

Concept Project ASAM OpenTEST

Based on ASAM Test Specification Study Group

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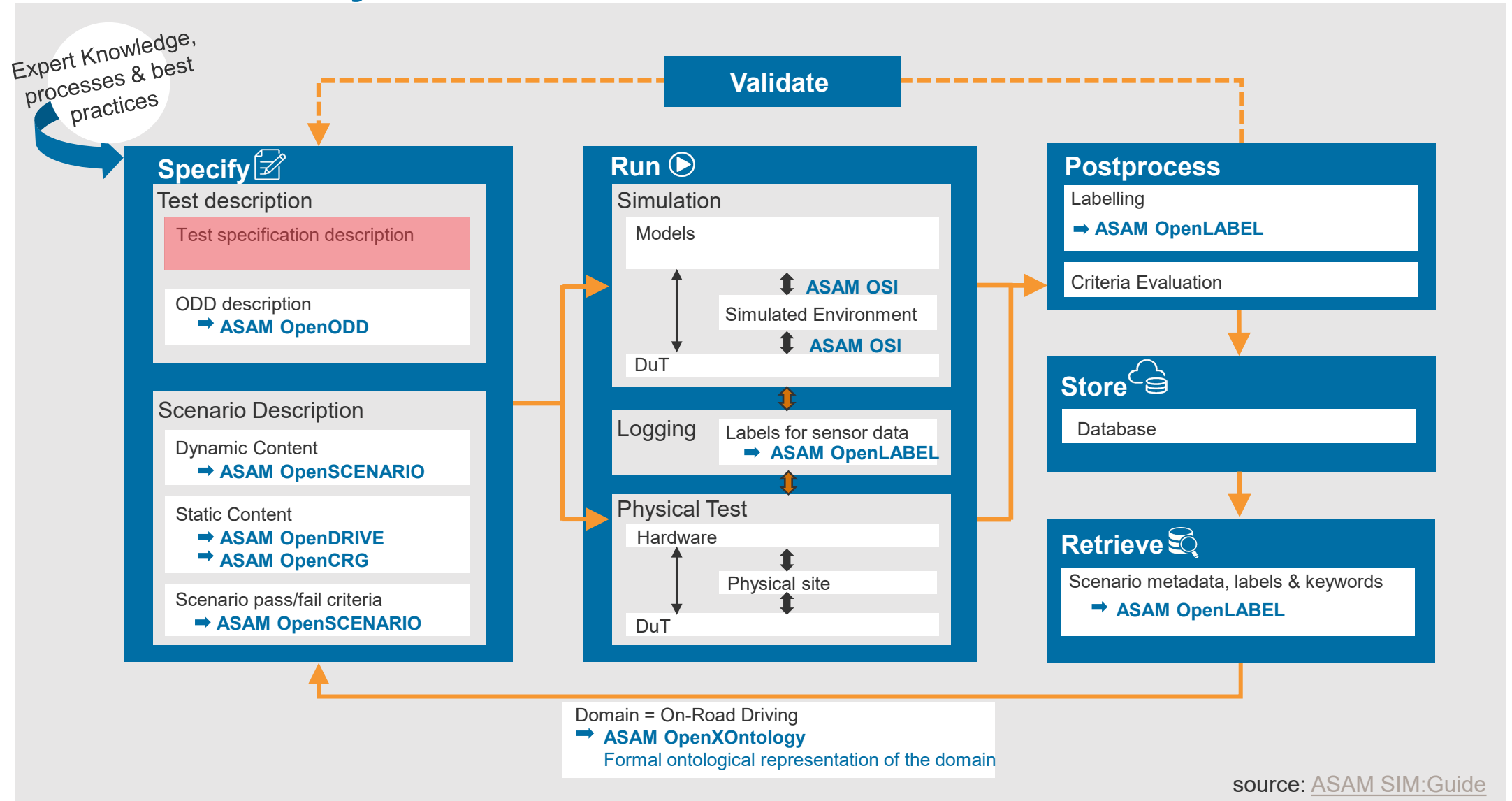


Agenda

- How did the activity start?
- ASAM Test Specification Study Group
- Concept Project ASAM OpenTEST

