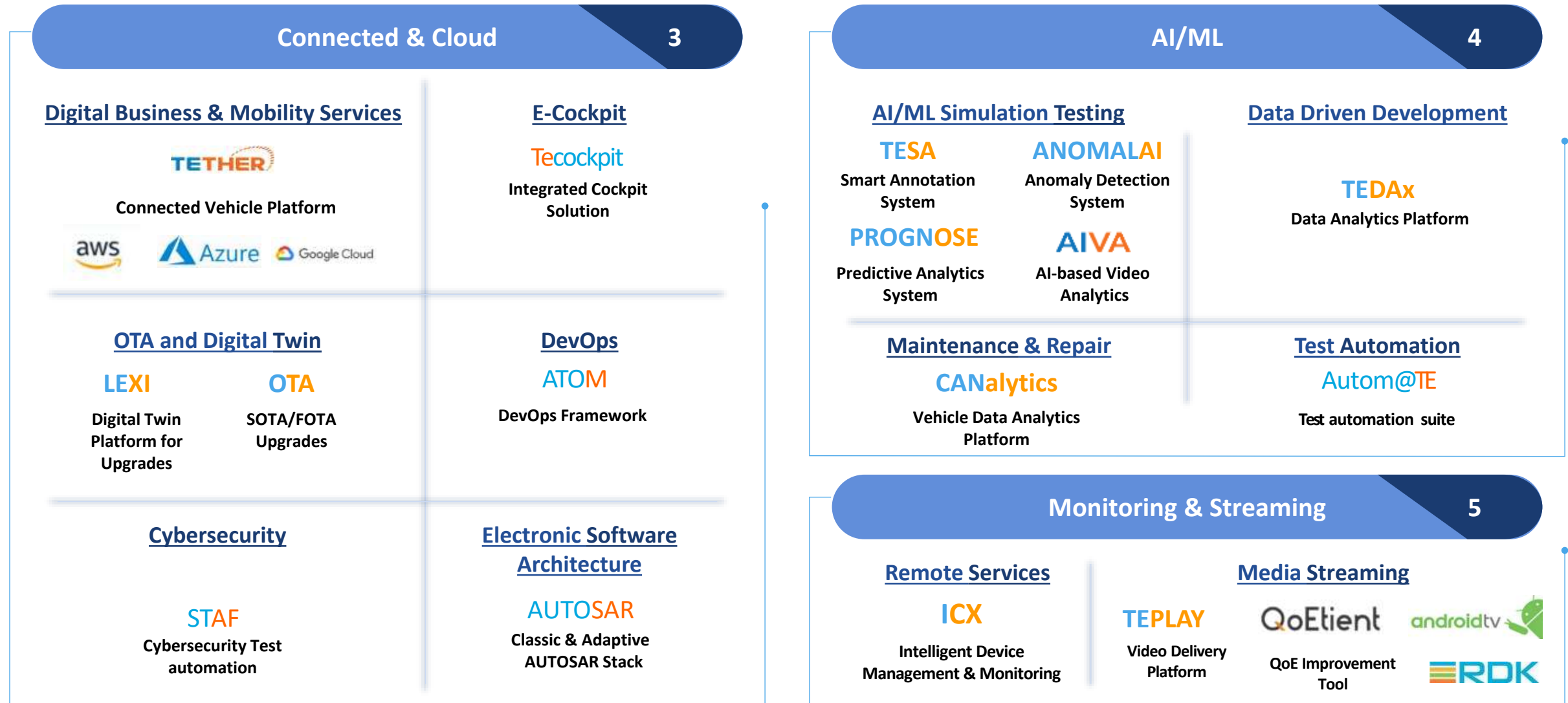
Tata Elxsi's Investment in Automotive software & systems (1/2)

Customizable system and software for accelerated development lifecycle



Tata Elxsi's Investment in Automotive software & systems (1/2)

Customizable system and software for accelerated development lifecycle



Tata Elxsi's Testing and Validation Overview

Utilize Infrastructure and capability with AI/Cloud-based Test Automation for faster results

MULTISYSTEM HILS



HVAC HILS



SEAT HILS



EMS HILS



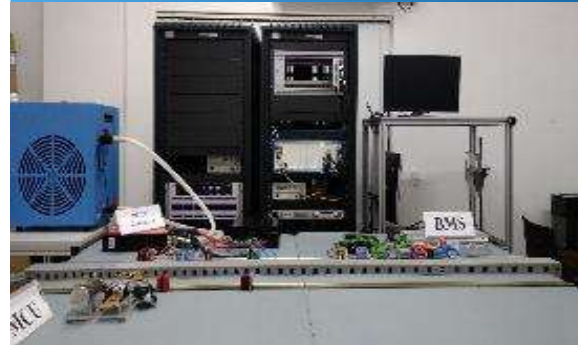
TRANSMISSION HILS



TCU HILS



eMOBILITY HILS



CAMERA HILS



18+ years of Experience in Automotive Validation

Large Key Deals Snapshot

Delivering Mobility Solutions for Global Clients – SDV, EV, Connected and autonomous

Software-Defined Vehicles



Strategic Development Partner for SDV and Software Development. This strategic Long-term partnership will ramp up across base platform software, EV, Autonomous and Connectivity Features

**APAC, EUROPEAN OEM
Global Tier 1**

Connected



Tata Elxsi's TETHER Connected Vehicle Platform deployed across emerging markets encompassing multiple countries in Asia. multimillion US\$ multi-year deal involves end-to-end managed services including platform licensing, cloud services and app development and sustenance

Two OEMs in APAC region

Electrification



GEC supporting leading supplier PT Electric, Electronics & Software Defined vehicle innovations

European Tier 1

Offshore High Voltage Test Facility with Cloud-based Automated Testing for multiple vehicle programs and multiple ECUs

European OEM

Latest Happenings @ Tata Elxsi

Investments in key technology areas to power future mobility requirements



SDV Framework

Tata Elxsi AVENIR: SDV Development and Validation Framework

Tata Elxsi AVENIR is a suite of cloud-native SDV development, validation, and deployment frameworks that enable our customers to develop, integrate, build, test, and deploy the SDV with ease.



Next Generation Mobility with Qualcomm

Tata Elxsi to Accelerate SDV Adoption for Next Generation Mobility with Qualcomm's Snapdragon Automotive Platforms

Tata Elxsi aims to utilize the Snapdragon Digital Chassis VSoCs to help revolutionize the Software-Defined Vehicle (SDV) development process, enabling R&D teams to accelerate software development and validation.



Tata Elxsi and Minespider Partner to Launch MOBIUS+ for Battery Lifecycle Traceability

This state-of-the-art platform integrates advanced data analytics, real-time monitoring, and compliance features to deliver actionable insights for OEMs and the entire battery ecosystem, including material suppliers, cell and module manufacturers, and recyclers.

Tata Elxsi sets up a global Advanced Technology Centre for Suzuki in Pune

To drive Suzuki's innovations in advanced engineering, shaping the future of mobility



Nidec Executes a Comprehensive MOU with Tata Elxsi Ltd.

To accelerate Nidec's group-wide enhancement of its software development capability



Tata Elxsi and Emerson Inaugurate the Mobility Innovation Centre in Bengaluru

Accelerating automotive
innovation with cutting-
edge systems, software
solutions, and global
automotive expertise



Partnered
with

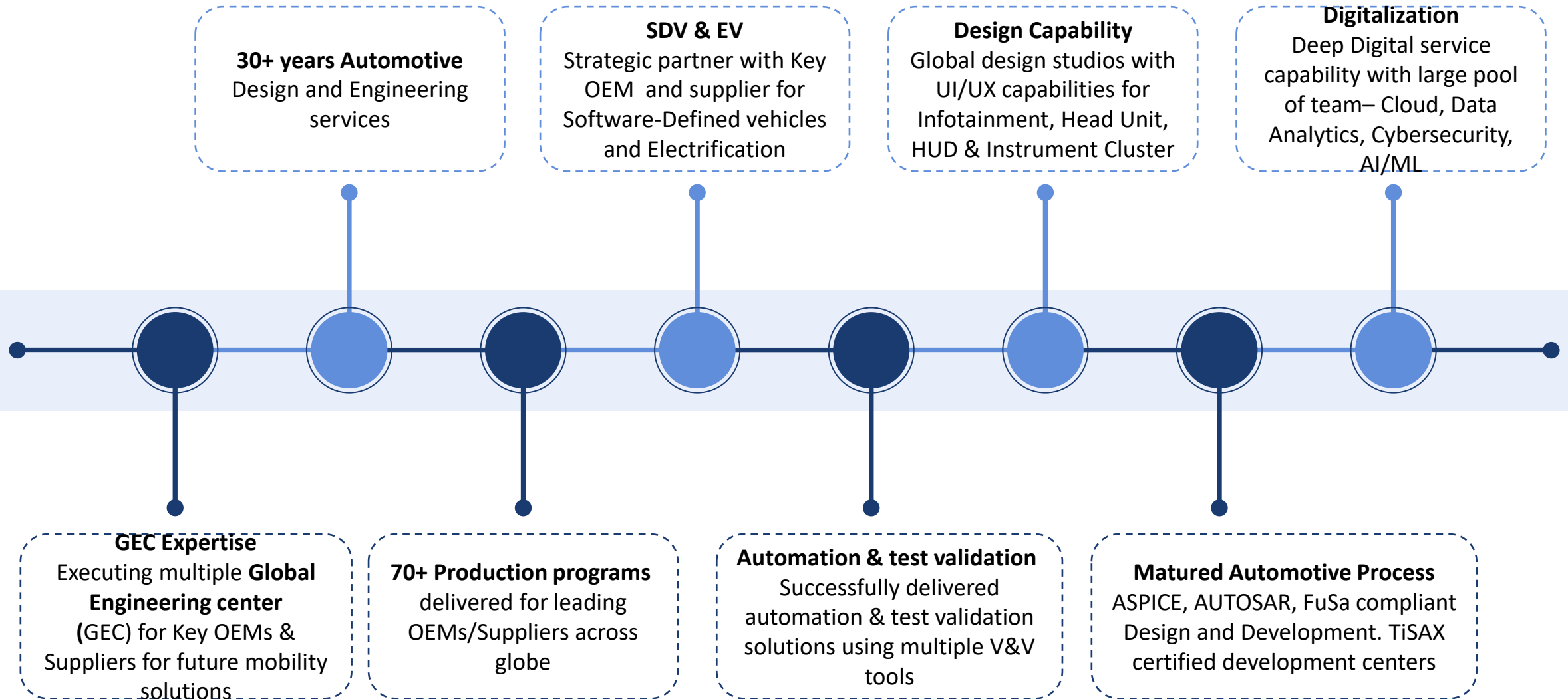


Automotive – LARGE ENGAGEMENT MULTI-YEAR PROJECT SNAPSHOT BY REGION

Year	BIG VALUE PROJECTS	Customer/REGION	Country of service
2003	Involved in Software design, Mechanical engineering, HILS testing and R&D for Domains - PT, Body & Chassis, EV-HEV, Autonomous, Infotainment and Telematics, V2X etc.	OEM, UK	India, UK
2004	Tata Elxsi manage their complete MCAL portfolio across 10 different Micro Controllers including Development, Porting, Integration and Maintenance	Chip Vendor, Japan	India
2009	Software development, Mechanical engineering, Advanced concept development, HILS testing. Involved in IVI, eCockpit, Telematics, Powertrain, ADAS, Body systems	OEM, APAC	India
2012	TATA ELXSI was selected through vendor consolidation. Complete ownership for Infotainment head units with advanced connectivity features – MirrorLink/ CarPlay/ Android auto supporting multiple OEM programs. Supporting 7 OEM programs worldwide	Infotainment Supplier, USA	India, US
2012	Involved in developing ADAS features for 12 OEM programs. Software development for Surround view, Rear view camera systems based on AUTOSAR	ADAS Supplier, EU	India, Japan
2013	Involved in ADAS, Autonomous driving, Control systems, Data analytics, Mechanical design engineering. Supporting 10 global OEM programs	Supplier, USA	India, US
2014	Involved in platform software for audio amplifiers, hardware design, testing and mechanical engineering. Supporting 10 OEM programs globally	Infotainment Supplier, USA	India, US
2020	Dedicated ODC for supporting Mechatronics, Chassis, eMobility for global vehicle programs	Supplier, EU	India, Germany
2020	GEC for European supplier in the areas of ADAS, Autonomous Driving, EV and Cybersecurity	Supplier, EU	India, Germany
2022	GEC for EU Powertrain supplier for development for Electric Drivetrain components and solutions	Supplier, EU	India, Austria
2023	Strategic Development Partner for SDV and Software Development. This strategic Long-term partnership will ramp up across base platform software, EV, Autonomous and Connectivity Features.	OEM< EU	India, Germany
2023	GEC of 150+ for a Japanese supplier in Connected Infotainment, Body electronics, Sensing and Communication technologies, AUTOSAR, Platform Development, and Cybersecurity	Supplier, Japan	India, Japan

