

Project Proposal Summary Sheet

Project Number	C_2023_01
Project name	OpenTestSpecification Concept
Domain	Test Automation (pending finalization)
Impacted standard(s)	ASAM XIL, ASAM MDF, ASAM OTX, ASAM ODS
Project type	Concept
Start date	01.05.2023
End date	31.03.2024
Submitted on:	
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Initiating Companies	<i>BMW, dSPACE, imbus, KAN Engineering, Foretellix</i>
ASAM funds	
Backwards Compatibility	N/A

For more information on the ASAM project process and the proposal phase in particular, please refer to the [ASAM Project Guide](#).

¹ Should this project be approved and no other volunteers be identified up to the kickoff workshop to take on the role of project leadership, the Proposer(s) take on the Project Lead role by default.

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1 Executive Summary

Based on the ASAM Test Specification Study Group Report that aims to provide overview and to additionally clarify the role of data-driven development and the importance of test data management the standard for Test Specification is proposed. The final chapter of the Report summarizes the study group's findings, deducing recommendations for further action. One of these is the definition of a Test Specification Standard as Interface between different test instances and test methods.

Scenario-based testing is highly popular and relevant for the safety argumentation, especially for automated vehicles. However, it is very clear from the report that this is only one part of testing. For a holistic release of the vehicle, its software, and electronics, a holistic approach as described in the Test Strategy Blueprint is necessary.

It is important to emphasize that different standardization domains should not be mixed up by addressing them with a common standard. This holds especially true for the two domains of automotive testing and scenarios, where the above-mentioned interface between tests and scenarios should therefore separate the associated domains while also enabling their interaction. In the area of scenario description standardization multiple activities at ASAM have already taken place (e. g. ASAM OpenDRIVE, ASAM OpenSCENARIO). The analysis in the ASAM Test Specification Study group revealed the need for activities to standardize Test Specification descriptions as well. This is to ensure that the different test methods and test environments along this test strategy are applicable and used, and firstly to use synergies, secondly to simplify transitions, and thirdly to increase the reusability of artefacts in all these tests.

As a preparation for a follow-up Test Specification standardization project at ASAM this concept project aims at laying the proper foundation for such a Test Specification standardization project (OpenTestSpecification). This upstream concept project will focus on two major topics, namely the development of a technical basis plus clear requirements for a Test Specification standard and on updating the ASAM Test Specification Study Group Report (published in 2022) with additional aspects such as V2X, cybersecurity or AI.

2 Overview

2.1 Motivation

The ASAM Test Specification Study Group project examined relevant techniques and use cases for testing and homologation of software-centric vehicles and automated driving functions. Identifying relevant standards, potential workflows, their variants, and the interplay between these parts led to a documented set of use cases, as well as to a set of potential workflows to implement them.

Scenario-based testing is highly popular and relevant for the safety argumentation, especially for automated vehicles. However, it is very clear from the report that this is only one part of testing. For a holistic release of the vehicle, its software, and electronics, a holistic approach as described in the Test Strategy Blueprint is necessary. To ensure that the different test methods and test environments along this test strategy are applicable and used, and firstly to use synergies, secondly to simplify transitions, and thirdly to increase the reusability of artefacts in all these tests.

Another important goal of the development of a test specification standard was to ensure their unambiguous derivation from underlying (main) requirements (so-called key performance indicators, KPIs) while guaranteeing their transferability. The derivation of unambiguous, concrete tests and analyses from partly generic and natural-language requirements as an important area of conflict in automotive development and validation was the main challenge here.

2.2 Relations to other standards, projects or organizations

As shown in the report, the map of testing is becoming increasingly complex and efforts to view these different activities holistically are also very heterogenous. The report serves as an invitation to analyze the different activities together and to look at them holistically. The clear recommendation is therefore to bring about a worldwide coordination of standardization in continuous follow-up activities. We currently see no tendency to reduce and unify standards and research projects. Therefore, our opinion is to invest more in alignments for:

- ATX, OTX, ODS
- ISO 26262
- SOTIF
- IAMTS

3 Technical content

The project covers two major topics:

1. Foundation for test specification standard
2. Test specification blueprint update

Concept for a Test Specification Standard

We want to develop a technical basis, including clear requirements, for how a suite of standards could support various testing workflows. This proposal describes a concept project for a planned standardization of test specifications. A standardization will potentially follow. It is planned to create an MVP (Minimum Viable Product) within the project to evaluate and demonstrate applicability of the concept. The specific work packages of the proposal project and their sequence are described in the following paragraph “Work Packages”.

Test Specification Blueprint Update

We will expand and update the blueprint, integrate feedback into a new revision of the test specification report. The group will continue to drive discussions for specific additions to the blueprint e. g. fault propagation or V2X in scenario-based testing.