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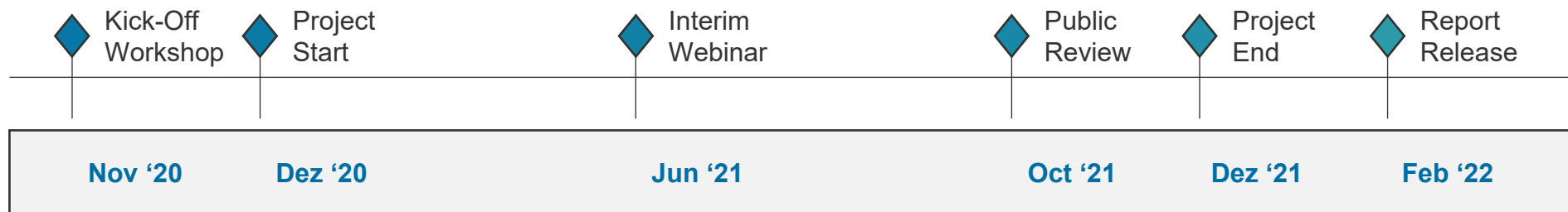


ASAM Test Specification Study Group

ASAM Test Specification Study Group

MISSION STATEMENT

- Examine relevant workflows and use cases for testing and homologation in the ADAS/AD domain
 - Identify relevant standards, potential workflows and their interplay
- Document a comprehensive overview of use cases, corresponding workflows, relevant users and standards
- Identify gaps in the workflows, leading to the identification of potentially needed additions to existing standards, liaisons between standards, or even the need for completely new standards
- Collect and document recommendations. Define a basis for follow-up activities and projects



ASAM Test Specification Study Group

REPORT

- Examination of **relevant test techniques and use cases for testing and homologation** in the ADAS/AD domain
- Documentation of **overall use cases for testing and homologation**, workflows implementing these, an overview of relevant users, standards and their application
- **Recommendations** for additions to existing standards or creation of new standards
- Core goal: **Define a valid basis for follow-up activities and projects**

Read the full report!

report.asam.net



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TEST STRATEGY BLUEPRINT Test Methods and Use Cases

- Blueprint to meet the challenges of testing
- Holistic best practice that can be tailored to the specific requirements, but meets regulatory, legal, and technical requirements
- Possible basis for the homologation of automated driving functions and software-defined vehicles

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)	PROVING GROUND	OPEN ROAD TESTING FIELD MONITORING
REQUIREMENTS- BASED TEST (FUNCTIONAL TEST) <i>Software architectural design/Specified functionality</i>	<u>More details 5.2.2</u> Requirements-based testing MIL +	Test of ADAS/AD software via open loop e.g. detection quality	Testing of ADAS/AD software stack in closed loop For example the trajectory planning algorithms		Testing of complete effect chains of ADAS/AD function in closed loop e.g. integration testing of software and hardware	<u>More details 5.2.7</u> 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	Testing of the ADAS/AD functions under real-life use cases in the field e.g. shadowing
INTERFACE TEST <i>Software unit implementation/ Hardware-software interface specification</i>			Software integration tests e.g. test of interfaces for communication between ...	<u>More details 5.2.6</u> 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>	<u>More details 5.2.3</u> 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		<u>More details 5.2.8</u> 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	Testing of system reaction in controlled environment e.g. testing of system reaction to the most relevant scenarios	Validating the complete system in real-life use cases e.g. endurance testing in the field

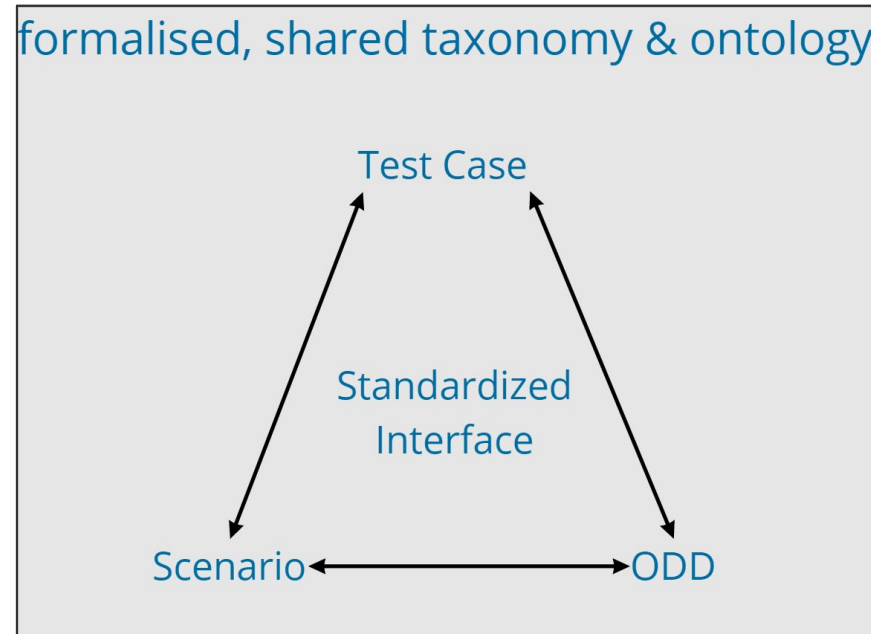
source: ASAM Test Specification Study Group Report