Competitive Advantage

Strategic Partner for Designing Next Gen Products & Solutions



Quality Management



Tata Elxsi's Quality Management journey

Ensuring zero defects and highest software and security compliance



Snapshot of Certifications for Governance

ISO 9001



Quality Management Systems

27001 - ISMS



Information Security

ISO 14001 and ISO 45001 EMS and H&S



Environmental Management System and
Health and Safety Management System

ISO 13485:2016



Standard for Design and
Development of Medical Devices

Automotive SPICE L5



Highest ASPICE Certification

TISAX Certified



Information Security Standard
for Automotive Control

ECOVADIS



Tata Elxsi among the Top 25%
of the companies assessed in
the world

Assessment for Ethics, Labour & Human rights,
sustainable procurement, Environment

Accolades & Partnerships



Awards and Accolades



German Design Award 2024
Recognized for Excellence in Product
Design in the Human-Machine
Interface Category



Tata Elxsi wins Gold e4M India Design
Excellence Award
Gold - Best Design for Automotive
and Transport



Value Creator Awards 2023
Recognized by Dun & Bradstreet as
India's Top Value Creator for
Software and BPM



Industry DevOps Awards 2023
NEURON for deployment and
operation of 4G/5G network – For
Connected and SDV



CII Technology Conclave & Innovation
awards 2023
"Top 50 Innovative Company of
2023"



NASSCOM
NEXT GEN Product of the Year 2021
Connected Vehicle IoT Platform

Innovations @ Tata Elxsi



Automotive-centric Patents snapshot

Tata Elxsi has 73 Automotive patents granted

Tata Elxsi Receives European Patent Grant **“SYSTEM AND METHOD FOR THE AUTOMATIC VALIDATION OF MOTOR CONTROL FIRMWARE OF AN EMBEDDED SYSTEM”**

Tata Elxsi receives Indian Patent grant for **“SYSTEM AND METHOD FOR VALIDATION OF A STEREO VISION SYSTEM”**

Tata Elxsi receives Indian Patent grant for **“SYSTEM FOR CONTROLLING CHARGING AND DISCHARGING OF BATTERY-OPERATED DEVICES”**

Tata Elxsi receives Indian Patent grant for **“SYSTEM AND METHOD FOR VEHICLE NAVIGATION”**

“SYSTEM AND METHOD FOR MANAGING CONTENT P

Tata Elxsi receives Indian Patent grant for **ROVIDER'S SENSITIVE INFORMATION IN USER DEVICE”**

Tata Elxsi receives Indian Patent grant for **“SYSTEM AND METHOD FOR ESTABLISHING SECURE COMMUNICATIONS BETWEEN CONNECTED SYSTEMS”**

Tata Elxsi receives Indian Patent grant for **“ENERGY-EFFICIENT TRAFFIC CONTROL SYSTEM”**

Tata Elxsi receives Indian Patent grant for **“MANAGED NETWORK AND METHOD TO SECURE ENDPOINT DEVICES IN THE MANAGED NETWORK”**

Tata Elxsi files a patent for **“PROTECTIVE GRILLE SHUTTER SYSTEM FOR VEHICLES”**



V2X - Connected Vehicles



Data Analytics, AI & Machine Learning



Automotive Testing & Validation



Blockchain Solutions



Advanced Driver Assistance



Sustainability



Electric Vehicles & BMS

Key Service Offerings



TATA ELXSI AVENIR – SOFTWARE-DEFINED VEHICLES (SDV) ENABLER



Time to Market
Reduced
by 20-25%



R&D cycle acceleration by using
Virtual Models leading to early
development and validation
(SHIFT LEFT)

Synergized R&D workforce across
OEM, Tier-1 and SI using a **Cloud
Native Platform & DevSecOps**

Development and
Maintenance Cost
Reduced **by 25-30%**



HW & SW **Platform Reuse** across
Vehicle Model Year **Upgrades &**
Vehicle Segments with **Scalability**

Optimized Lifecycle costs with
Prognostics (enabled by **Digital
Twin**), OTA & Reduced Recalls

Future-Proof Platform
Realization



Modular SW Architecture
(SOAFEE) enabling **portability**

Improved **Customer Experience**
with constant **features upgrades**

Continuous
Revenue Streams

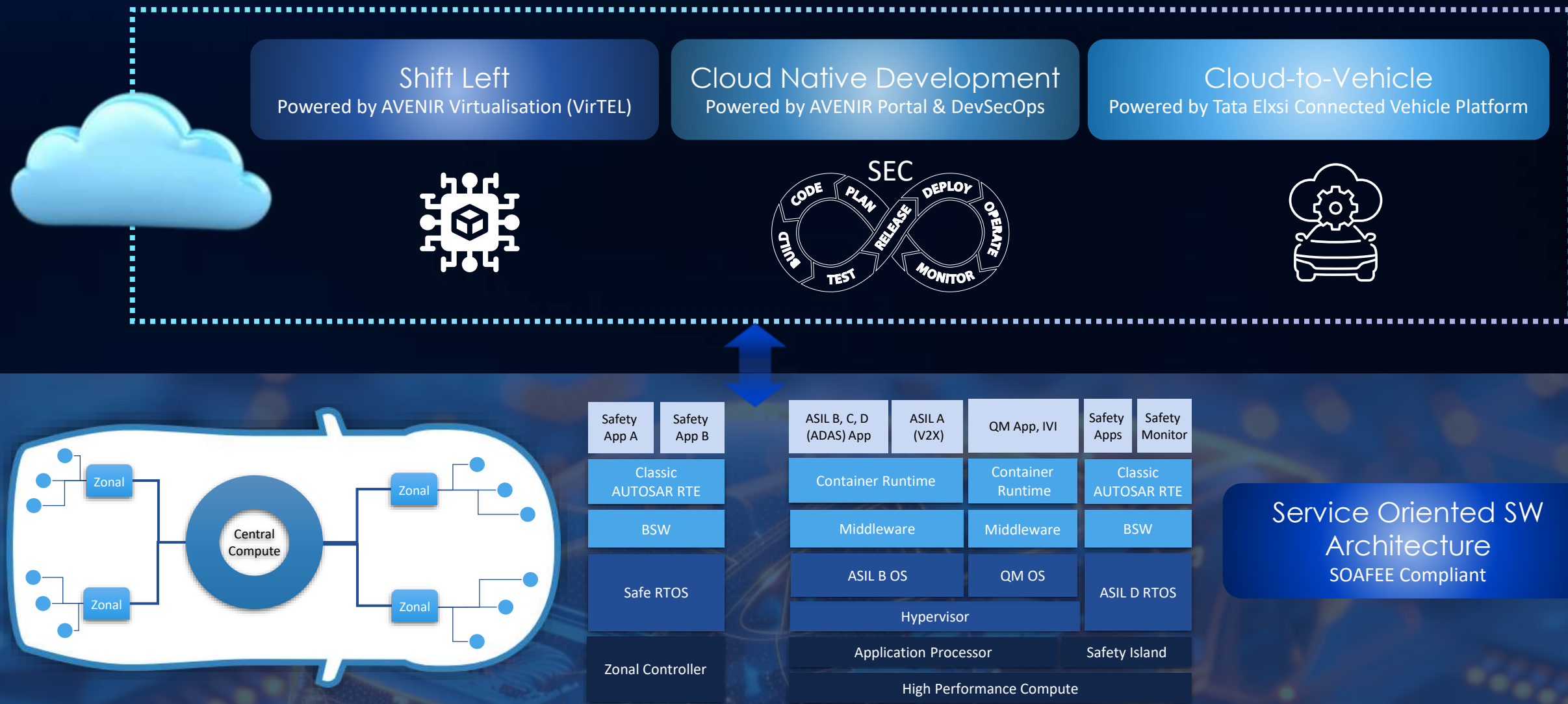


Post-sales Revenue streams from
Feature subscription

Platform capable of beaming
updates from **Cloud to Vehicle**

Tata Elxsi AVENIR for Future Mobility

Building Blocks for Accelerating Your SDV Transition

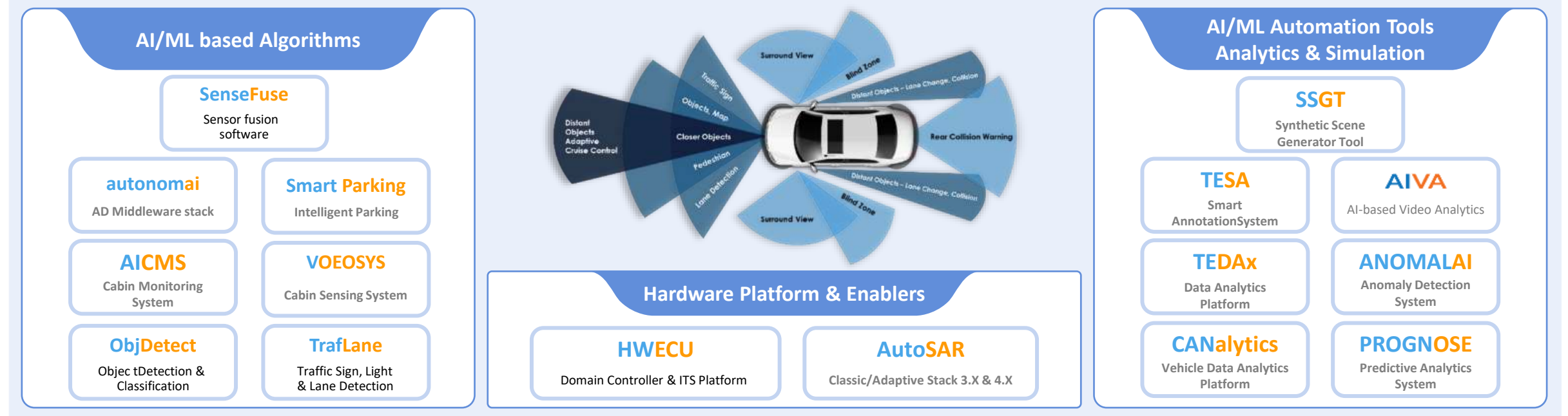


AD –ADAS Service Framework

Perceive | Integrate | Validate

DESIGN & ENGINEERING SERVICES							
System & S/W Engineering	Hardware Design & Engineering	Embedded porting & optimization	Algorithm/ Framework Development	Image Processing Video Pipeline	HMI Graphic overlays, AR/ VR	Radar/LiDAR Processing	System / Vehicle Integration
AUTOSAR Classic / Adaptive	Functional Safety	Cyber security	Model Based Development	ASPICE	Digital Solutions AI/ML	Navigation HD Maps	Verification/ Validation (SIL, HIL, LAB, FIELD)

