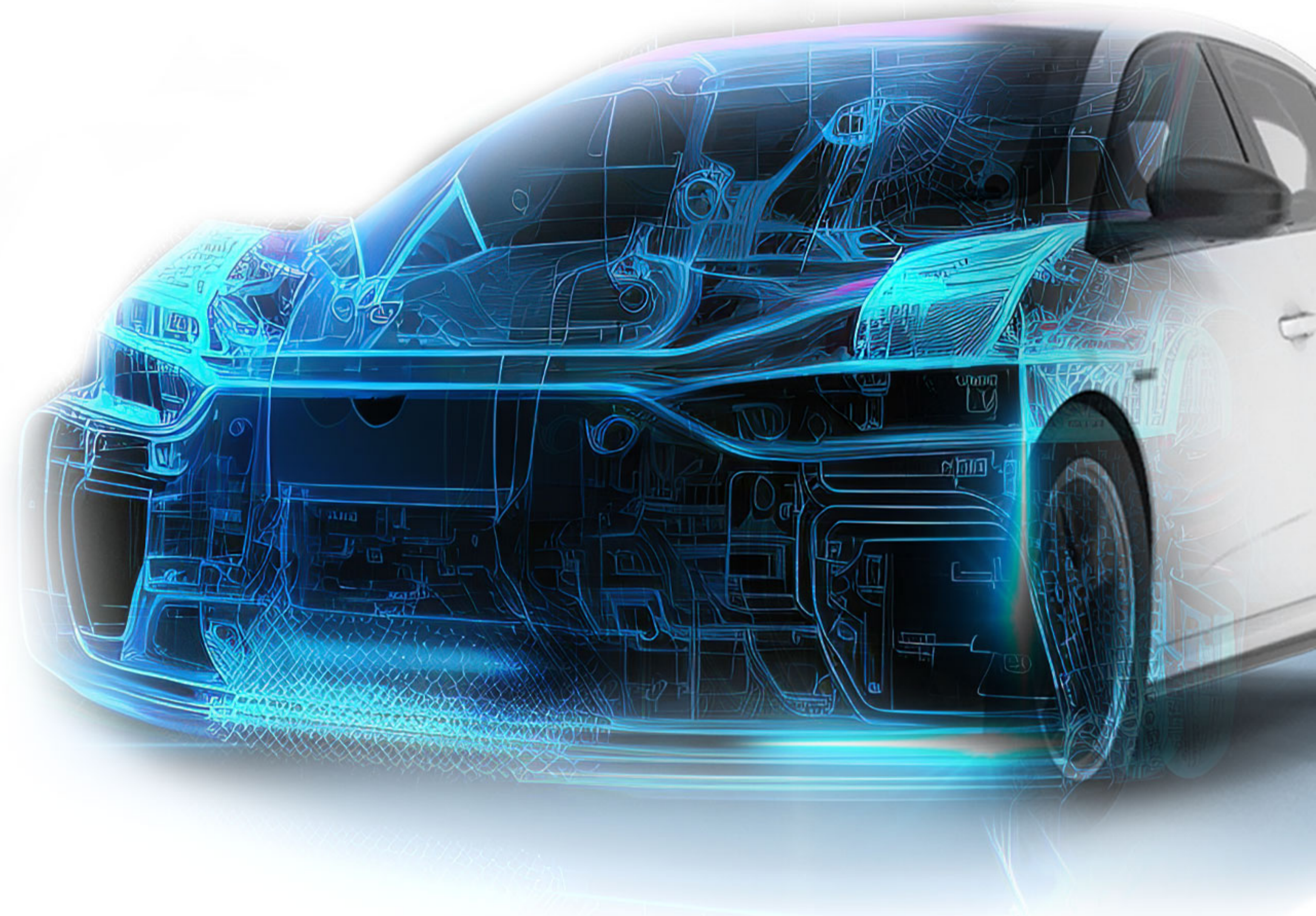# Automotive Excellence through Verification & Validation with Bosch SDS

Ready to elevate your automotive systems to better safety, reliability, and compliance?

Find out how.

Navigating complex compliance and quality standards can be costly and time-consuming for businesses. Bosch's comprehensive suite of services is designed to address the evolving needs of modern automotive systems, from software validation and functional safety assessments to performance testing and regulatory compliance.