ASAM Test Specification Study Group

STANDARDIZED INTERFACES

Recommendations for a new standard at ASAM

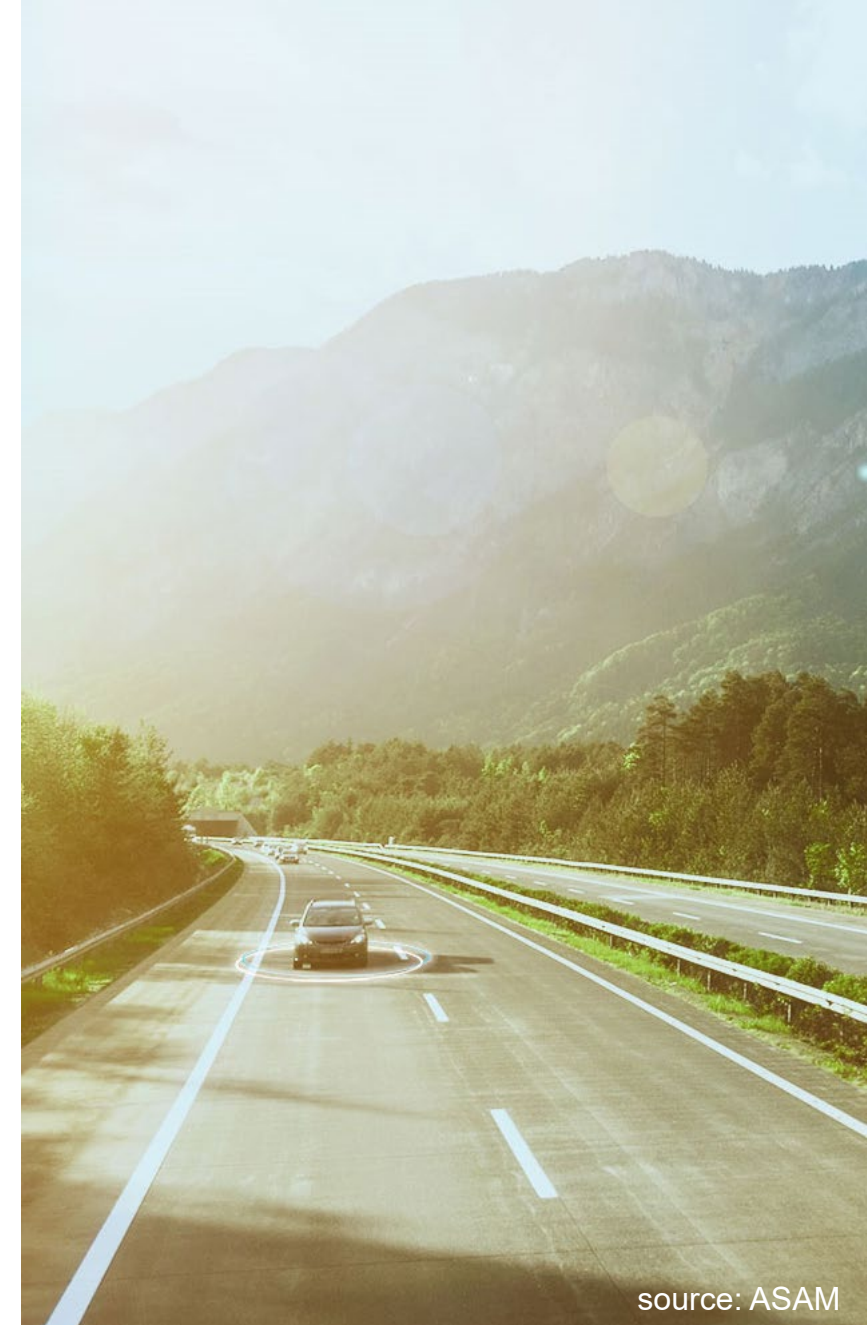
- Scenario-based testing is highly popular but it is only one part of testing
- To ensure support for various test methods, a flexible approach to the interaction between scenarios and tests is needed
- **Standardized interfaces between test cases, scenarios and ODD definition** are needed