AD & ADAS Building Blocks towards Software Defined Vehicle



EV Service Framework

Sustainable | Futuristic | Smart

Services

System
Engineering

Mechanical
Design

Embedded
Engineering

Simulation
& Analysis

Cloud
Engineering

Verification &
Validation

Tech Support &
Program Management

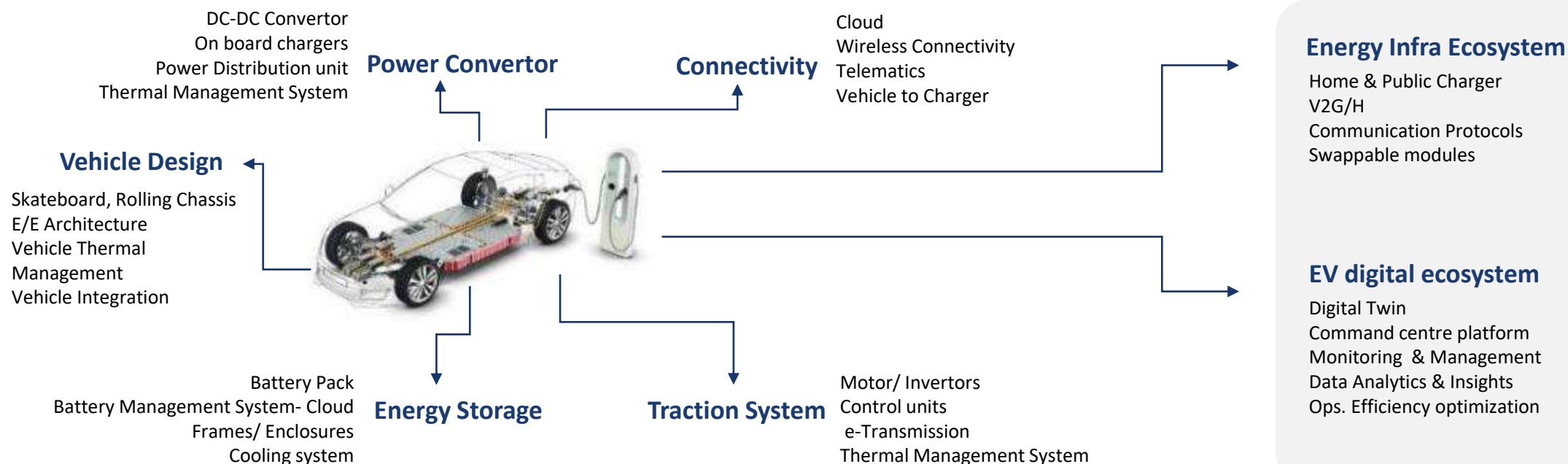
VAVE &
Compliance Testing

Benchmarking
& Teardown

Functional
Safety

Cyber
security

EV Systems (In-Vehicle & Ecosystem) Services



Accelerators

OBC- DC-DC
Combo Reference
Design

AUTOSAR
stack

CHAdemo
Stack
Framework

eMobility
HILS

EVSE/EVCC 15118
Stack Framework

IoT Software
Platform

OBC, DC-DC, Motor,
Inverter models-
Plant/Controller

Battery & BMS
models- Plant,
SW & HW

PMSM Motor
Design
Framework

E-Cockpit System Services

Connected and User-Friendly

4000+ person years of expertise
in IVI, Telematics & Clusters.

Multiyear engagement with
multiple leading IVI Suppliers.

Involved in series production
programs for next-gen IVI Head units.

Successfully implemented 20+
Cluster Production Programs.

INFOTAINMENT

- NextGen IVI systems & App Design & Development
- Middleware and System Infrastructure platform
- Connectivity & Projection Solutions
- IVI Automotive Android , GENIVI, AGL frameworks

CLUSTER & HUD

- Reconfigurable / Digital / Hybrid Cluster
- Middleware Development
- Secure and safe RTOS
- Functional Safety (ASIL)
- Linux based low-cost solutions
- Image processing modules like Warping and Flipping
- HUD Motor and mirror control logic
- Response time optimization

TELEMATICS & V2X

- Terminal Box software development
- Telematics feature validation
- V2X Application development
- Day 1 & Day 2 Features for V2X
- Connectivity & Apps
- Cloud Based Services

VIRTUALIZATION

- Partitioning Domain Controller
- Hypervisor based safety complain solution
- LXC Linux Container based solutions
- Peripheral sharing
- Para virtualization
- Virtual I/O devices handling
- GHS and QNX VAI (value-added integrator) Strategic Partnership accelerating Development

HMI & UX

- HMI framework and Apps
- 2D & 3D HMI Development
- Multi-modal HMI
- OpenGL experience
- Research and benchmarking
- Interaction design
- Visual design
- Concept development and simulation

ECockpit Solution | Automotive Android | HMI & Middleware frameworks

Global Partnership with
Google for Pre-Release
Android Versions

1 of the First 4 Android O IVI
Implementations – Google
Certified Solution

**Tata Elxsi Android
Repository** for Reusable SW
Components

irdeto
Building a Secure Future.™

In Vehicle Telematics & V2X Engineering Services

Connected and Safer

Design Services & Feature Development

- Telematics and V2X system design & development
- Telematics Feature Development - eCall, bCall, SVT, Remote Ops
- V2X Features - EEBL, CLC, GLOSA
- R&D support for advanced V2X feature design
- Integrated Architecture definition for V2X, Telematics and Connected GW

Middleware & Frameworks

- Customizations and Porting
- Telematics Middleware Components
- V2X Application Frameworks

Operating System

- Platform bring-up
- BSP and Kernel porting
- Device driver development
- Customization and enhancement of integrated components
- Platform Benchmarking
- Platform Optimizations

Hardware

- Hardware Design
- Prototyping

Integration & Validation

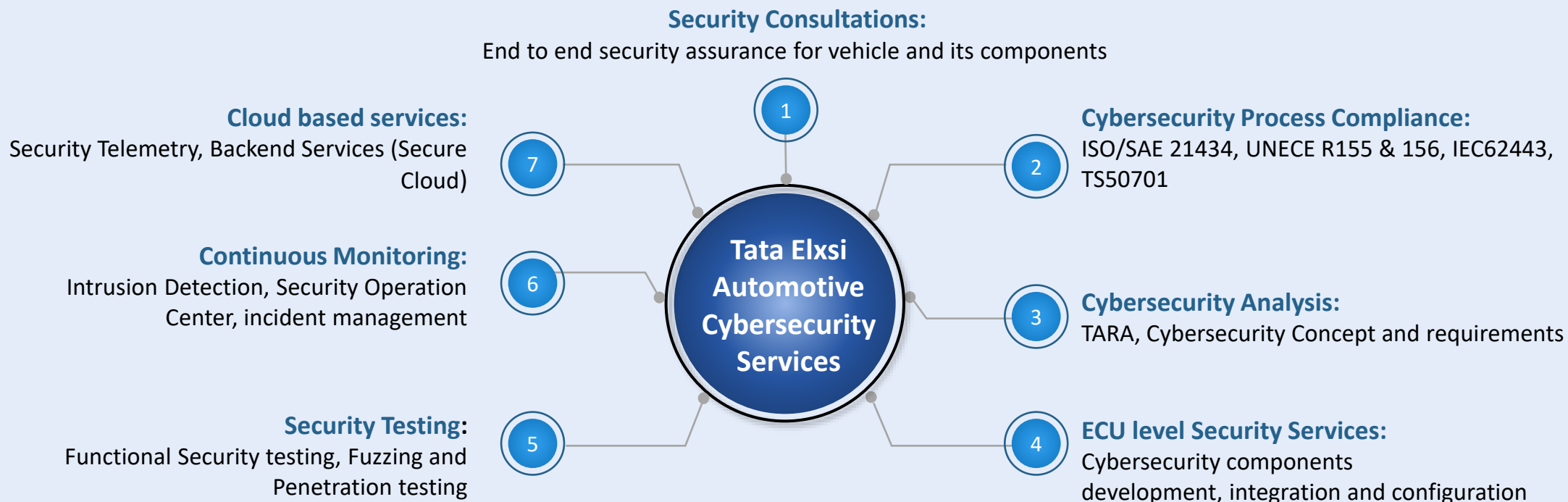
- System Integration
- Vehicle Integration
- HIL, SIL
- Feature Testing
- Wireless Testing
- GPS Testing
- Performance validation
- Test Solution Setup
- System Testing
- V2X Emulator

System Design

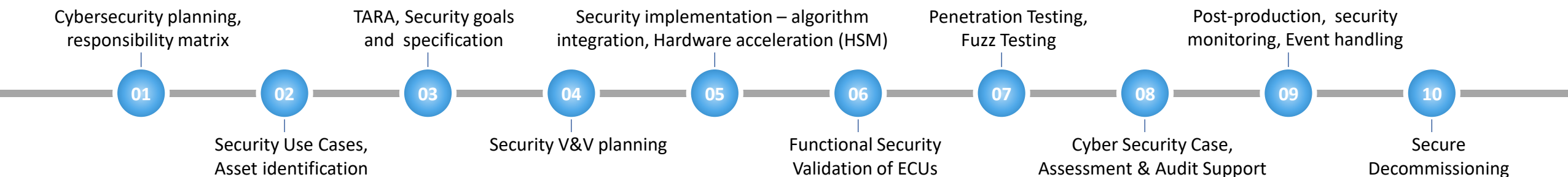
- Program Management
- System Engineering & Design
- Requirement Management
- Next Gen Arch -Connected GW and Connectivity Domain
- 5G Migration Support
- ASPICE Assurance
- Component Design

