

Standards for simulation and testing

Covering the real and the virtual world

Marius Dupuis
CEO ASAM e.V.

Dr. Klaus Estenfeld
Executive Advisor ASAM e.V.

Oct 11th - 13th, 2022
SIP-adus Workshop 2022



Association for Standardization of
Automation and Measuring Systems

Agenda

I'll keep it short!

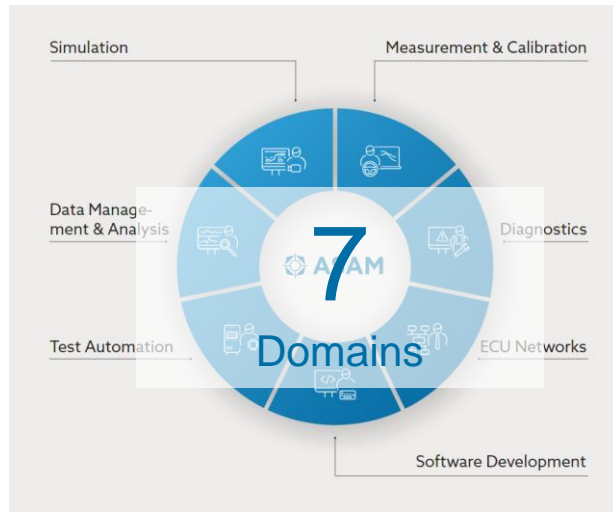
- 1 **ASAM in a nutshell**
- 2 **ASAM standards for ADAS/AD**
- 3 **Strong standards**
- 4 **Outlook**

ASAM in a nutshell

ASAM in a nutshell

A member-driven nonprofit organization

ASAM = Association for Standardization of Automation and Measuring Systems



A large graphic displaying '400+ Members' in the center, surrounded by logos of various industry partners categorized into: OEMs, Tier-1 Suppliers, Tool Vendors / Service Providers, and Universities / Research Institutes.

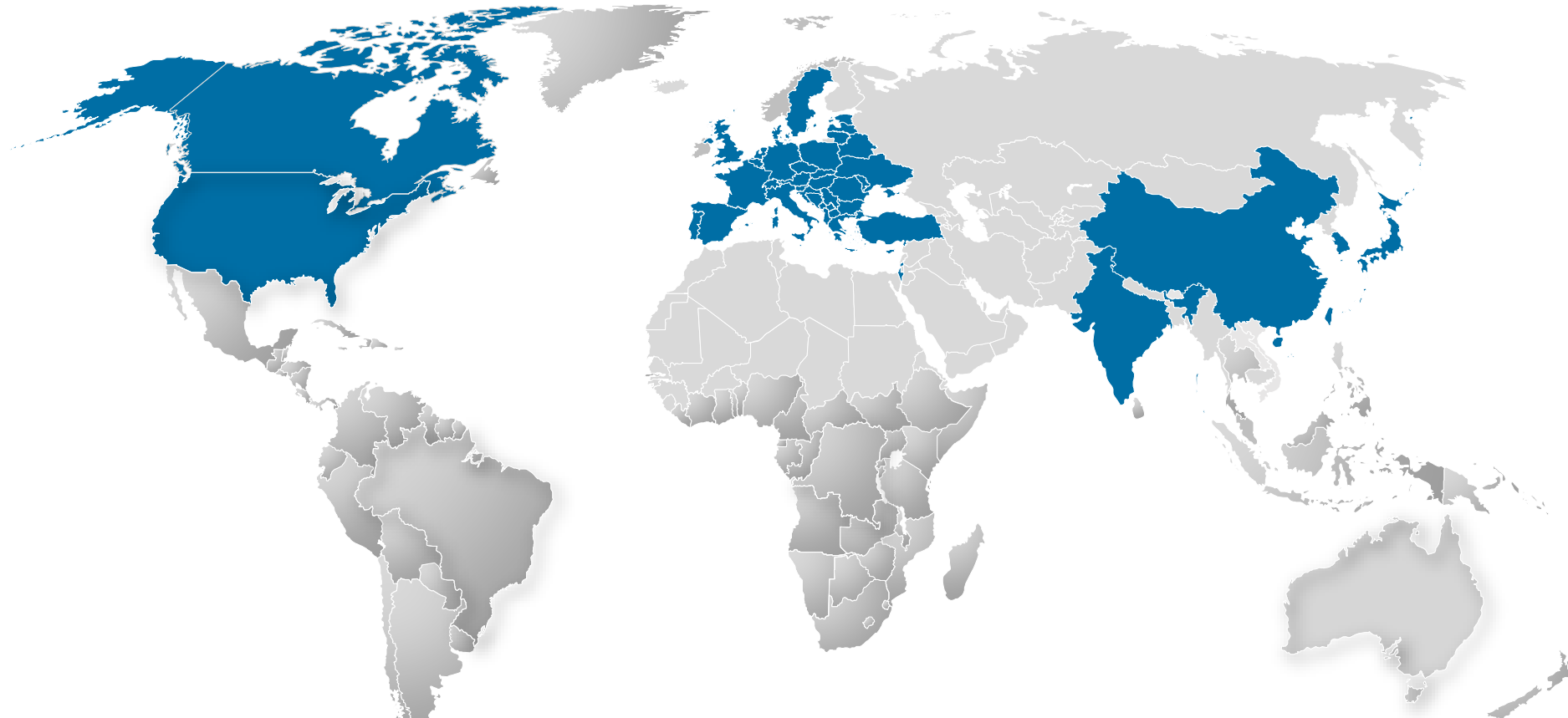
Measurement & Calibration	Diagnostics	ECU Networks	Software Development	Test Automation	Data Management & Analysis	Simulation
ARTI	MCD-2-D	MCD-2-NET	CC	ACI	CEA	OpenCRG
CDF	MCD-3-D		FSX	ASAP 3	ODS	OpenDRIVE
CMP			ISSUE	ATX		OpenLABEL
CPX			DX	GDI		OpenODD
HMS			MBI	iLinkRT		OpenSCENARIO
MCD-1-CCP			MDX	MCD-3-MC		OSI
MCD-1-POD			SCDL	OTX Extensions		
MCD-1-XCP						
MCD-2-CERP				XIL-MA		
MCD-2-MC						
MDF						