As we propel into the era of autonomous vehicles, electric propulsions and interconnected smart systems, the importance of verification and validation (V&V) becomes paramount. You need a partner who is future-ready and can help you deliver cutting-edge automotive solutions to your customers! You need Bosch SDS!

Bosch SDS overcomes key challenges in automotive V&V with:

- ⊘ **Shorter Test Cycles**
- ⊘ **Digitalization & AI driven Validation**
- ⊘ **Process driven V&V Practice**
- ⊘ **Data driven Validation & Intelligent Automation**
- ⊘ **Convergence of AI & Automation**

V&V Range of Services

Virtualization

- ⊘ **Plant Model**
- ⊘ **Virtual ECUs & Network**
- ⊘ **Virtual Hardware**
- ⊘ **Cros Domain Virtualized System**
- ⊘ **Data Driven Validation**

DevOps Enabled V&V

- ⊘ **CICT on Cloud / On-premise**
- ⊘ **Parallel Testing**
- ⊘ **E2E Test Automation**
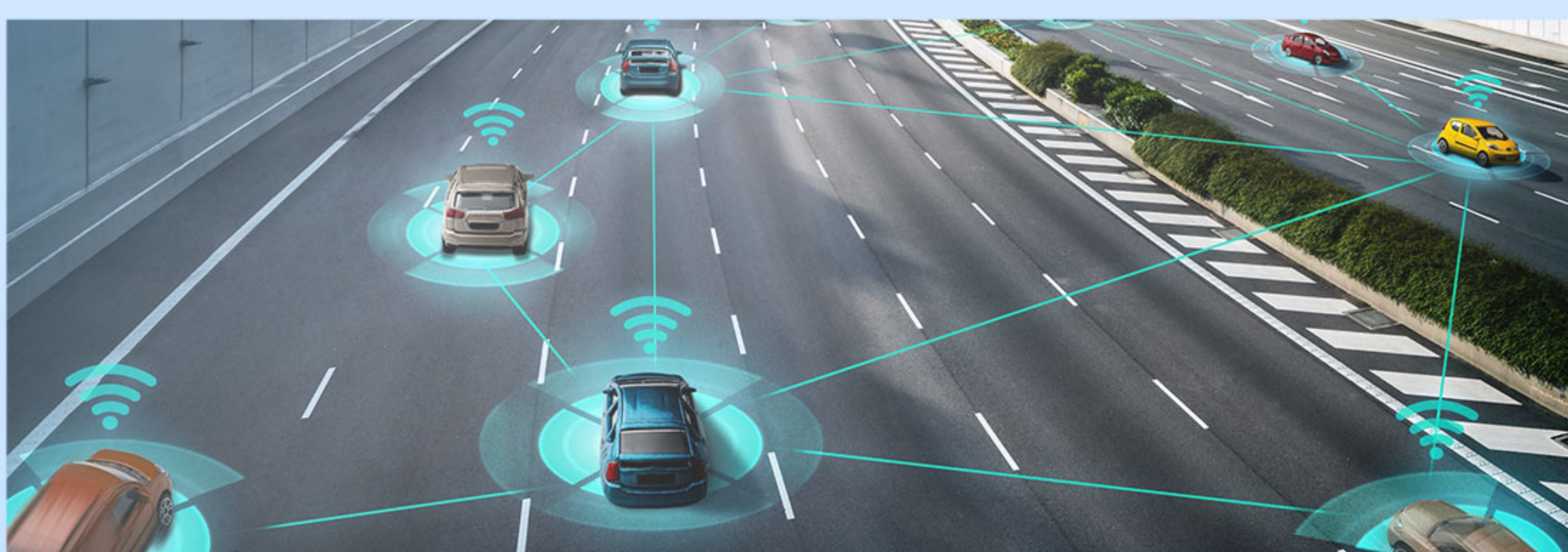- ⊘ **Automated Defect Analysis and Analytics**

System of System Validation

- ⊘ **Cross Domain ECU Validation**
- ⊘ **ADAS Validation**
- ⊘ **EV Platform Validation**
- ⊘ **AI Based Test Libraries**
- ⊘ **HiL Infra Solutions**

Connected Testing

- ⊘ **Telematics**
- ⊘ **Ota (FOTA, SOTA)**
- ⊘ **SDV**

- ⊘ **ECU Test**
- ⊘ **Robot Framework**
- ⊘ **Automation Desk**
- ⊘ **vTest Studio**
- ⊘ **Custom Frameworks**

Expertise in Leveraging MathWorks Tools for MBSE/MBD Journey

Experience the unparalleled synergy between Bosch expertise and MathWorks tools for a seamless MBSE/MBD journey. Dive into the realm of technical computing with confidence.