Cybersecurity Services

Transform your business and mitigate risk with cyber security services



Cybersecurity Lifecycle stages supported



DevOps Services

Faster time to Production with Automation, continuous integration and delivery

01 CI/CD pipeline setup, Customization, Automation

02 Build Strategy implementation

03 Build Failure Handling Strategy

04 UT Integration

05 Test Automation Integration

06 Deployment Strategy

07 Dashboards and Reports (Build health, Issue trends, Build Failures)

08 Legacy Pipeline Review and Migration

09 Patch Management and Platform Monitoring

10 Azure, AWS DevOps Pipeline integration

Code Commit

- Version Control
- Pre-commit checks
- Code Reviews



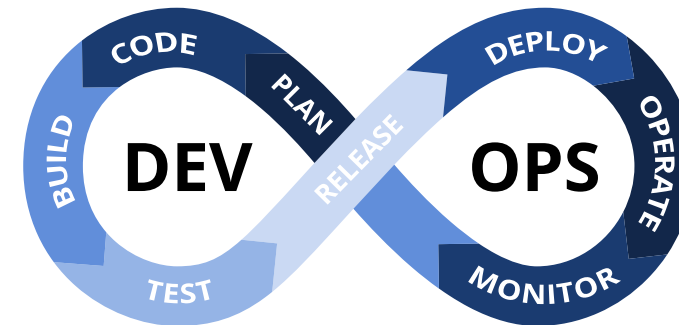
Deploy

- Deployment – Dev Setups, QA, Pre-Prod, Prod
- Patch Management



Monitor

- Platform Monitoring
- Logging
- Audits
- VAPT scans



Build

- Build
- Static Analysis
- Unit Testing



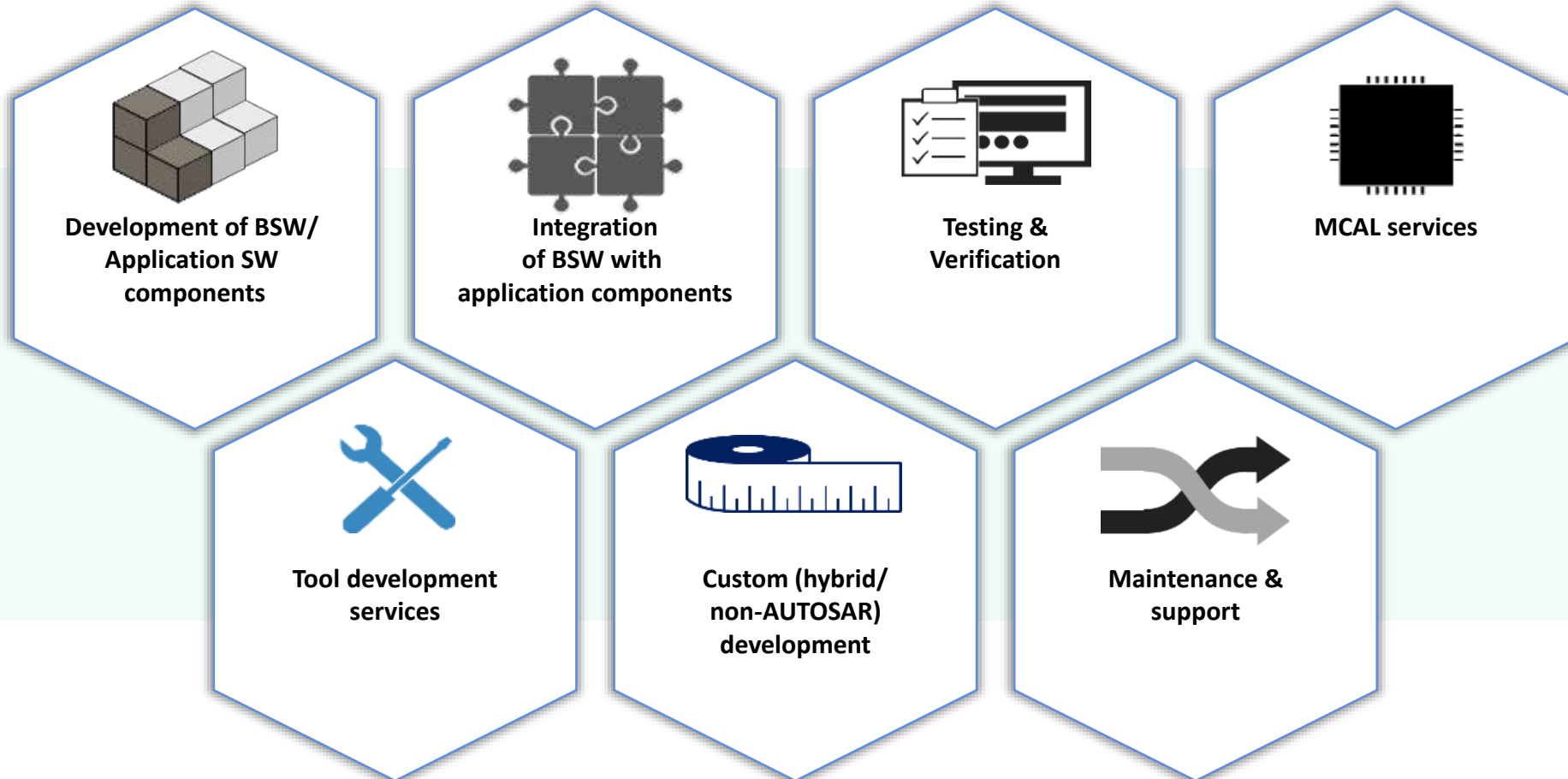
Test

- Automated Tests
- Manual Test



AUTOSAR Services

Develop | Configure | Integrate & Maintain



Rich experience of working with products of

VECTOR

EB
Elektrobit

Mentor
Graphics

ETAS

TATA ELXSI

Model Based Design Services

Visualize | Collaborate | Reuse

Plant Modelling

- Plant model for Testing the Controller
- Mathematical / Data Driven Plant Models
- Integrated testing of the Controller code with the Plant model
- System Identification & Parameter Estimation

Sensor Modelling

- Mimic environmental, channel, and sensor configurations
- Corresponding emitters and channels as separate objects

Actuator Modelling

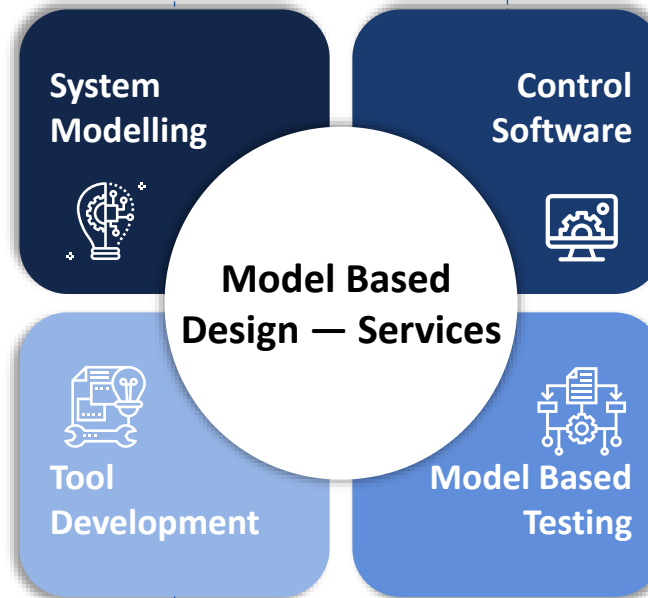
- Linear and Non Linear Actuator Models
- Control Analysis Simulation
- Optimization for end application

Co-Simulation

- Multibody Simulations
- Co-Simulation with Virtual Hardware
- Functional Mock-up Interface
- Component Co-Simulation
- Multithread Co-Simulation
- Expertise in GT-Suite, AMESIM, DyMola

Tool Development

- Proprietary tool box development
- Embedded Target / driver development
- Simulator development
- Data Analysis / Data Visualization Tools



Control Software Development

- New Control Software Development
- Algorithm Refinement & Tuning
- Algorithm Optimization
- Algorithm Verification
- Industry Standard Compliance (AUTOSAR/MISRA/MAAB/ISO26262)

Reverse Engineering

- Phased migration of legacy components
- Legacy Software to Model-based conversion
- Tool chain and automation tools for migration process
- Spec Development from Model

Code Generation

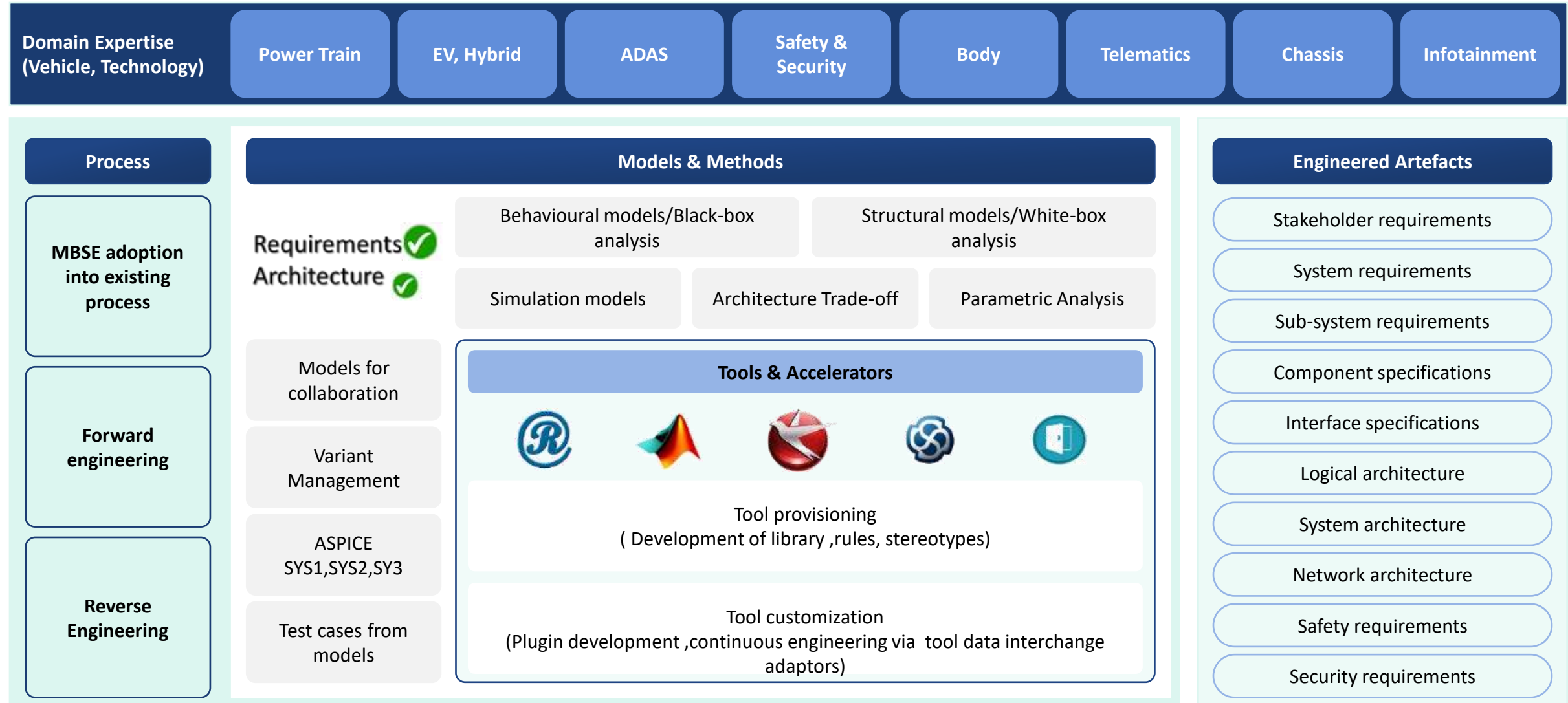
- Code Generation & Integration
- Integrate generated code with legacy code
- Model checking for production code worthiness
- Target Specific Code Generation for the Controller

Model Based Testing

- MIL, SIL, PIL Testing
- Testing of the MATLAB model by Comparing the legacy Code
- Model Integration Testing
- FuSa Compliance Testing

Model Based System Engineering Solution framework

Visualize | Collaborate | Reuse



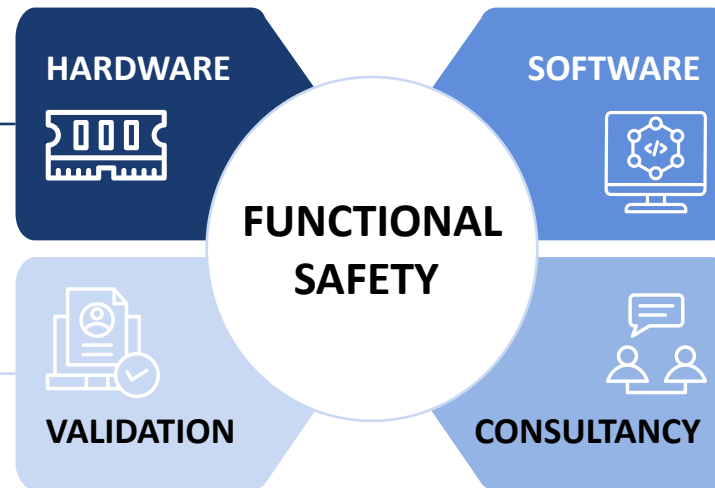
Functional Safety Services

Secure | Safe | Reliable

- Hardware Design & Development as per ISO26262
- Safety Analysis like FTA, FMEA, Reliability Prediction
- Hardware Architectural Metrics, FMEDA



- Fault injection testing
- Safety Validation testing
- Safety Test Cases development HW-SW, HILS & Vehicle level testing



- Legacy Software re-engineering & documentation for ISO26262 compliance.
- Software Safety Analysis (FTA, FMEA)
- Coverage Analysis & Fault Injection Testing
- MIL ,PIL SIL testing for MBD
- Tool Classification & Qualification



- Process definition and deployment
- Gap analysis against a targeted ASIL
- ISO26262 Training
- Hazard Analysis & Risk Assessment (HARA)
- ASIL Determination & Safety goal identification



STANDARDS : ISO26262, IEC 61508, MIL 1629, SN29500, MILHDBK 217, IEC 62380
TOOLS: RELIABILITY WORKBENCH, FTA+, RELEX, SOX2, MEDINI ANALYZE