37
Released Standards



ASAM – a truly international association!

ASAM Japan G.K. is your direct contact in Tokyo



Membership
Revenue:

13,6%

50,5%

35,9 %

Status: Jul 05, 2022

ASAM in Japan

Currently 53 members

OEMs



Tier-1 Suppliers



Tools Vendors



Academics



Status: Jul 05, 2022

ASAM Development

From the first idea to the publication of a standard



Guiding Principles:

- **Member-driven**
Initiatives and decisions are taken by the member companies.
- **Open collaboration and exchange**
ASAM requests open exchange among all stakeholders.
- **Domain expertise**
ASAM has a global network of domain experts to develop standards
- **Flexible processes**
ASAM has lean yet flexible process structures leading to short development times
- **Project support**
Experienced Technology Managers support the working groups

Strategic partnerships



AUTOSAR –
AUTomotive Open System ARchitecture
www.autosar.org



Eclipse Foundation
www.eclipse.org



IAMTS e.V.
International Alliance for Mobility Testing and
Standardization
www.iamts.org



ISO
International Organization for Standardization
www.iso.org



MIPI Alliance
www.mipi.org



Modelica Association / FMI - Functional
Mock-up Interface
www.fmi-standard.org



MOST Cooperation
www.mostcooperation.com



prostep ivip Association
www.prostep.org



SAE International
www.sae.com

Government funded R&D projects



KisSME

Artificial Intelligence (AI) for the selective near-real-time recording of scenario- and maneuver data during the testing of highly-automated vehicles

- Funded project, Germany
- <http://www.kissme-projekt.de/>



RDV - Real Driving Validation

Extension of the verifiability of continuous SW Integration in communication with vehicles in the field

- Funded project, Germany
- www.eclipse.org



Set Level

SET Level creates an environment for simulation-based testing and development of automated driving functions (simulation platform).

- Funded project, Germany
- Duration: 2019 - 2022
- <https://setlevel.de/>



SIP-adus

(Strategic Innovation Program - Innovation of Automated Driving for Universal Service)
Implementation of cooperative automated driving.

- Funded project, Japan
- Duration: 2014 - 2023
- <https://en.sip-adus.go.jp/>



TreuMoDa

(Trust Office for Mobility Data)
Guidelines for the data protection-compliant exchange, processing and storage of data.