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FURTHER RECOMMENDATIONS

- Investigate the potential benefit of a **testing application ontology**, align with **OpenX** domain model
- **Align** with the standards FMI, ASAM MDF, ASAM OSI, and **ASAM XIL**
- Consider ADAS/AD domain model in associate ASAM ODS standard
- Investigate the potential of **ASAM OTX**, **XIL** and **ATX** more closely for scenario-based testing
- Increase the understanding of data-driven development and testing
- Consider extension of **ISO 26262** and renewal of proposed test procedures and test strategy for the next edition
- **Most importantly:** Increase **global alignment** between standardization efforts in the testing domain worldwide



source: ASAM

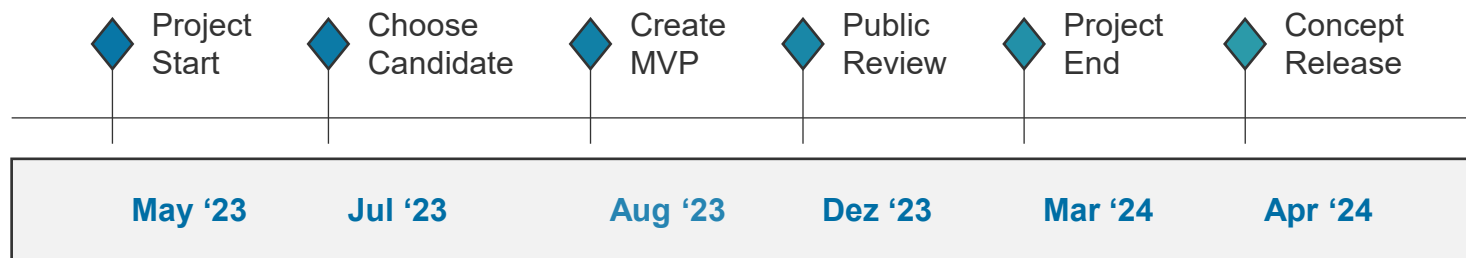
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GOALS

Develop a technical basis, including clear requirements, for how a suite of standards could support various testing workflows

- Build on the test spec report to define requirements towards a suite of standards for testing. Use the blueprint as basis for defining the requirements
- Evaluate existing standards, standardization activities and/or proprietary solutions to determine if new standard(s) need to be defined
- Implement an MVP demonstrating consistent application of the concepts across different test platforms via a specific use case



source: ASAM

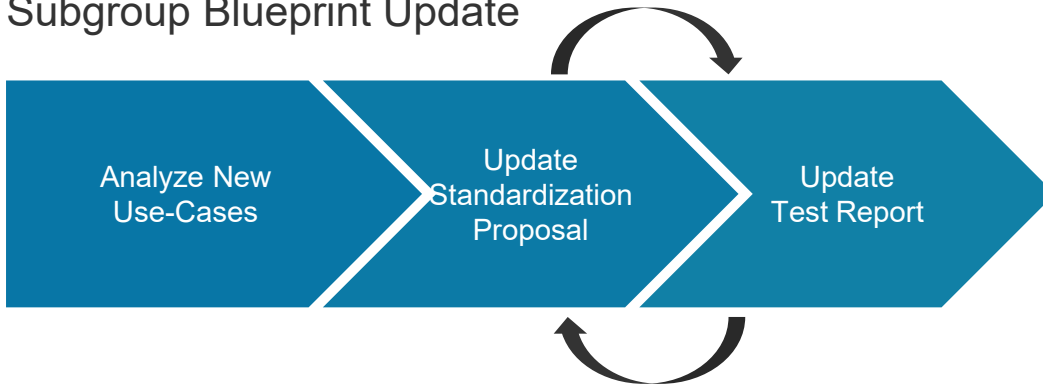
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PROJECT STRUCTURE

Subgroup Standardization Proposal



Subgroup Blueprint Update



Concept Project ASAM OpenTEST

ENROLLMENT

- Project Number: C_2023_01 ASAM OpenTEST
- Project Type: Concept Project
- Proposal Submitter: BMW, dSPACE
- Domain: Test Automation

Proposal: [Download here](#)

- Deadline Mar 27th, '23

Please enroll!

<https://www.asam.net/project-detail/c-2023-01-asam-opentest/>



source: ASAM

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