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Implementing Automotive Safety

Training and consulting services regarding SOTIF and ISO 26262

TÜV NORD

dSPACE

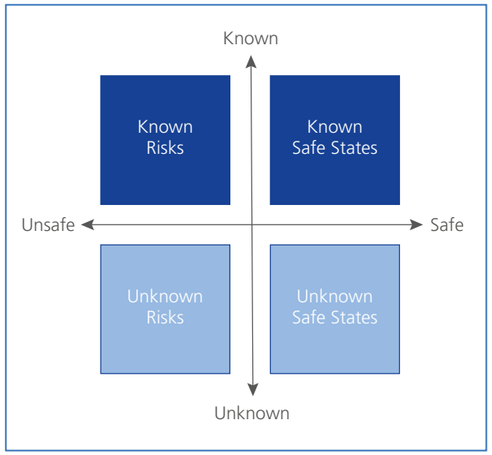
The Challenge: Evaluating Unknown Risks

Homologation used to be the last step during or after development. In this step, samples of vehicle-level tests were used to check the overall system behavior. However, given the complexity of new systems, this method is no longer sufficient because it is impossible to determine the residual risk of such highly automated systems at the overall system level. Therefore, future development processes and their (mostly simulative) methods, which are used to establish the basis for approval, will be used for the approval of functions for automated driving.

Accordingly, a new data-driven development process must be designed to achieve homologation as efficiently and safely as possible, and to meet the compliance requirements for such a process. To achieve this, the requirements of the relevant current and future security standards, such as ISO 26262 (Functional Safety) and ISO 21448 (SOTIF), must be met.

This requires verification by evaluating system behavior within known risks based on known triggering conditions.

The evaluation of the unknown risks calls for a combination of testing methods such as requirements-based testing



and scenario-based testing to identify unknown triggering conditions.

The reduction of the residual risk to a reasonable minimum and of the verification of system behavior in a known environment requires an appropriate combination of vehicle testing, simulation, and virtual testing.

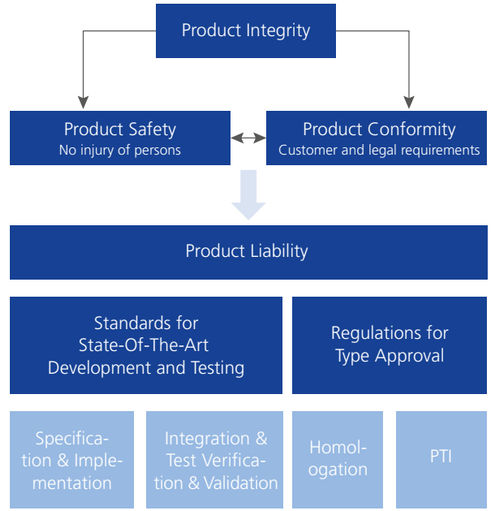
The Solution: Cooperation of TÜV NORD and dSPACE

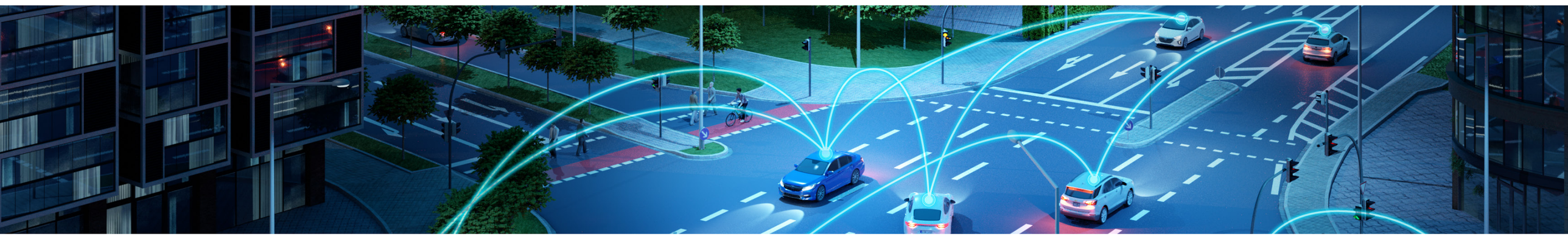
To meet these **new challenges** of system engineering, safety management, system verification and validation must coordinate their efforts.

Complying with **ISO 26262** and using classical development methods to ensure SOTIF compliance is just as crucial as agile development methods.

This requires the **expertise** from the various areas that must be compiled and centrally managed by specialists.
The TÜV NORD Mobilität GmbH & Co. KG and dSPACE GmbH cooperate to address these requirements to overcome future development and production challenges.

TÜV NORD and dSPACE provide comprehensive experience and expertise in all major disciplines of automotive development, from the first system requirements to homologation.





Four Steps to SOTIF Implementation

2-Day Workshop (onsite or online) SOTIF Training

Participants will achieve a general understanding of

- **Challenges** in the implementation of and compliance with operational and functional safety
- **Interaction** of ISO 21448 and ISO 26262, their processes and implementation methods
- **Experiences** and best practices from AD projects according to European standards

Workshop deliverables

- Guideline for the application of Functional Safety & SOTIF
- Documentation of processes, methods, and implementation frameworks
- List of test methods and test concepts for SOTIF argumentation

3-Day Workshop (onsite or online) Gap Analysis

Goals

- Gap analysis of safety processes and workflows at customer site
- Analysis of status quo and potential of improvements
- Definition of deliverables to achieve full compliance with ISO 26262 and ISO 21448
- Customer-specific gap mitigation plan

Workshop deliverables

- Project plan including safety management, risk assessment, and triggering conditions analysis
- Definition of methods to achieve safety compliance in the customer specific project
- Preselection of the verification & validation strategy, incl. release strategy

Concept Development Consulting

Goals

- Application of risk assessment and safety analysis methods for the implementation of operational and functional safety
- Developing a verification concept – test strategy for the verification of safety requirements, application of established quality assurance methods, assurance of suitable quality measures for SOTIF
- Developing a validation concept using scenario-based approaches in simulation and testing on test benches and on the road.
- Selecting algorithms for the measurement of previously defined key performance indicators (KPI)

Consulting deliverables

- Customer specific process definitions
- Templates for work products
- Assessment strategy for safety release
- Plan for test infrastructure and definition of test and scenario parameters

Implementation and Roll-Out

Implementation and roll-out services

- Consulting and implementation of safety work products
- Process and product assessment and certification
- Implementation of test framework infrastructure
- Test scenario design
- Fit for purpose Homologation

Introduction → Gap Analysis → Consulting → Implementation and Roll-out

Consultants

Jann-Eve Stavesand

Responsible for dSPACE Consulting

- Deep knowledge of the development and verification processes in the automotive industry (OEMs and suppliers)
- Functional safety expert – contributes to ISO 26262 2nd Edition and ISO/PAS 21448 SOTIF
- Participant of the VDA working groups on standardization (ISO 26262 and ISO 21448)
- Model-based design and virtual testing
- Verification of autonomous driving functions
- Prior experience in the product management for hardware-in-the-loop test systems

Heiko Ehrich

Responsible for Automotive Electronics at TÜV NORD Mobilität

- Long-standing experience in the analysis, validation, and qualification of distributed reliable embedded systems for the automotive industry
- Expert for safety and security systems, vehicle networks, and agile development
- Active in research, development and standardization projects for automated and connected driving
- Participation in ISO standardization and type approval regulations (e.g., ISO 26262, ISO 21448, ISO/SAE 21434, UN ECE GRVA)

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