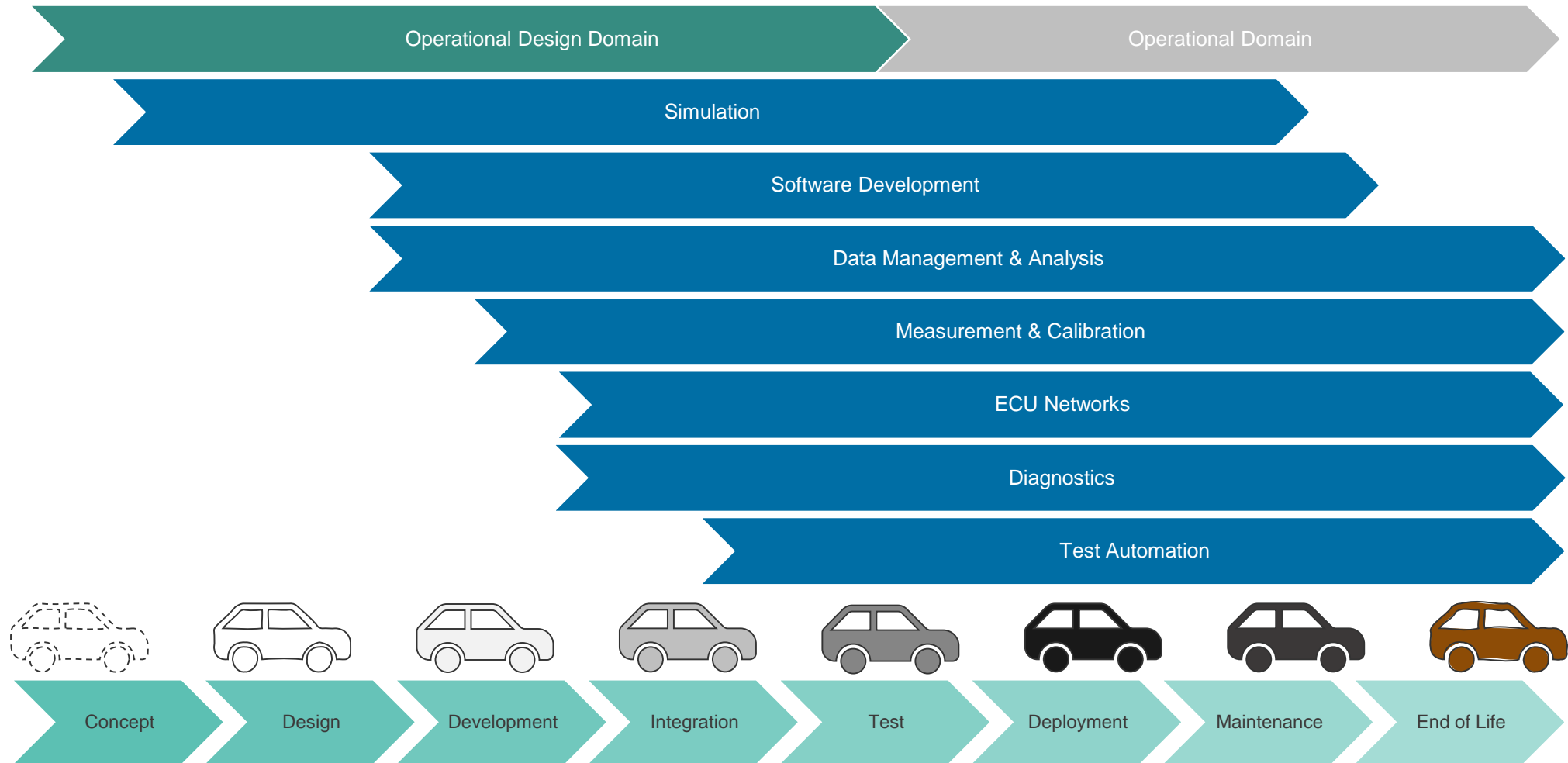
- Funded project, Germany
- Duration: 2022 – 2024
- <https://www.treumoda.de/>