Work Packages

WP No.	Title	Description	Estimated effort for each area of expertise (S, M, L) (please remove, replace and/or extend as deemed necessary)		
			Documentation	Implementation expertise (e.g. MVP development)	Technical/domain knowledge
1	Define Evaluation Criteria	Define criteria for evaluation of existing test specification standards (e.g. based on blueprint use-cases)	S	N/A	M
2	Identify Interoperability Requirements	Identify interoperability requirements from other ASAM Standards (ODD, OpenXOntology, Scenario) and from integration of scenario interface	S	N/A	M
3	Evaluate Existing Test Specification Formats	Evaluate existing test specification formats from automotive testing and other domains (ATX, OTX, ODS, proprietary,...) based on defined metrics and requirements	S	N/A	M
4	Choose Potential Candidate	Rank potential candidates based on the evaluation of the previous WPs to serve as basis for test specification standard or create a new one	S	N/A	S
5	Scenario-Based MVP	Create and evaluate a scenario-/replay-based MVP to demonstrate standard potential and integration with ASAM ecosystem	S	L	S
6	Create Concept Document	Create concept document based on findings and results from previous WPs	L	N/A	S
7	Propose Further Development	Propose further development (ASAM proposals) based on chosen candidate and MVP	S	N/A	S
8	Blueprint: Analyze New Use-Cases	Analyze new use-cases (cyber security, V2X etc.)	M	N/A	M
9	Blueprint: Update Standardization Proposal	Update use-cases for standardization proposal	M	N/A	S
10	Blueprint: Update Test Report	Update test report	M	N/A	S

3.1 Use-cases

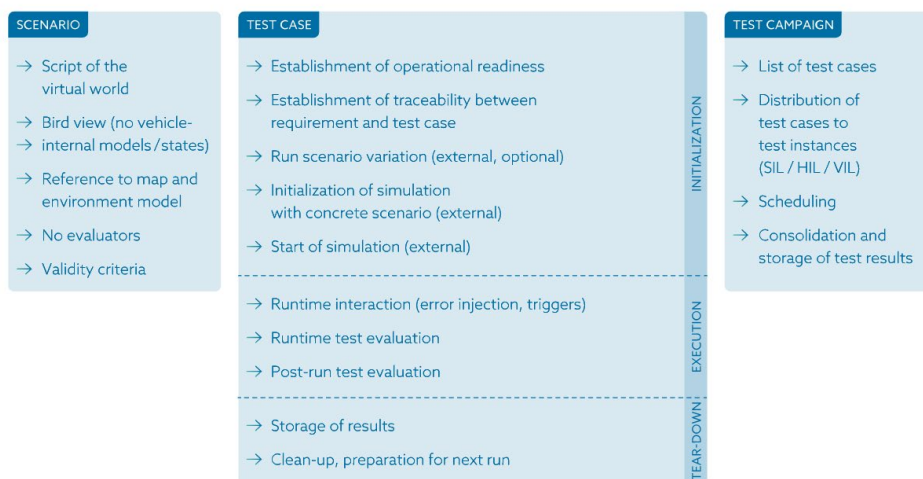
The minimum set of use cases that will be analyzed (not all of them will be covered in the MVP):

- Requirements Based Testing (MIL/SIL/HIL)
- Fault Injection Testing MIL
- Scenario-based Open Road Testing
- Scenario-based Testing on Proving Grounds
- Hardware Reprocessing / Data Replay
- Requirements-based Vehicle-in-the-Loop Testing
- Scenario-based SIL Closed Loop Testing

Further use-cases may be identified in the course of the project.

3.2 Features or requirements

The following paragraphs summarizes requirements on a test specification standard as already worked out by the ASAM Test Specification Study Group (see <https://report.asam.net/>). Due to the heterogeneous architectures of tool chains in the industrial environment (heterogeneous tool chains and test environments for implementation of test strategies), document types (such as scenario descriptions, test cases and test campaigns) must be formulated generically with respect to the underlying hardware and software architecture. This is necessary to enable the consistent use of test cases (test campaigns) and scenarios across different test instances and test environments throughout the development process and within homologation processes.



Source: <https://report.asam.net/>

The study group proposes a standardized interface between a scenario description and a test case. It is recommended to define and specify this interface satisfying these requirements:

- Depending on the use case there are test cases without any scenario description (e.g. Data-Replay Testing) or test cases using one or even multiple scenario descriptions
- Different scenario description languages/standards exist but they need to be able to be connected to tests in flexible and common way.
- For the test description, different languages/standards are applied.
- Features of the “standardized interface” are driven from the test perspective; the interface provides a decoupling; the scenario does not contain test aspects and vice-versa. Testing “drives” the requirements on this interface and scenario descriptions implement such an interface (handshake).

Traceability needs to be supported. This affects requirements, test cases, test results and ODD definitions.

Furthermore, a Test Specification Standard shall enable automated or semi-automated processing by formalization such as:

- Automated checking of test specification content with regard to semantics and completeness
- (Semi-)automated creation of concrete test cases
- Unified powerful database searches for models, raw-data, scenarios

To gain the highest possible value from standardization a Test Specification Standard must unify the understanding and consistency for:

- Standardization bodies
- Regulators
- Vehicle manufacturers (OEMs)
- Suppliers

Major goal of the development is the consistent use of tests throughout different test instances, and above-mentioned entities within the automotive industry. Therefore, interoperability with existing standards and traceability has to be ensured.

4 Project resources

All information for project resources can be found in the accompanying Excel file.

Filename/URL:

5 Deliverables

A concept document describing a technical basis, including clear requirements, for how a suite of standards could support various testing workflows. The Blueprint of the Test Specification Group is updated.

5.1 Review Process

The process for deliverable review documented in the project guide is applicable to all projects (see [here](#)).

There will be 2 reviews conducted. The first will be a Project Group Review followed by an overall ASAM Members Review.

ASAM member review

6 References

<https://report.asam.net/>