- **Plant & Control Modeling**
- **Verification & Validation**
- **Automation & Integration with heterogenous Tools**
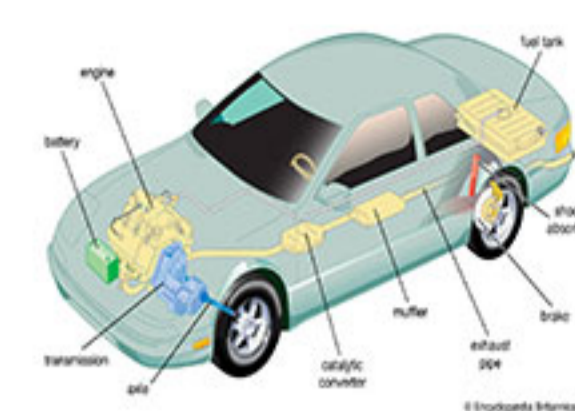- **Model Exchange & Co-Simulation**
- **Code Generation**
- **Engineering Process, Methods, Standards, Guidelines & Tools**
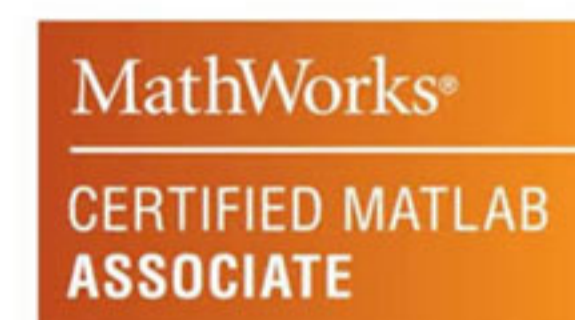- **MIL, SIL & HIL**

Domain

Automative

Customer Electronics

HealthCare

Technology

MathWorks CERTIFIED MATLAB ASSOCIATE

MATLAB SIMULINK

Expertise

Training

Consultation

Software Development

Discover a new era of excellence with Bosch SDS V&V solutions.

fasTest: Automation in the Testing Pipeline

fasTest is a web application that enables V&V teams with various process improvements such as enhancing productivity, reducing license costs, increasing reuse capacities of TCs. The main functionality of the application is to convert test cases to target based test scripts for the specific automation tool (eg: ECU TEST, Automation Desk, Robot Framework, CAPL, PROVEtech TA, etc.) which shall be used for test execution in XiL environment for multiple targets.

- **Test Case DB**
  Library of TC and Keywords across Domains/ECU
- **Manage Test Case**
  Create, Update, Delete, Review Tests
- **Script to spec Generation**
  Create, Update, Delete, Review Tests
- **Manage Project**
  Project Parameterization
- **Test Script Execution**
  Execution of test script on target
- **API**
  Interface to other tools
  Jira, RQM