ASAM standards for ADAS/AD

Supporting the entire lifecycle

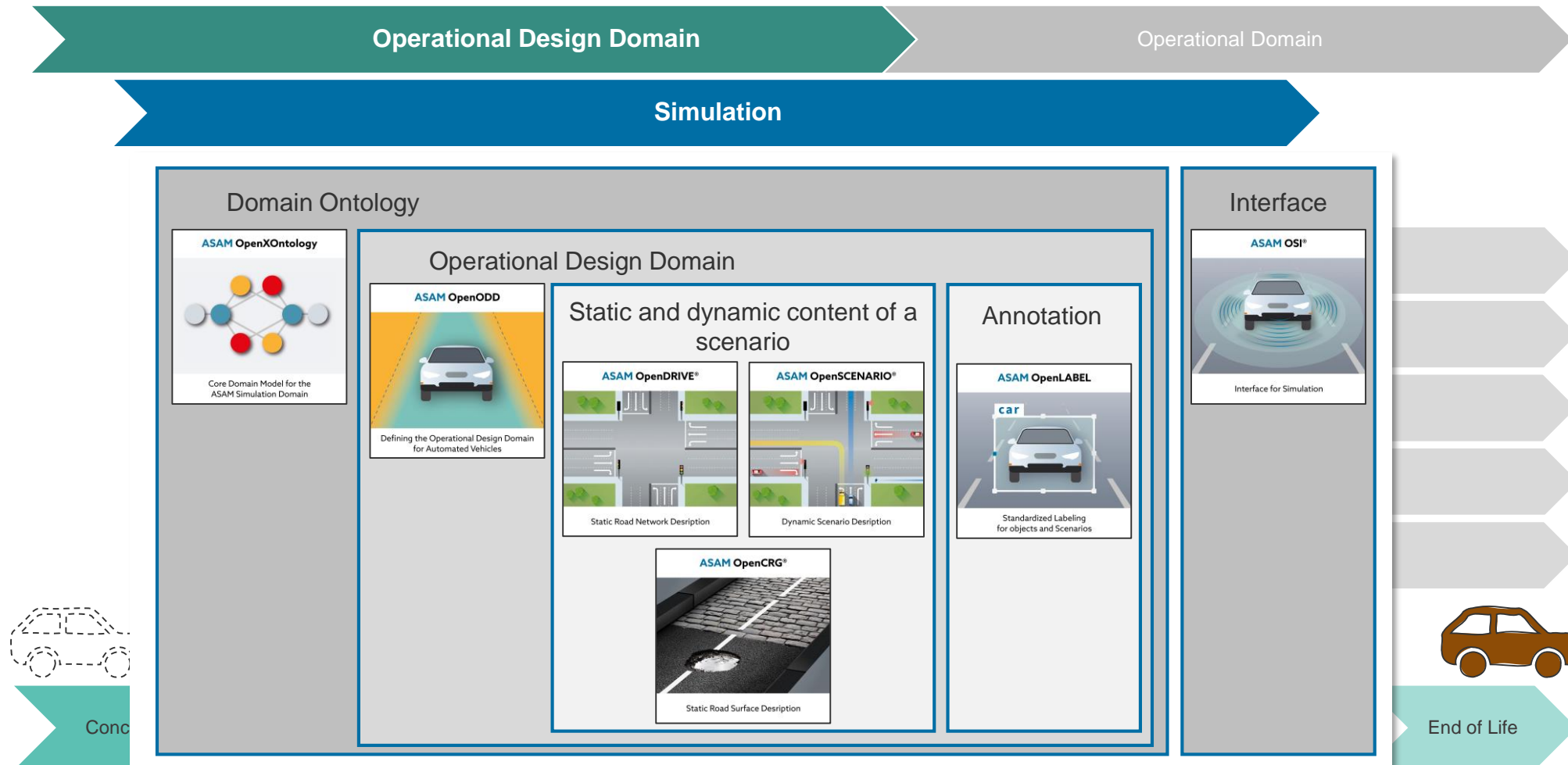
ASAM standards for ADAS/AD