Hardware Service Offerings – Specification to Production

Combination of the engineering team, robust product design processes and the vendor ecosystem

DEFINITION

- Technology Analysis
- Feature Analysis
- SWOT Analysis
- Architecture Definition
- Processor Selection and bench marking
- Proof of Concept development
- Product System Requirement Specification

ANALYSIS

- **DFMEA / DRBFM** Analysis
- FTA Analysis
- Worst Case Circuit Analysis
- Circuit Analysis & Simulation: Using **MathCad**
- Advanced Simulation using **PSPICE & LTSPICE**
- Digital Circuit Analysis
 - DC Analysis
 - AC Analysis
 - SI analysis
 - PI Analysis
- Reliability Analysis
 - MTBF Calculation

DESIGN

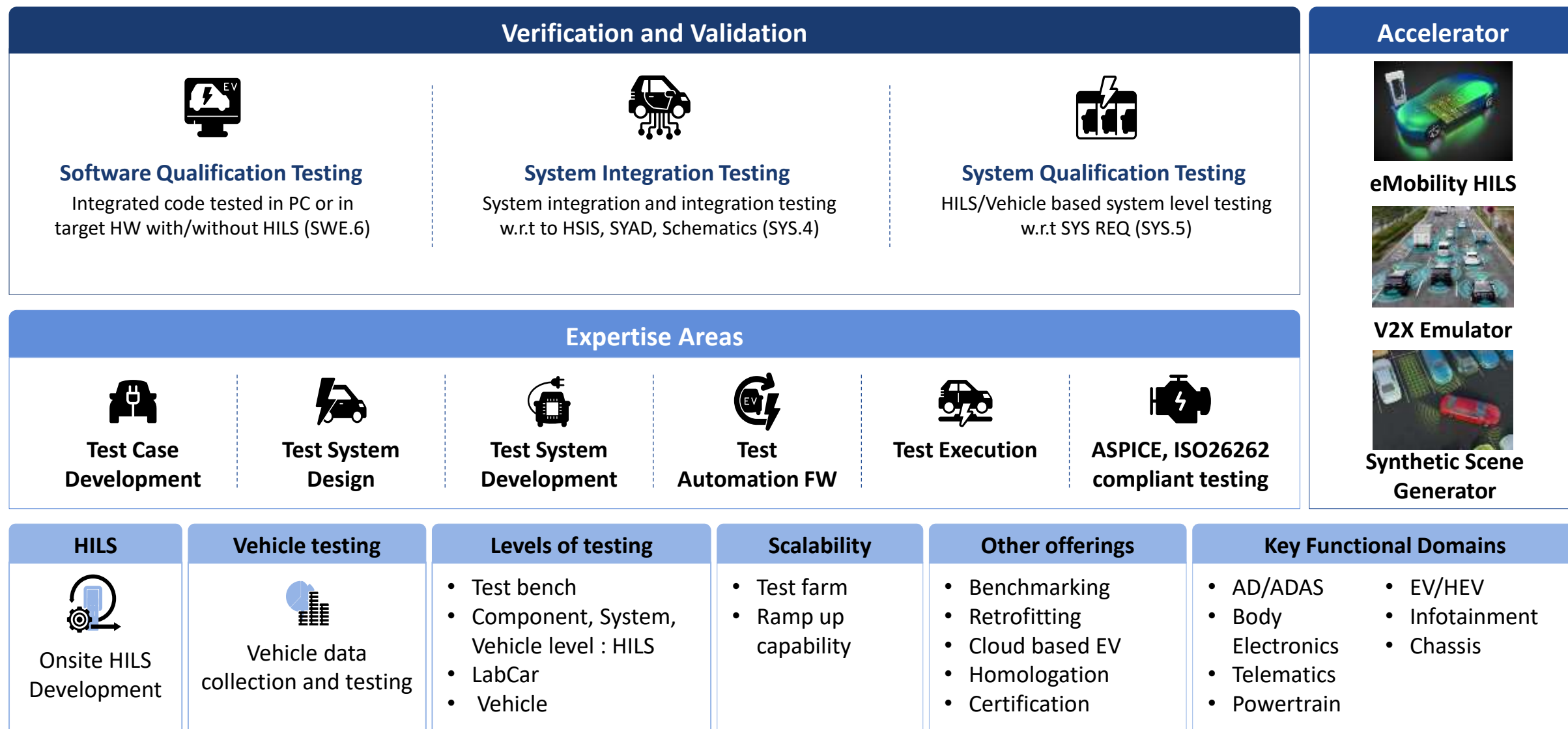
- Design of Analog, Digital and Mixed Signal circuit
- FPGA based HW Designs
- Circuit Design
- PCB Layout Design
- DFM and DFT
- Design Documentation
- Detailed HW Design Document
- Hardware Software Interface Specification
- TOOLS**
 - Mentor Graphics Dx Designer
 - Cadence Allegro
 - Altium Designer
 - Mentor Graphics Expedition

VALIDATION

- HW Bench Testing
- Waveform Capturing
- Circuit Characterisation
- Over/Under voltage testing
- Jump start evaluation
- Load dump testing
- Reverse voltage testing
- Current measurement for various operating modes
- CAN/LIN Physical layer testing
- Pre-Compliance testing
 - Electrical
 - Environmental

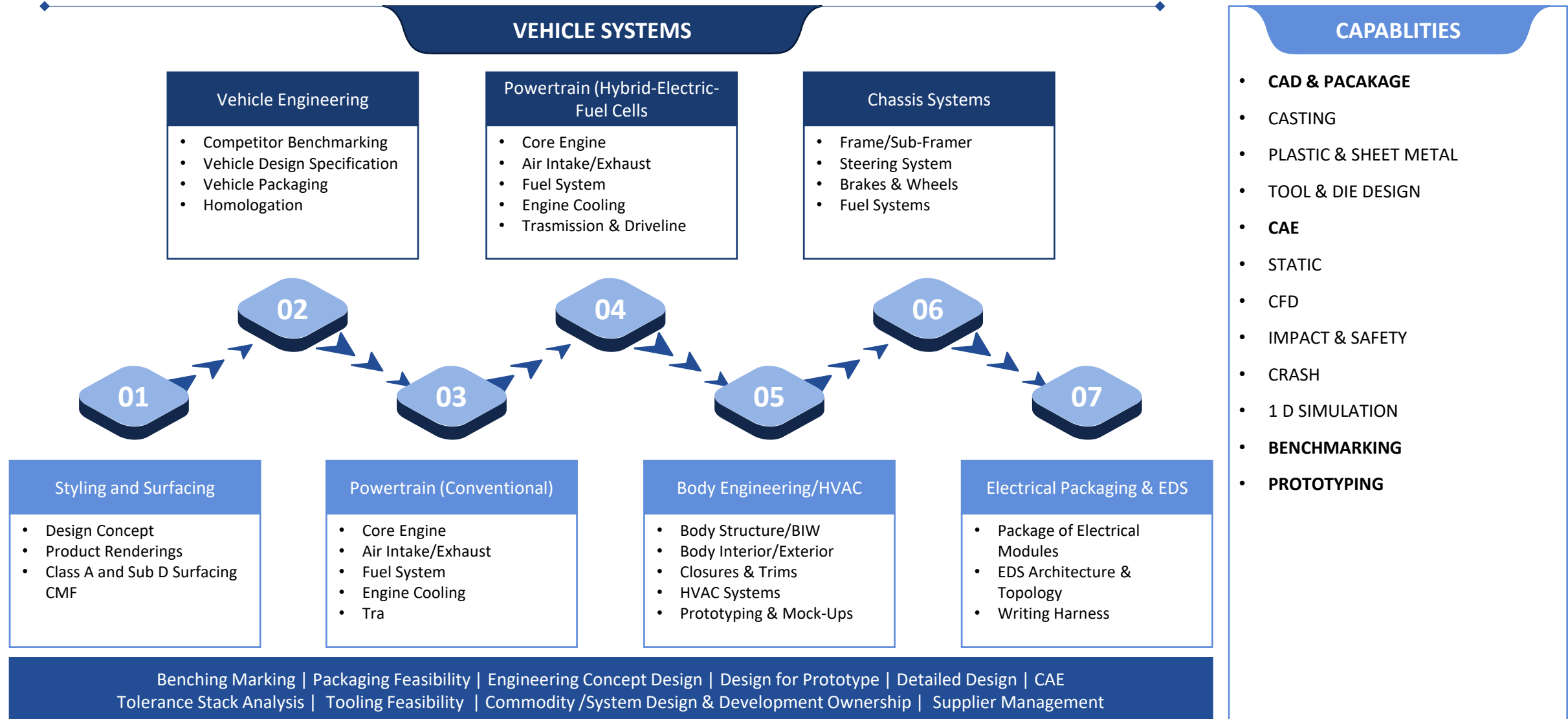
Automation and Validation Overview

Utilize Infrastructure and capability with AI/Cloud-based Test Automation for faster results



Mechanical Services – Domain Level

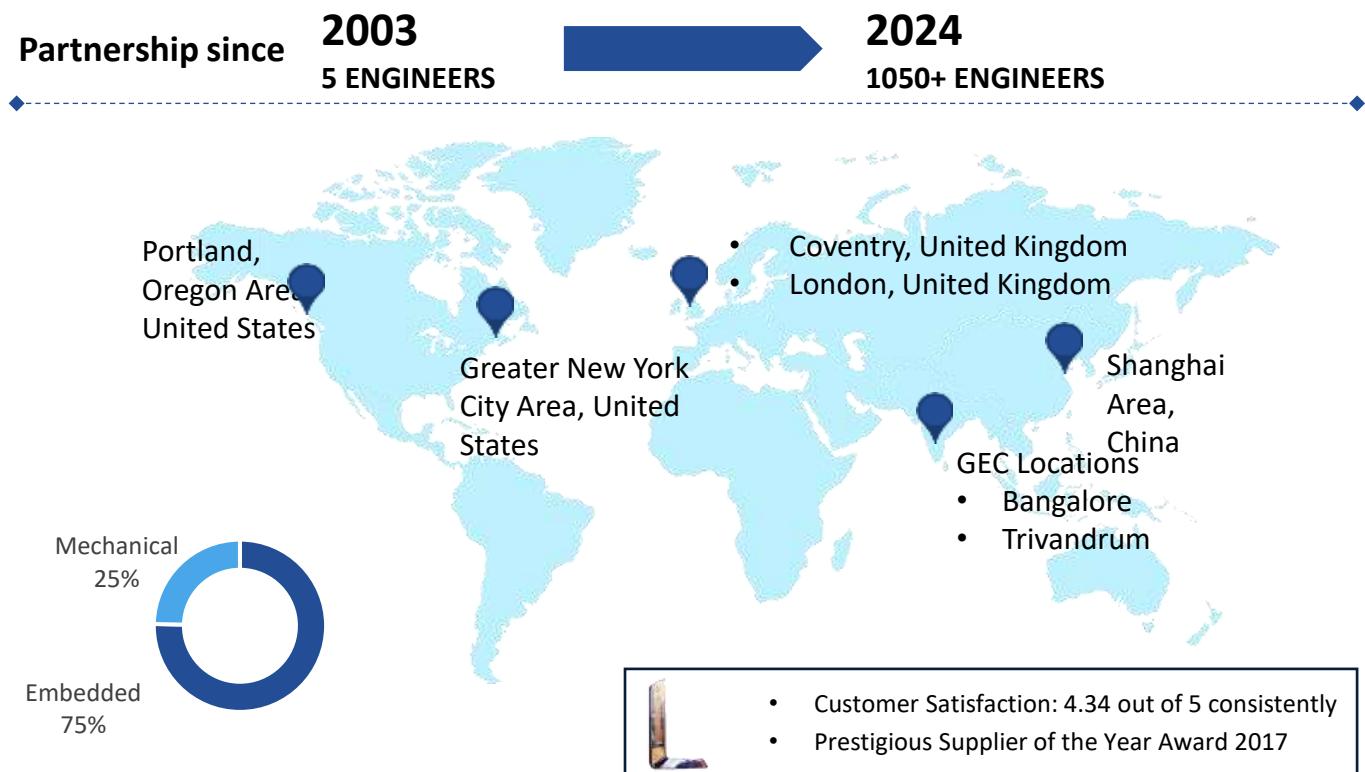
Empowering Future Mobility



Key GEC Engagements



Tata Elxsi sets up Global Engineering Centre For a European Luxury OEM



"The Tata Elxsi team brings a great combination of Design, Domain and Digital capabilities to support our innovation agenda and future vision. The flexible offshore and on-site delivery model has made our collaboration more seamless, agile, and cost-effective. We were also impressed with how aligned the team is, to our stringent quality standards and evolving technology needs."