fasTest Benefits

- ✓ **Test Script Effort reduced from 3 hours to 1 hour per test case**
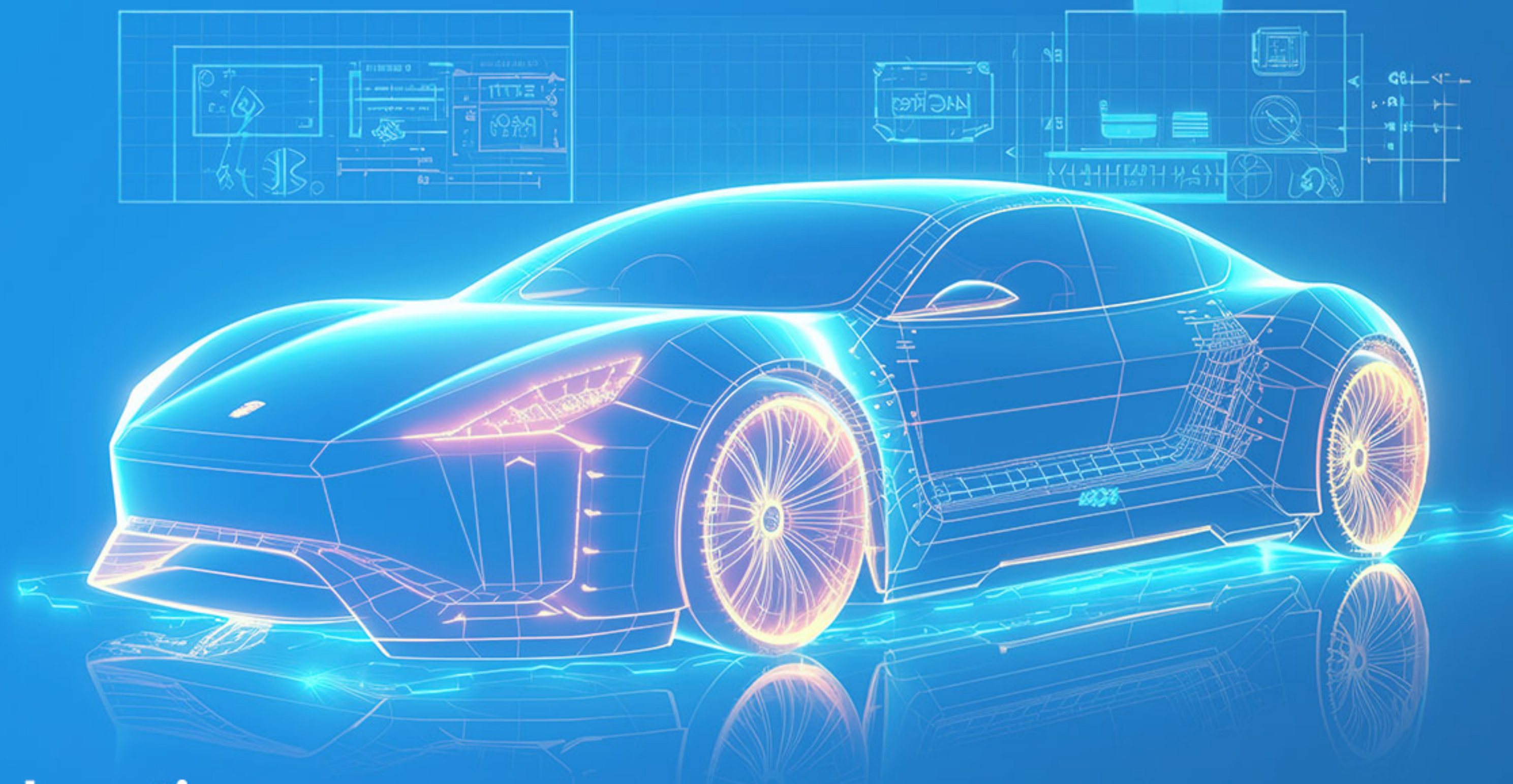- ✓ **70% efficiency improvement per test case**