The V-cycle and beyond – covered by ASAM domains



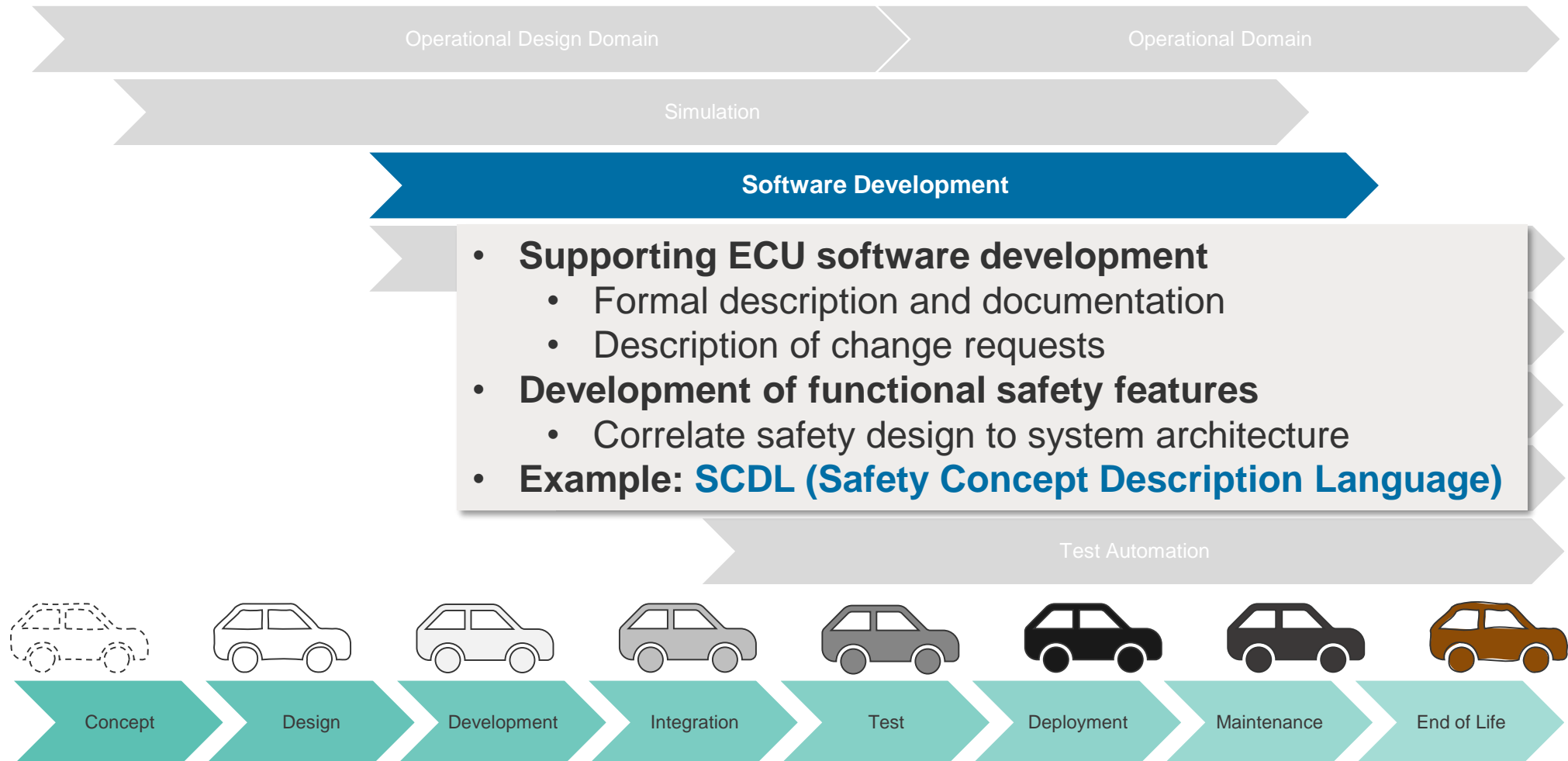
ASAM standards for ADAS/AD