Jai Gupta, Head of Engineering

Scope of Work

- Embedded Software – AUTOSAR & Non-AUTOSAR
- Mechanical Engineering
- Vehicle Program Management
- Design & Visual Content Development
- 24/7 HILS Verification & Validation
- Advanced research activities for future MY programs

Impact Created

- Process development, Productivity improvement by 10% YoY
- Automation Tools for validation
- Effective utilization of resources
- Complete software delivery and maintenance ownership for next-gen Model vehicles
- Program Management for multiple MY vehicles – 13MY onwards



AUTOSAR compliant Seat Zone Module in production



Feature Model Implementation for Door Zone Module



Program Management for multiple MY vehicles



Development of AUTOSAR compliant HVAC software



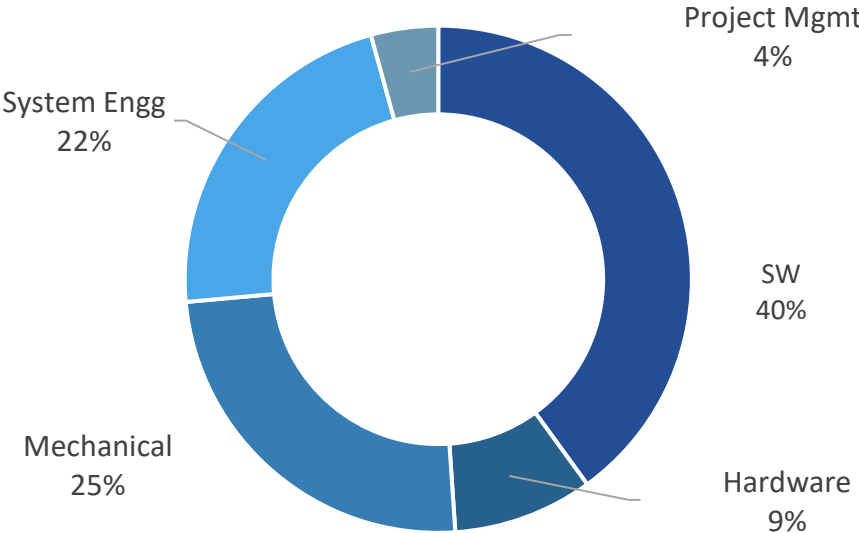
Design, Development and Validation of NGI-HMI apps



Design, & Development, HILS – Seat, HVAC, Driveline, EMS, Infotainment, IC & HUD

Tata Elxsi sets up Global Engineering Centre For Powertrain Electrification

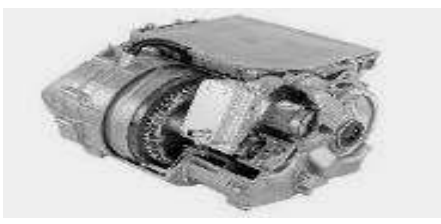
Partnership since **2022** **34 ENGINEERS**  **2024** **300+ ENGINEERS**



Scope of Work	Impact Created
<ul style="list-style-type: none">Model Based DesignCloudHILS ValidationMechanical DesignEMI/EMCEmbedded CFuSaAUTOSARSystem EngineeringInverter DesigneMotor Design	<ul style="list-style-type: none">Accelerated Work Package Transfer of medium to high complex long-term projectsMaturation of Management practicesBuild a team of 300+ engineers within 18 months of successful collaborationComplete Transmission traditional Building Block Design & Development including Testing



- Supporting 5 OEM programs and Internal Platform programs
- Supporting 6 Global Dev Centers (Austria, Germany, USA)



Transmission and Electric Drives Application Projects



Cybersecurity



eDrive Technology Programs

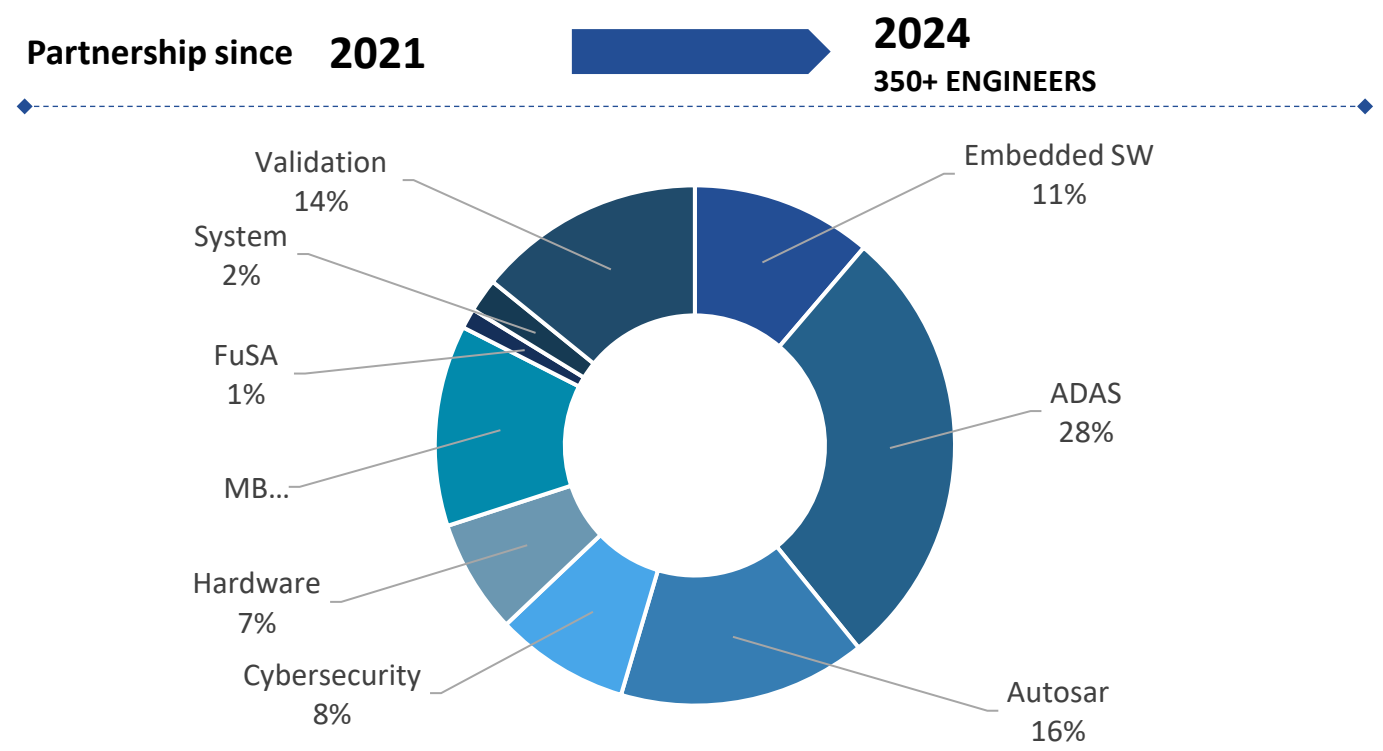


Power Electronics



Developing futuristic CAE methods

Tata Elxsi sets up Global Engineering Centre For EU Tier 1 For ADAS, Braking, Steering, and Cybersecurity programs



Scope of Work	Impact Created
<ul style="list-style-type: none">• ADAS Full System Development• ADAS Core Function• ADAS MIL/SIL• Cybersecurity• Algorithm Development• Auto Parking Function• Data Re-Simulation	<ul style="list-style-type: none">• TARA Report Analysis System Architecture refinement• Cybersecurity feature implementation• AUTOSAR based Software Architecture Development and Validation• Development and Integration of Camara/Radar based ADAS systems for multiple OEMs.



- Supporting 11 OEM programs
- Supporting 6 Global Dev Centers
- (US, UK, Germany, Poland, India, Japan, China)



Supporting 60+ different projects globally



ADAS system Engineering



Algorithm Development

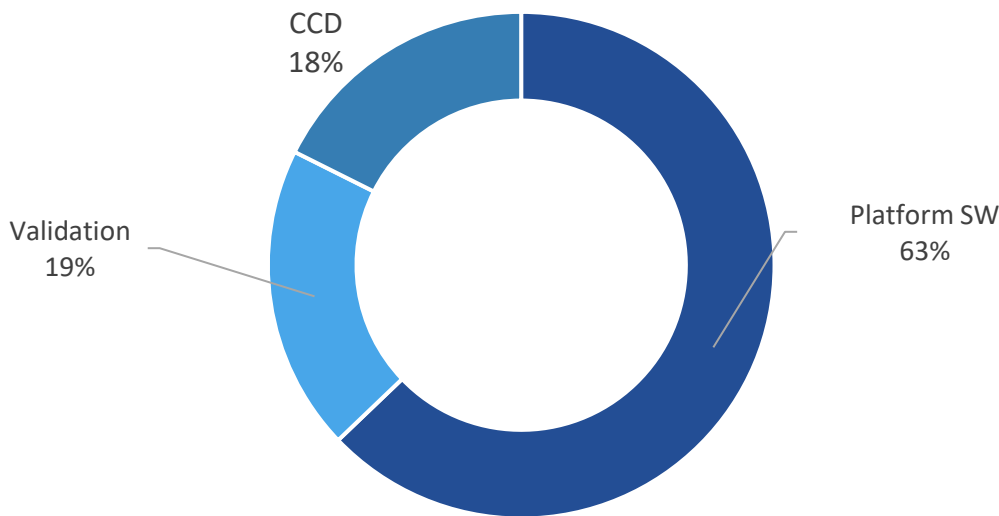


Cybersecurity




L2 Automated Parking


Tata Elxsi sets up Global Engineering Centre For US Tier 1 For Electronic Power Steering



Scope of Work	Impact Created
<ul style="list-style-type: none">HILs Validation ProjectsTest Automation FrameworkValidating EPS on NI based HILSEPS Software PlatformBootloaderDriver Readiness Analysis	<ul style="list-style-type: none">Fully Automated Test Framework built on dSpace. Multiple variant/program, 11 programs from OEMsFully Automated Test Framework developed using NI LabVIEW to validate EPS Software ArchitecturesMBD based platform Software Development – ASIL D CompliantValidation of Electric Power Steering (EPS) ECUs – dSpace, NI and Vector VT Systems



- Customer Satisfaction: 4.92 out of 5
- Supported Production Programs for 5 Premium OEMs



HILS Set up for EPS Validation
dSPACE, NI and Vector VT systems



Platform Software
EPS Platform Software
(Infineon + Renesas chipset)

