

EVOLVING LANDSCAPES OF COLLABORATIVE TESTING FOR ADAS & AD

ASAM Test Specification Study Group Report 2022

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Virtually



Agenda

- 1 The Study Group Mission Statement**
- 2 Project Method - Design Thinking on Collaborative Platform**
- 3 Content Overview**
- 4 Example Major Findings – Test Strategy Blueprint**
- 5 Dive into Digital Version**

The Study Group Mission Statement

In this study project we will examine the **relevant test techniques and use cases for testing and homologation** of the ADAS/AD Domain in automotive. Our goal is to identify relevant standards, potential workflows and their variants, and the overall interplay between these parts to form a cohesive whole.

This analysis will lead to a documented set of **overall use case for testing and homologation**, a set of potential workflows implementing these, together with an overview of relevant users, standards and their application.

Additionally, we will identify gaps in the workflows, leading to the identification of **potentially needed additions to existing standards, liaisons between standards, or completely new standards**.

Recommendations for these standards or additions shall be collected and documented. The goal is to define a valid basis for follow-up activities and projects

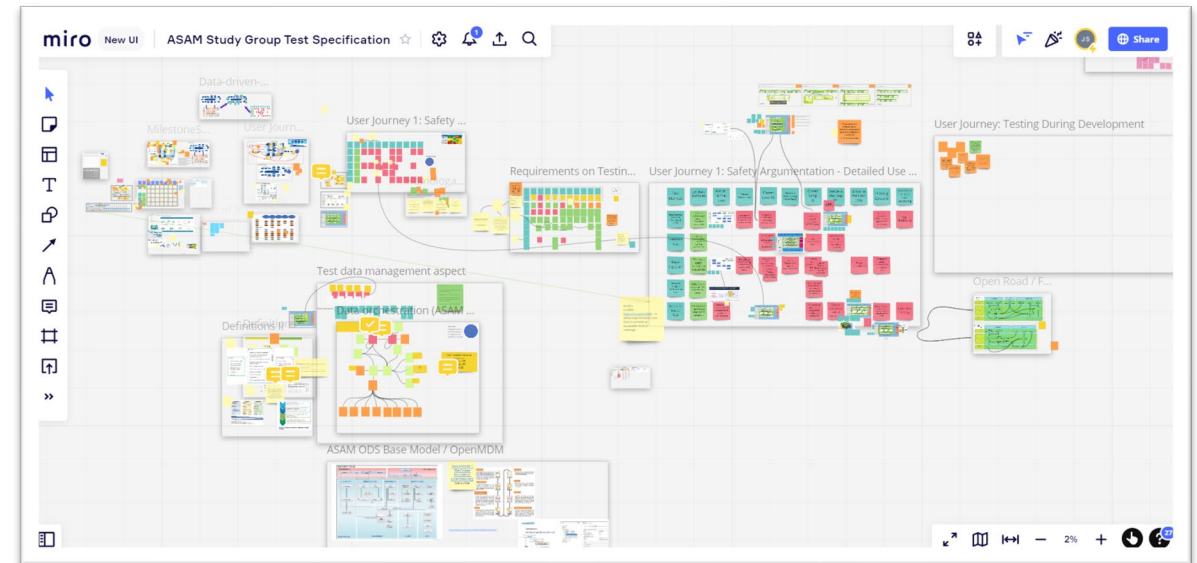
Project Method - Design Thinking on Collaborative Platform

Define the Scope

Central Work vs Decentralized expert groups

- Collaboratively design the landscapes
- Split the workload and create break out sessions

Use Miro and SharePoint to enable collaboration



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5.3.9.3 ASAM_StudyGroup_Relations2OtherStandards_ASAM_AT...									Markus Deppe	22. November
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DefinitionAndTerms_TestCase_01.rnpx									Frank Hantschel RA Cons	9. September

Content Overview

Executive Summary

Scope

Terms and Definitions

Automotive Industry Insights

Current Standards

- **Infrastructure Representation**
Domain Representation & Taxonomies
- **Interface Definitions**
- **Test Specification**
- **Data Handling**
- **Methods and Processes**

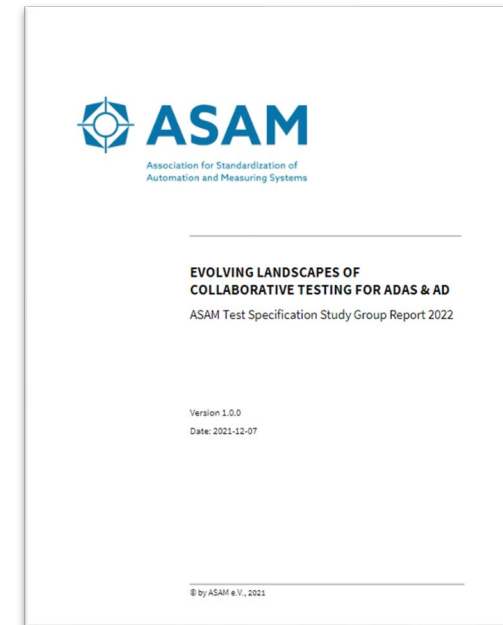
Research Projects

A Blueprint for New AD/ADAS Test Strategies

Test Data Management

Recommendations

Appendix



Example Major Findings – Test Strategy Blueprint

Based on the experience of the many experts working together during the course of the ASAM Test Specification Study Group project, **a blueprint to meet the challenges of testing** has been developed.