Domains in Detail



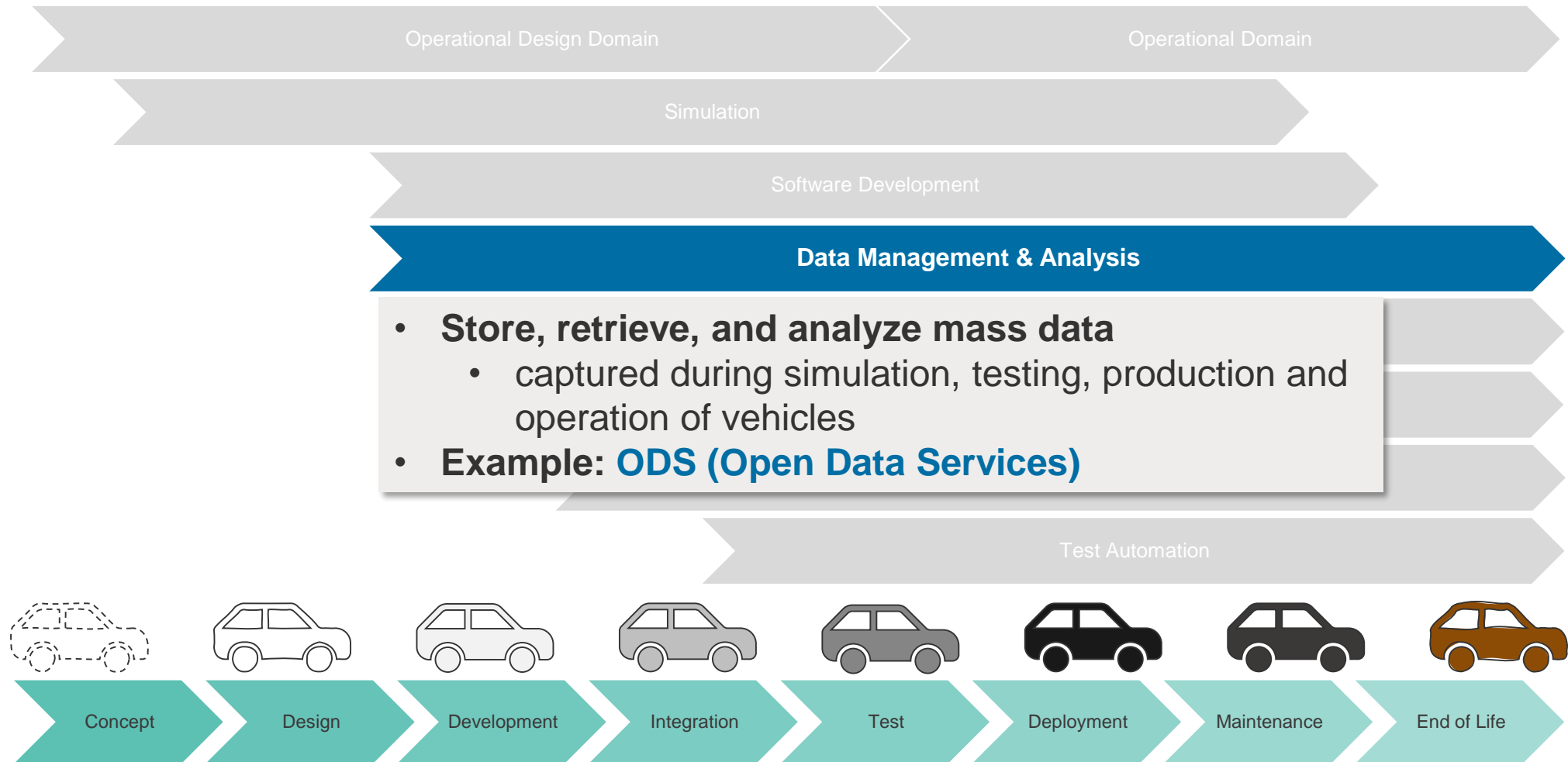
ASAM standards for ADAS/AD

Domains in detail