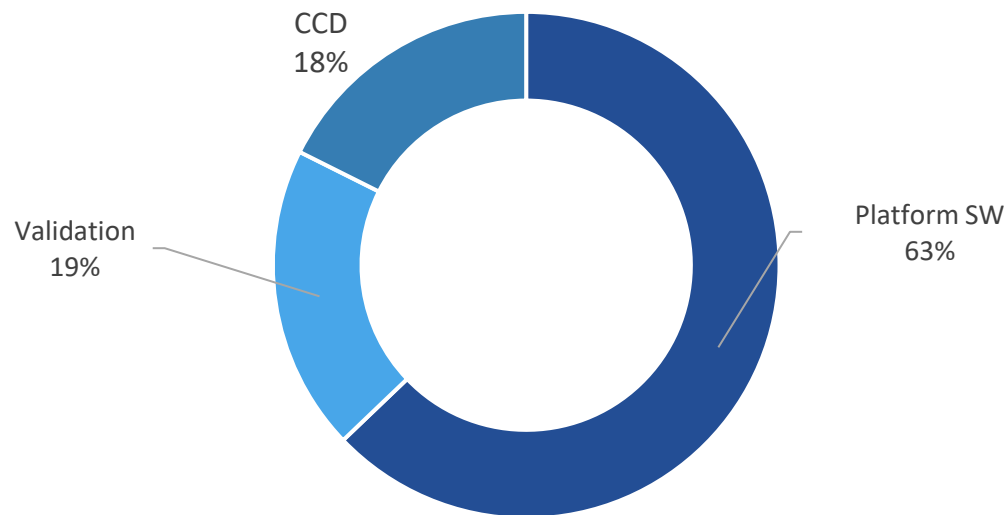


Driver Readiness
Driver Monitoring Analysis to switch from Auto to Manual mode

Tata Elxsi sets up Global Engineering Centre For US Audio Supplier

Partnership since **2014**
1 ENGINEER

2024
210 ENGINEERS



Scope of Work	Impact Created
<ul style="list-style-type: none">Audio Amplifier Hardware DevelopmentMechanical DesignAUTOSAR SoftwareHILS 24/7 UtilizationValidationeMobility	<ul style="list-style-type: none">Automated Test Case Development and prove out in HILS system, NI custom device developmentDevelopment of re-usable software platform for scaling across multiple OEM programsMechanical Design for Audio Amplifier and Infotainment Systems

- Customer Satisfaction: 5 out of 5
- Supporting 5 Global Dev Locations (USA, Mexico Germany, Hungary, China)



Partner for Global Platform Development:
Supported 12 OEM Product programs

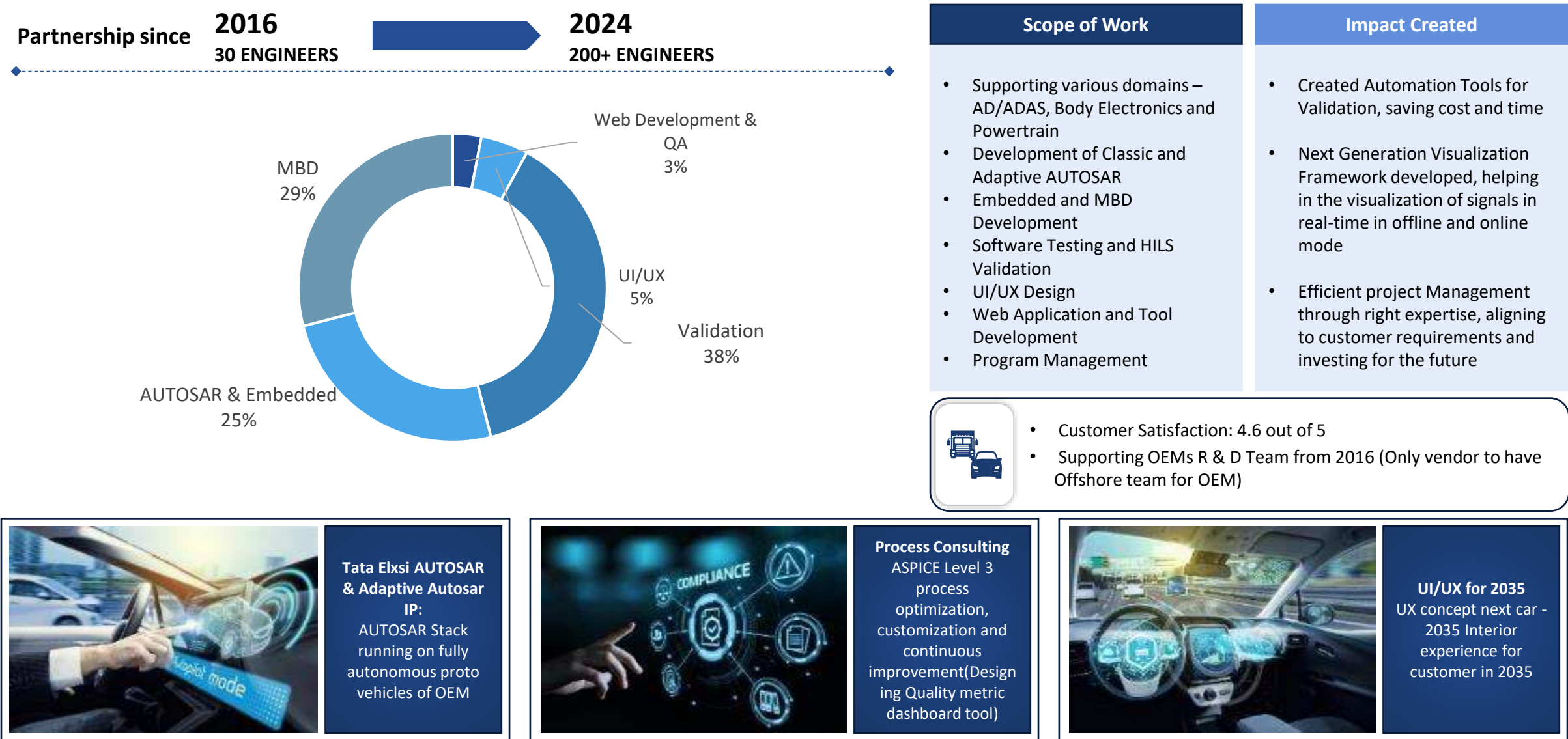


Audio Amplifier Hardware & Software Development for multiple OEM Programs



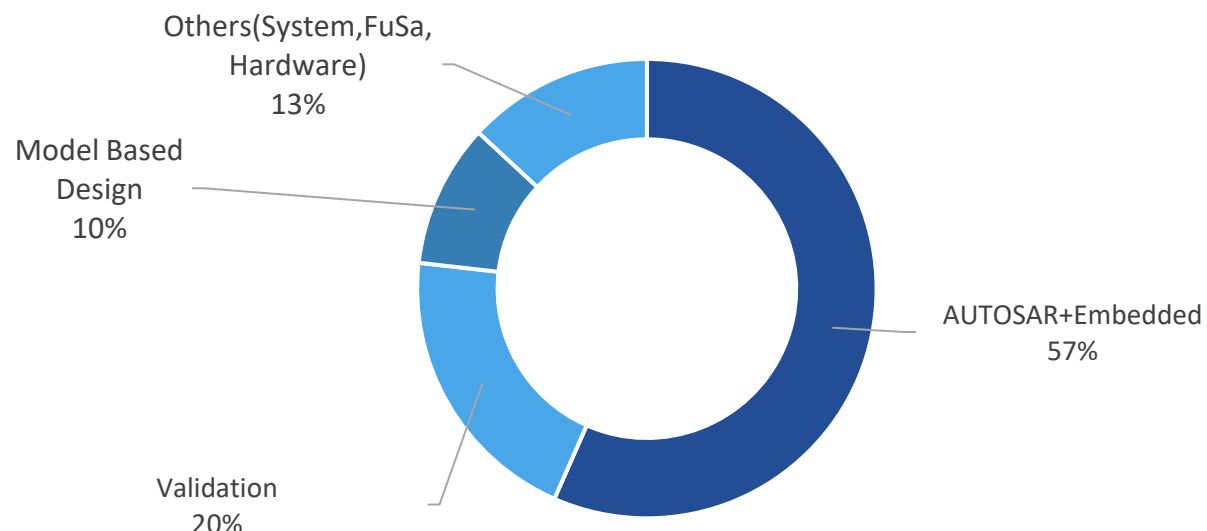
Electric Vehicle Approaching Vehicle Audible System (AVAS) Module Software development

Tata Elxsi sets up Global Engineering Centre For European OEM



Tata Elxsi sets up Global Engineering Centre For Japanese Tier 1 Supplier

Partnership since **2019** **10 ENGINEERS**  **2024** **150 ENGINEERS**



Scope of Work	Impact Created
<ul style="list-style-type: none"> Hardware – Design and Analysis System Requirements AUTOSAR & Embedded - BSW Integration & CDD Model Based Development – MILS, SIL & Auto code Software validation – Software Testing & HIL validation Functional Safety Cyber Security 	<ul style="list-style-type: none"> Only vendor to have offshore team for Tier 1 US 2nd PDB program ASPICE L3 Certification Japan - HVAC Production Program Ramp up



- Supporting 6 Global Dev Centers
- Supporting Tier 1 team from 2019



Domain
Body Control Module
HVAC
Power Distribution
Junction Box

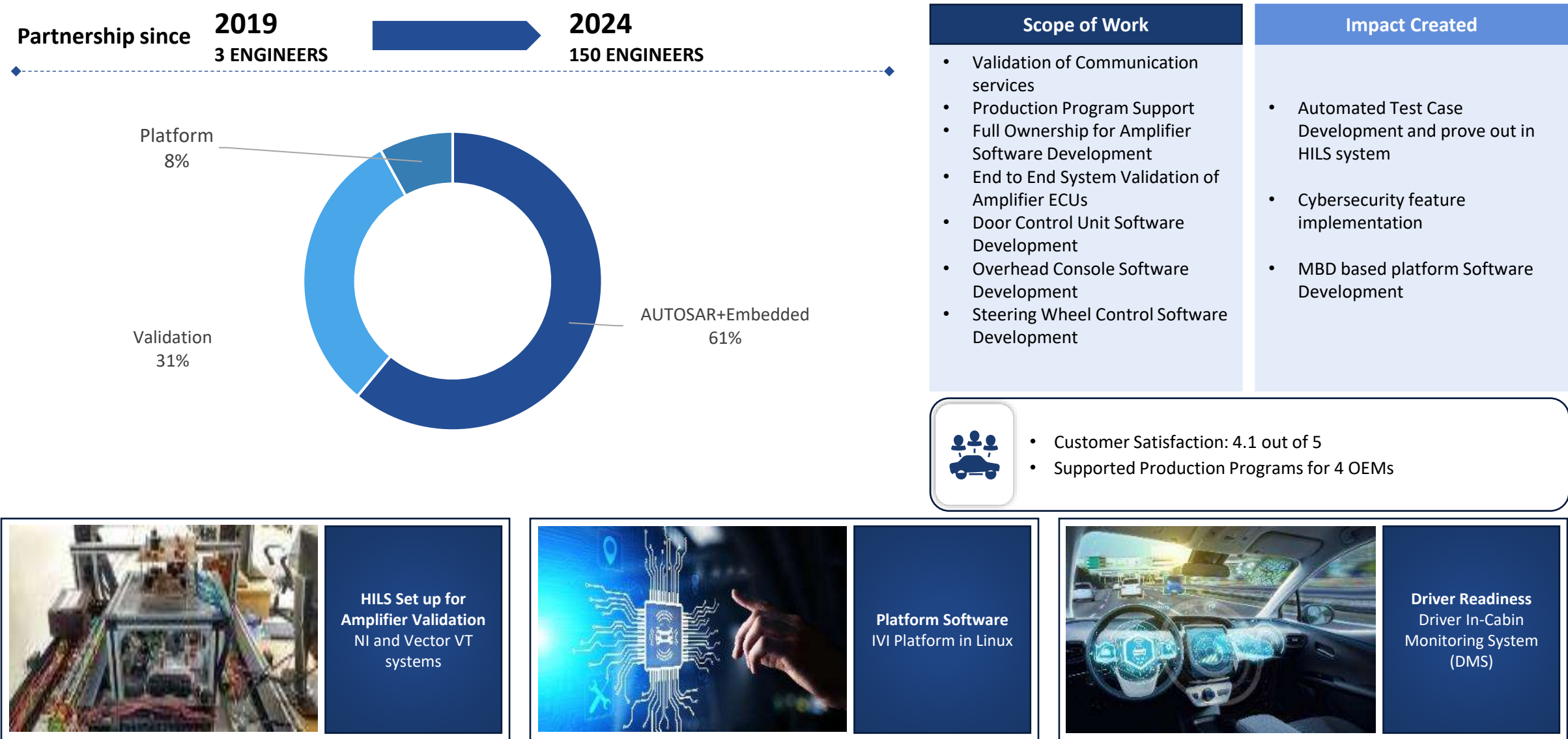


Process compliance
ASPICE Level 3
process certification
for 2 PDB production
programs