EVirtualization

Virtualization revolutionizes the development and optimization of electric vehicles by enabling comprehensive simulation and modeling of vehicle dynamics, battery performance, powertrain efficiency, energy management strategies, and safety testing in a virtual environment.
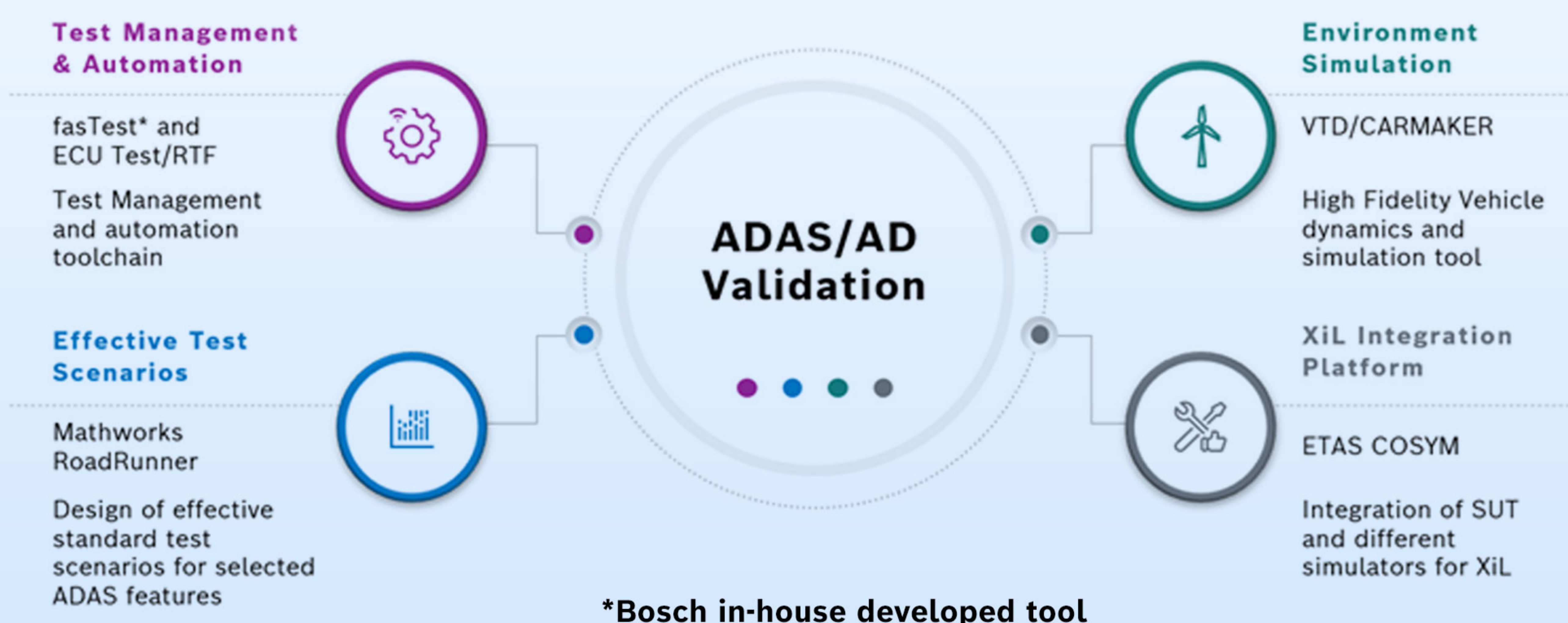
Virtualization Benefits

- ⊘ **Efficiency improvement through CapEx reduction**
- ⊘ **V&V of edge scenarios (e.g., Near crash scenarios)**
- ⊘ **Frontloading in projects for faster feedback**
- ⊘ **Quality improvement and reduction in rework**
- ⊘ **Market leadership maintenance**
- ⊘ **Creation of new revenue streams & collaborations**

Autonomous Driving Systems Validation

The use of traffic simulation for studies of advance driver assistance systems facilitates impact analysis at early stages of the system development. New and additional requirements are however then placed on the traffic simulation model. It is necessary to model both the system functionality of the considered driver assistance system and the driver behavior in system equipped vehicles.