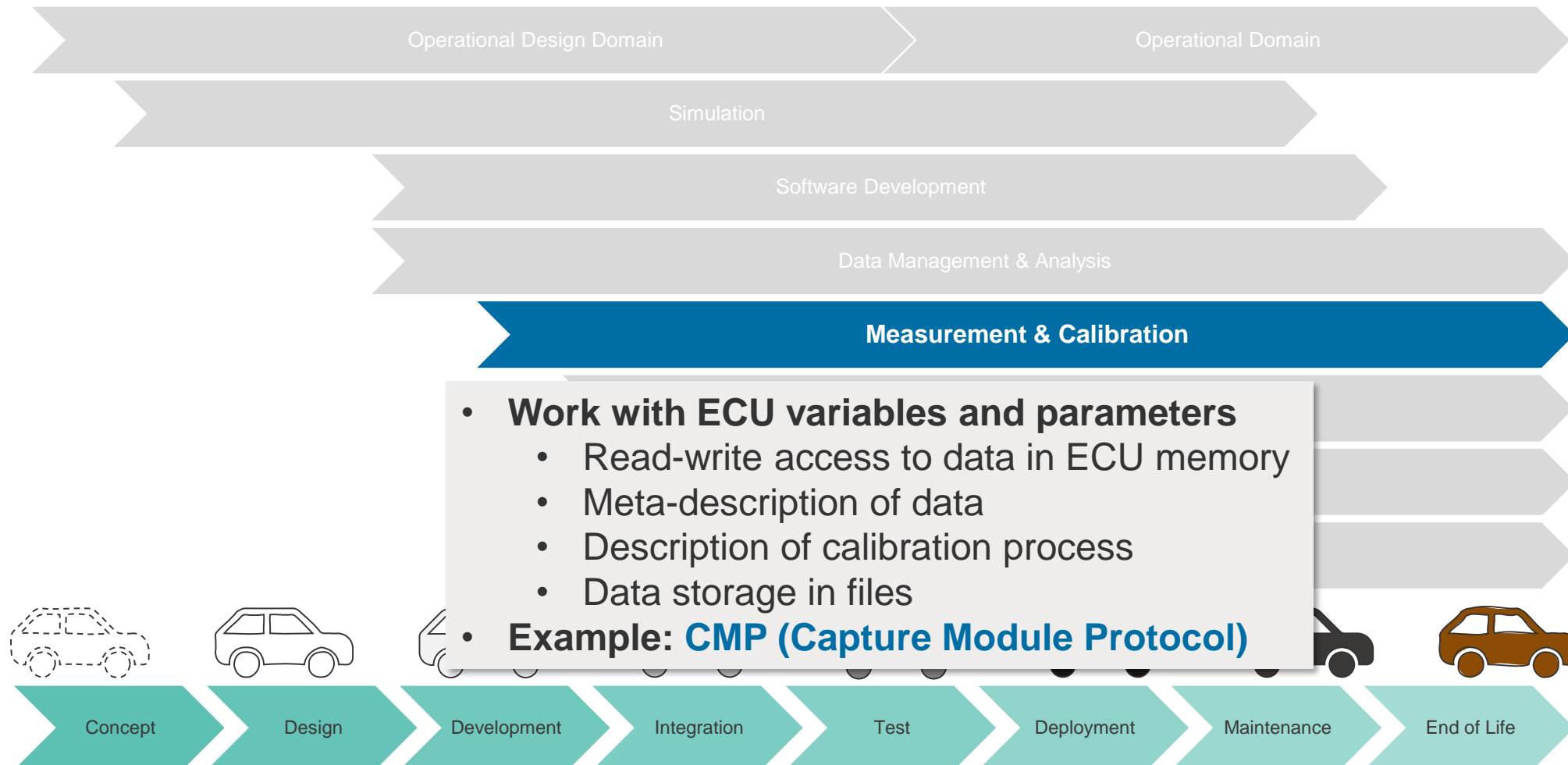
ASAM standards for ADAS/AD

Domains in detail



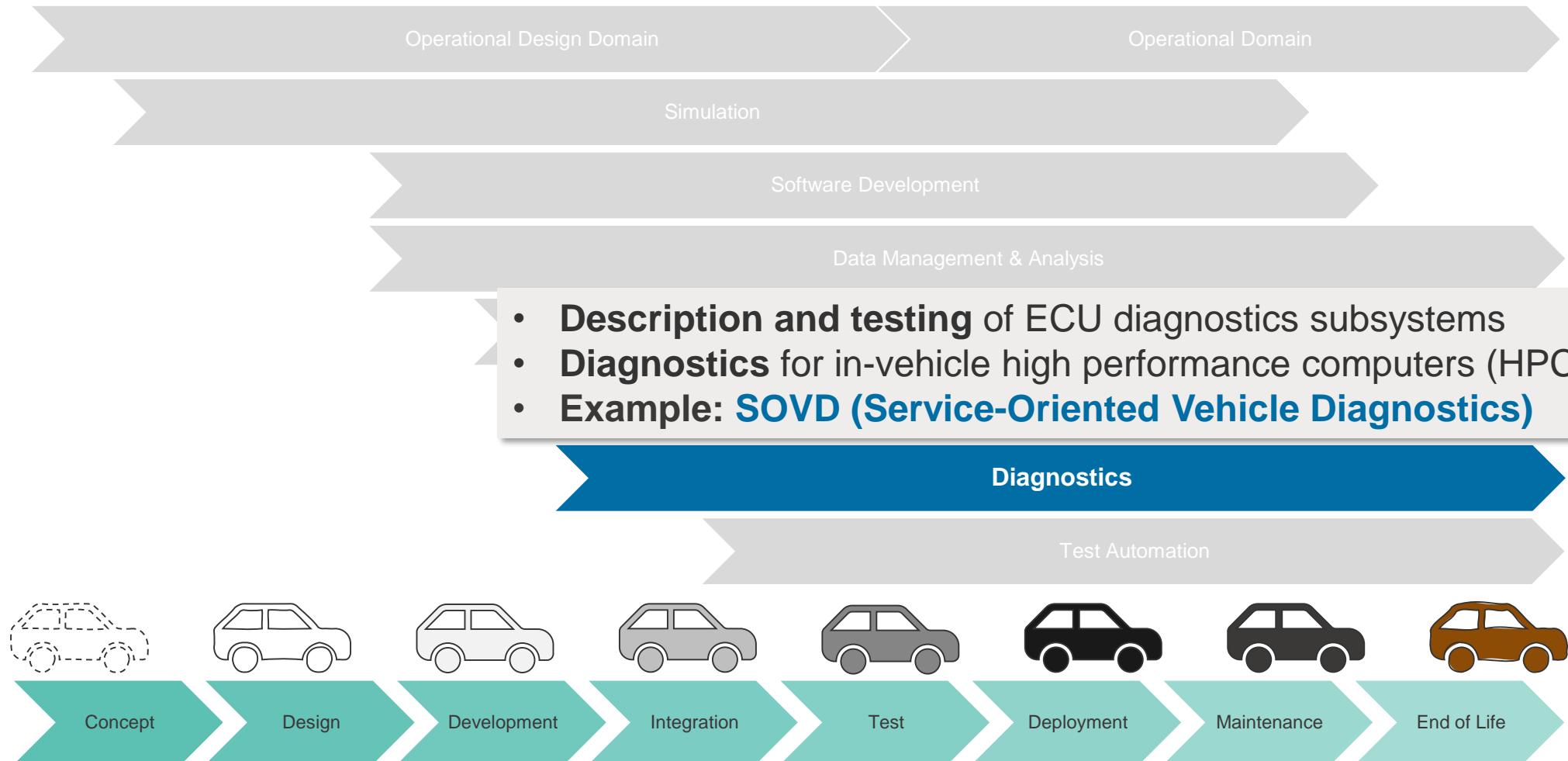