A holistic best practice that can be tailored according to the specific requirements of manufacturing and other projects, but one that meets regulatory, legal, and technical requirements.

The possible basis for the Homologation of Automated Driving Functions and Software-defined Vehicles.

Test Methods and Use Cases

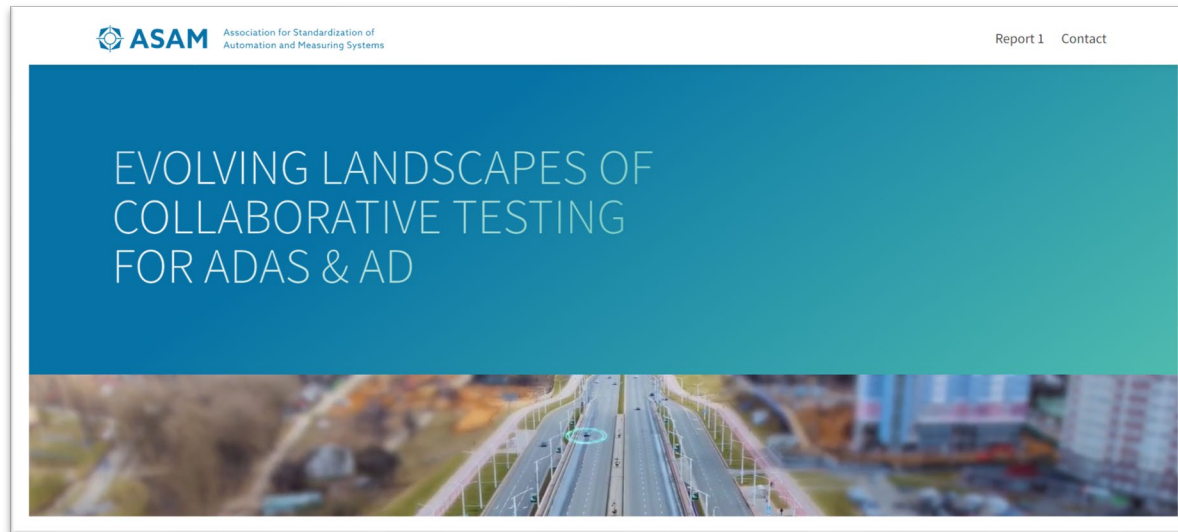
TEST METHOD	TEST ENVIRONMENT							
	MODEL- IN-THE-LOOP	SOFTWARE REPROCESSING	CLOSED-LOOP SIL	HARDWARE REPROCESSING DATA REPLAY	CLOSED-LOOP HIL	VEHICLE- IN-THE-LOOP (VIL)	DRIVER- IN-THE-LOOP (DIL)	OPEN ROAD TESTING FIELD MONITORING
REQUIREMENTS- BASED TEST (FUNCTIONAL TEST) <i>Software architectural design/Specified functionality</i>	More details 5.2.2 Requirements-based testing MIL	Test of ADAS/AD software via open loop e.g. detection quality	More details 5.2.1 Use Cases Requirements-based test SIL		More details 5.2.1 Requirements-based testing on Closed loop HIL	More details 5.2.7 Requirements-based testing vehicle in the loop		Testing in a controlled proving ground environment e.g. testing of the complete ADAS function in real-world conditions
INTERFACE TEST <i>Software unit implementation/ Hardware-software interface specification</i>			Software integration tests e.g. test of interfaces for communication between ...	More details 5.2.6 Hardware reprocessing Data replay	Higher-level integration tests e.g. testing of bus communication between ECUs	Testing of complete ADAS/AD effect chain on system level e.g. interaction ...		
FAULT INJECTION <i>Testing of safety mechanism/ Robustness</i>	More details 5.2.3 Fault injection on MIL	Evaluation of robustness e.g. robustness against pixel faults	Verification of safety mechanisms e.g. out of range e.g. testing robustness of software calibration	Verification of safety mechanisms including hardware e.g. testing robustness	Testing of safety mechanisms with integrated system e.g. electrical failure simulation like short to ground e.g. testing of robustness against vehicle tolerances		Validation of overall system behavior e.g. testing of controllability	Verification of overall system performance e.g. testing of safety
RESOURCE USAGE PERFORMANCE TEST <i>Sufficiency of resources/ Hardware architectural design</i>					Testing of the vehicle network performance e.g. sleep and wake			
SCENARIO-BASED TEST <i>Validation of real-life use cases/SOTIF validation</i>	Validation of control components e.g. testing of ADAS/AD effect chain in modeling environment		More details 5.2.8 Scenario-based testing SIL Closed loop		Validation of electronics integration e.g. testing the overall system behavior in challenging scenarios	Validation on system level e.g. complete system reaction to the most challenging scenarios	Validate interaction of driver with safety- relevant vehicle function (HMI, ADAS, active chassis systems), confirm controllability classifications from hazard analysis and risk assessment	More details 5.2.5 Scenario-based testing on Proving Grounds
								More details 5.2.4 Scenario-based Open Road Testing

Digital Version & Continuous Improvement

There is a digital version of the report in the form of a website where additional content can be added.

For example, videos as explanations of the content.

We want to enable a new presentation, encourage participation, start new discussions, use the website for presentation and above all enable continuous development.



We plan a team that continuously monitors the feedback on the website and derives steps from it and, if necessary, establishes contacts.

**The automotive landscape is evolving
but so is how we collaborate.**

Let's put it to the test.