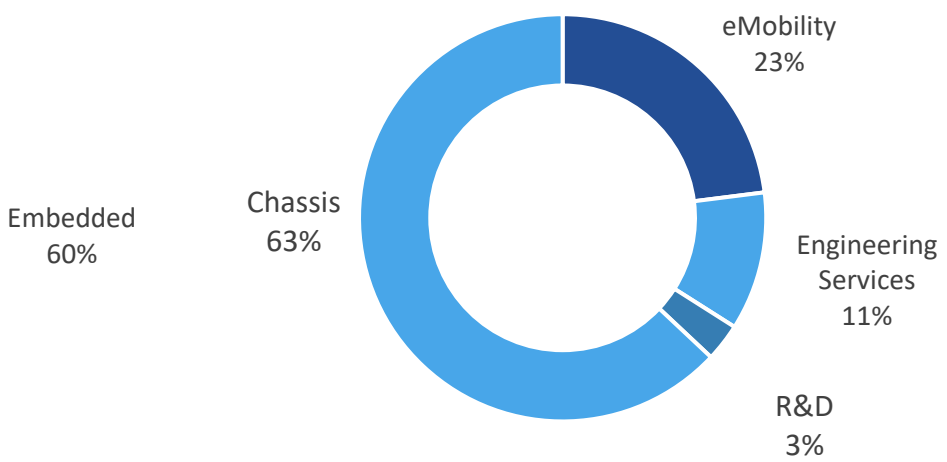
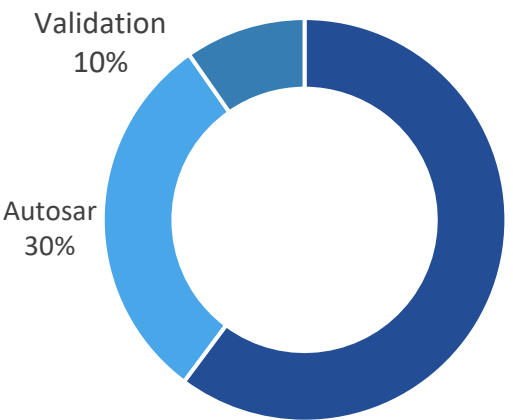


Semiconductor supported
NXP S32K324
Renesas RL78


Tata Elxsi sets up Global Engineering Centre For Japanese Tier 1 Supplier



Tata Elxsi sets up Global Engineering Centre For EU Tier 1 For Chassis Engineering and Mechatronics



Scope of Work	Impact Created
<ul style="list-style-type: none">Data AnalyticsRequirements EngineeringMotor Control Software DevelopmentUnit Testing of Automotive ECUSWE.1-SWE.6 End to End Development for Hydraulic Power Steering, Active Roll Control and Rear Wheel Steering systemsAUTOSAR platform for Chassis ElectronicsDesign and ValidationHILS ValidationBSW and ASW Development	<ul style="list-style-type: none">Establishing close & regular connect with stakeholdersParticipation in OEM review meetings , Scrum of Scrum MeetingsWorking from customer location for initial period of projectCreation of project specific Knowledge repository for smooth onboarding / transitionMigration from T&M mode to Fixed Price Mode for few projects



- Customer Satisfaction: 4.62 out of 5
- Supporting 3 Global Dev Locations



Digital Factory
For Production line data

Optimize production process & Return path analysis



Process Management Tool

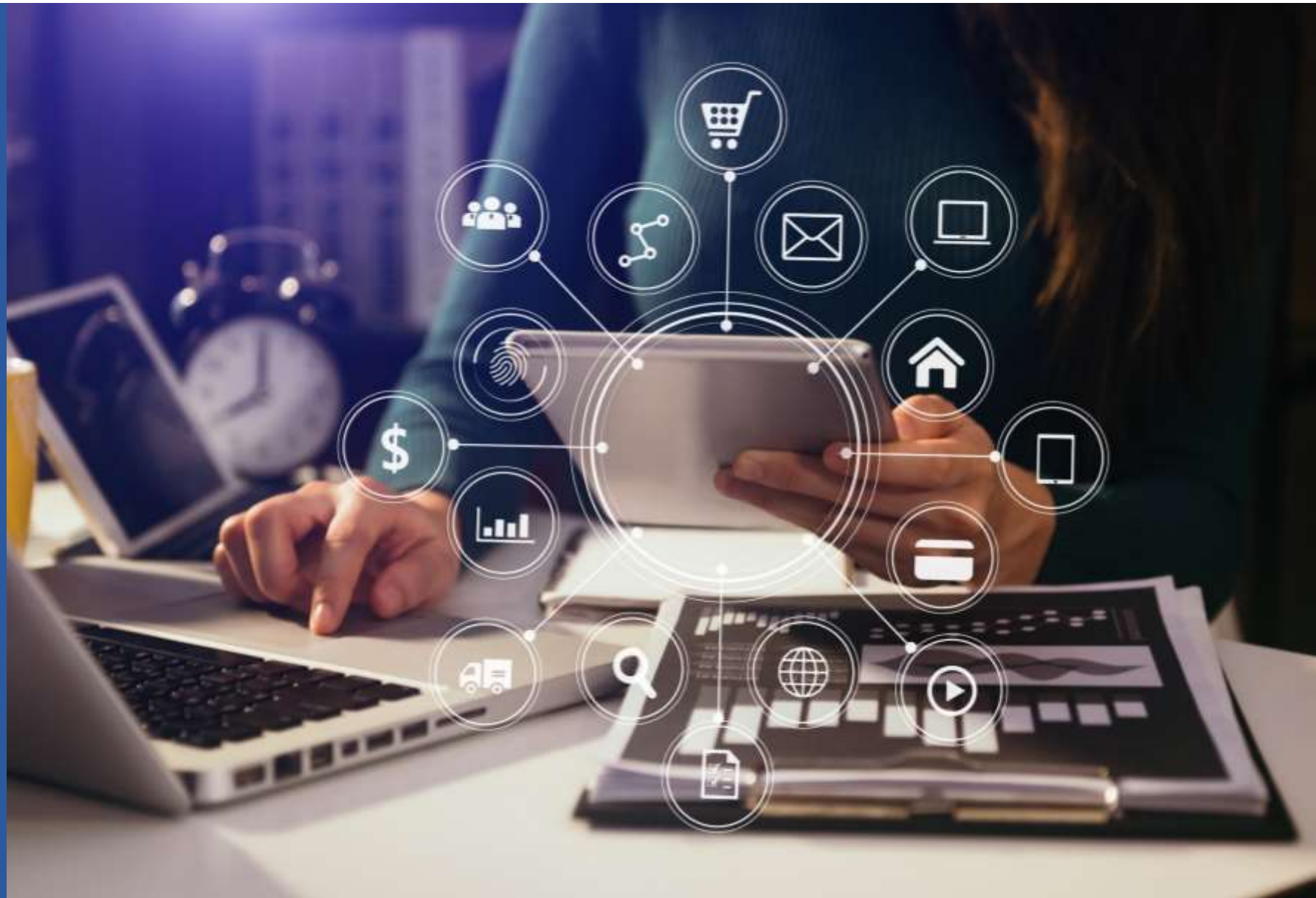
Build Automation Framework development



Mechatronics For Chassis

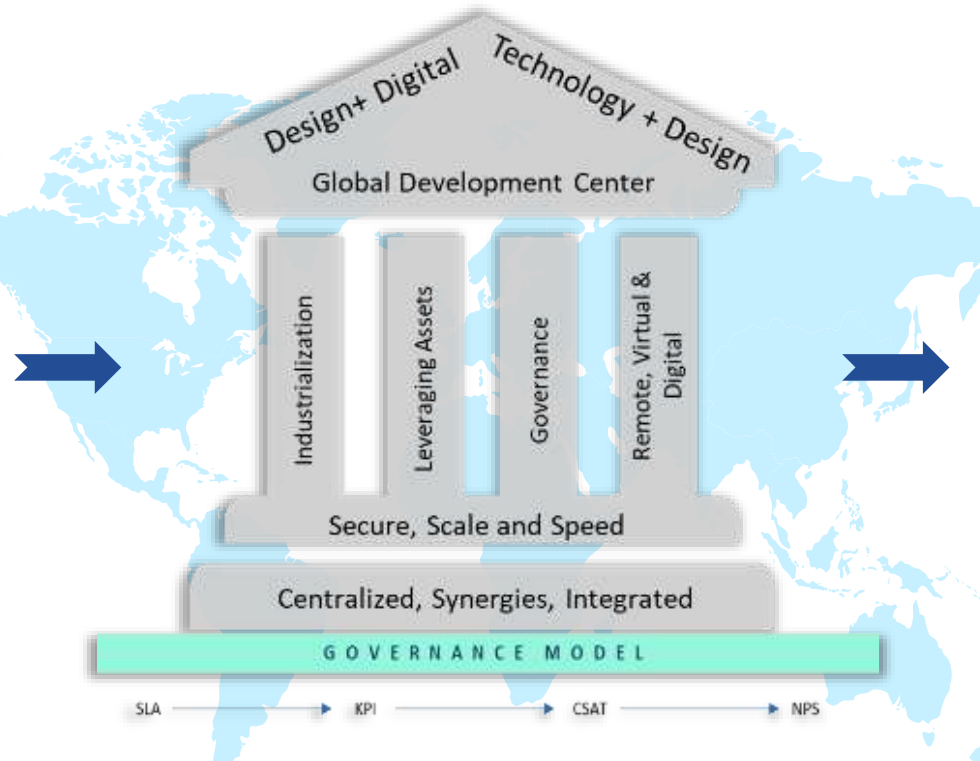
AUTOSAR Configured Platform development

Managed Services



Right-Shoring for Business Growth

For changing business conditions, increasing competition and still maintaining edge in marketplace



GEC Benefits

1. **Continuity** : Client-> Experience <- Employee
2. **Resilience** : Capacity & workforce availability
3. **Efficiency**: Productivity
4. **Cost advantage**: Lean Onsite(1:9 ratio), Ready solutions
5. **Increased flexibility**: Core-Flex Model, Quick Ramp up-down
6. **Added value**: Ready Dashboards

Digitized Processes, Quality Service, Domain knowledge, Client project management



"Follow the Sun" Model
Work round the clock-
increasing capacity 2-3 times



Global resources
Offshore, Nearshore, Onshore



Blended sourcing
Delivery Model- Core-Flex
Model Competency Model-
Practice teams



Risk Mitigation
Multi work location avoids
disruptions

Tata Elxsi's investments bringing Multi-layered Engagement Governance

Applicable only for Managed Programs by Tata Elxsi



Program Manager

Dedicated Program Manager defining program controls (Procedures/Reporting), Managing risks and contingency plans, program budgets, interdependencies between projects, Overseeing project managers, team, and overall project progress



Software Quality Assurance

Implementing quality assurance policies and procedures, Identify and resolve workflow and production issues, Ensure standards and safety regulations are implemented, Document QA tasks with audits and reports



Practice Team

Step-in as consultants with senior architects and specialists, resolve technology issues, bring additional value through developing solution accelerators and building blocks that can be customized for required project. Train engineers with industry and customer requirements so the resources can deliver from day one



Buffer Resources

Trained resources with process and quality requirement readily available to fill in resource requirement for projects



Dedicated Training Programs

Conduct dedicated and calendarized training programs mapping to customer project requirement to fulfill team deployment



Consultants

Technology experts bring additional value through industry expertise for winning deals – Bid participation, solutioning

THANK YOU

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