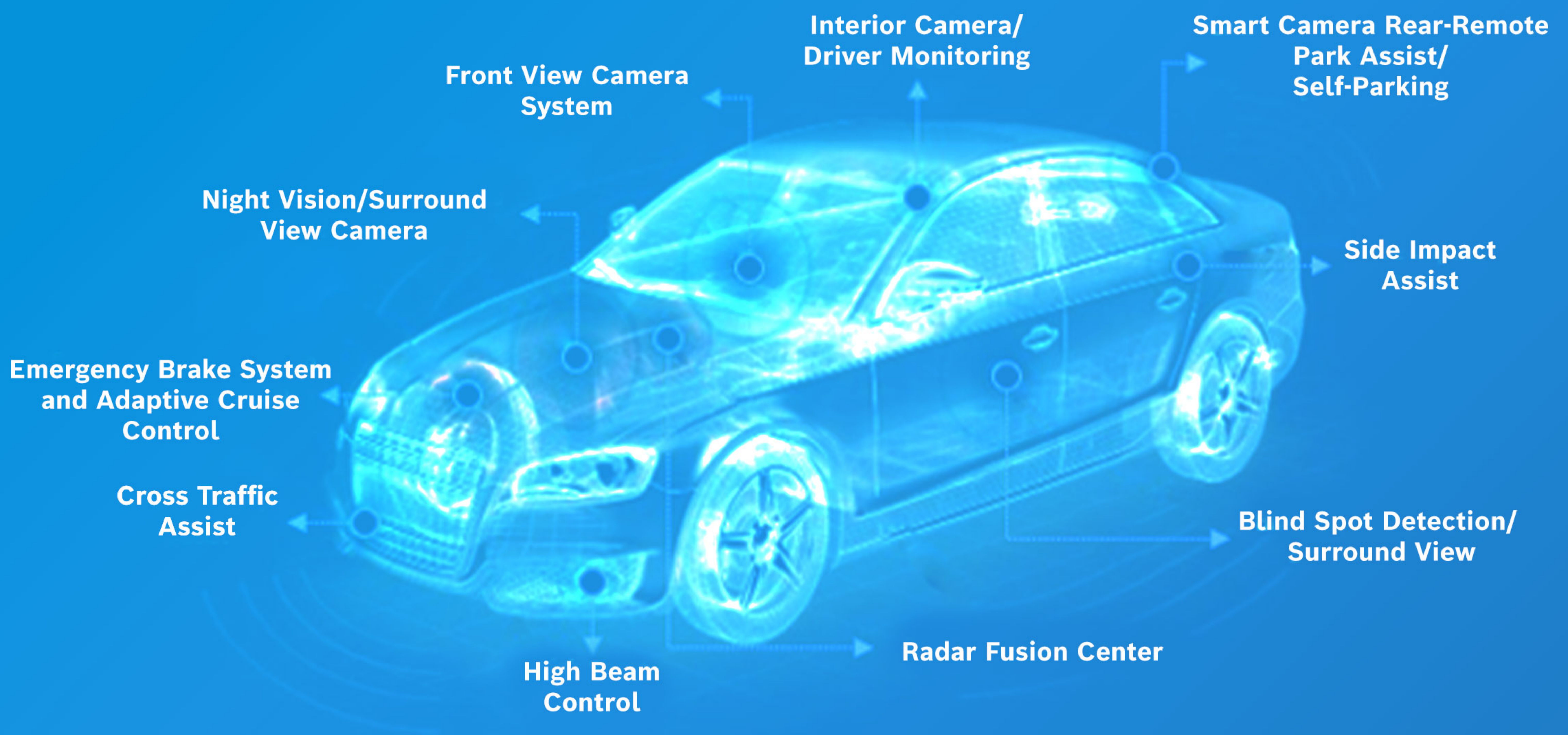## XiL integrated toolchain for ADAS V&B at Bosch:

Test Management & Automation

fasTest* and ECU Test/RTF

Test Management and automation toolchain

Effective Test Scenarios

Mathworks RoadRunner

Design of effective standard test scenarios for selected ADAS features

ADAS/AD Validation

Environment Simulation

VTD/CARMAKER

High Fidelity Vehicle dynamics and simulation tool

XiL Integration Platform

ETAS COSYM

Integration of SUT and different simulators for XiL

*Bosch in-house developed tool

Co-simulation benefits

- ⊘ **Interactive traffic simulation ensuring a realistic traffic enviroment**
- ⊘ **Accurate traffic conditions for testing different traffic senarios**
- ⊘ **Synchronized co-simulation for VnV Automated Driving**
- ⊘ **Complex scenarios validation**

Dive Into the Future with Bosch SDS

Front View Camera System

Interior Camera/ Driver Monitoring

Smart Camera Rear-Remote Park Assist/ Self-Parking

Night Vision/Surround View Camera

Side Impact Assist

Emergency Brake System and Adaptive Cruise Control

Cross Traffic Assist

Blind Spot Detection/ Surround View

High Beam Control

Radar Fusion Center

Expertise You Can Trust

- ⊘ Benefit from a team of **3000 experienced Automotive V&V engineers,** offering cross-domain expertise and proven system engineering prowess.

- ⊘ Experience **end-to-end testing** of automotive systems, solutions, and software.

- ⊘ **Innovative solutions** that open up new opportunities for market advancement.

- ⊘ With over **25 years of automotive V&V expertise,** we rely on our long-term know-how and 25+ home-grown V&V accelerators. These are supported by **500+ certified multi-domain COE V&V experts and SMEs.**

- ⊘ **15+ alliances in emerging tech** ensure you stay ahead in the automotive industry's ever-evolving landscape.