ASAM standards for ADAS/AD

Domains in detail



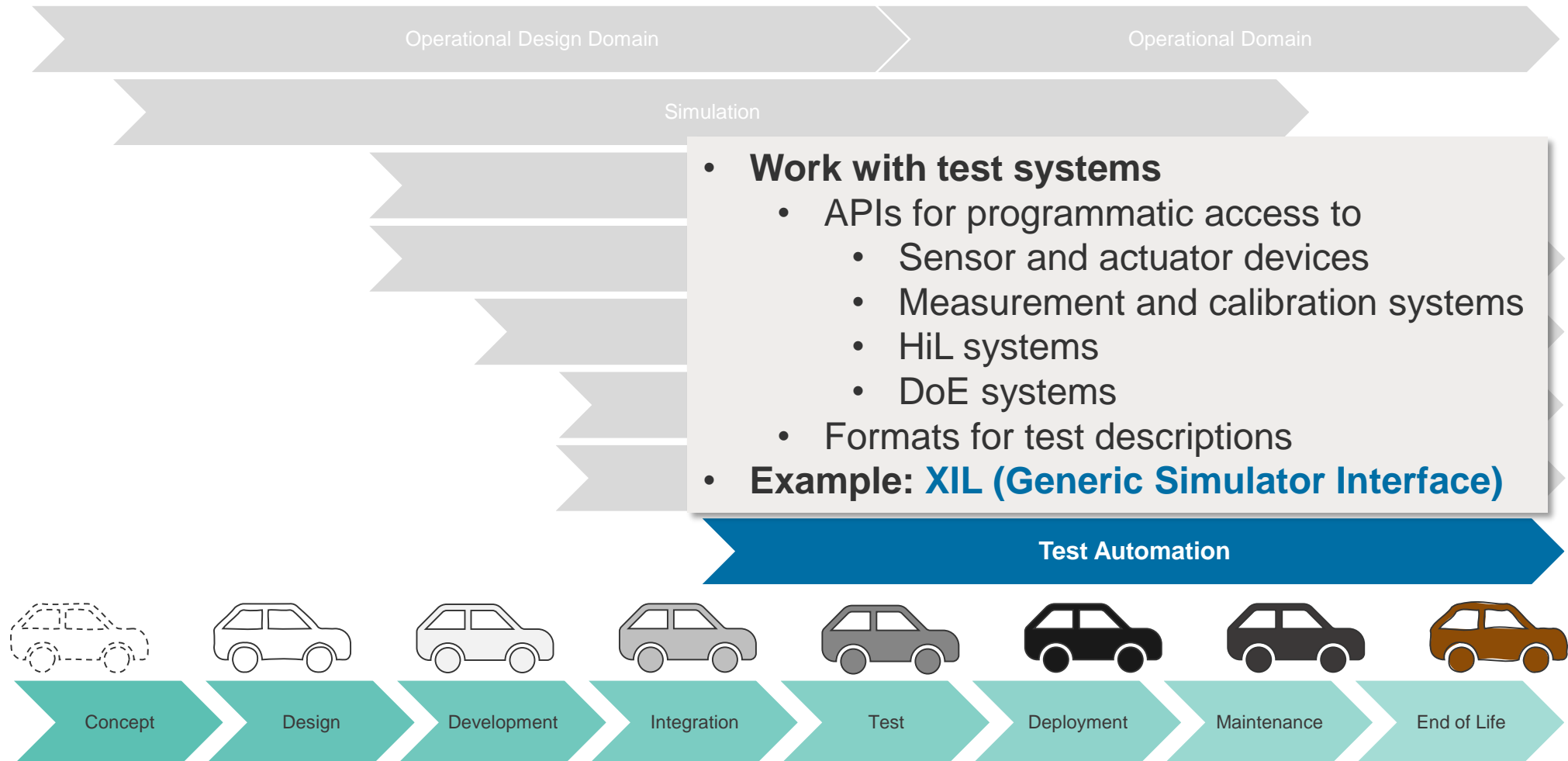
ASAM standards for ADAS/AD

Domains in detail



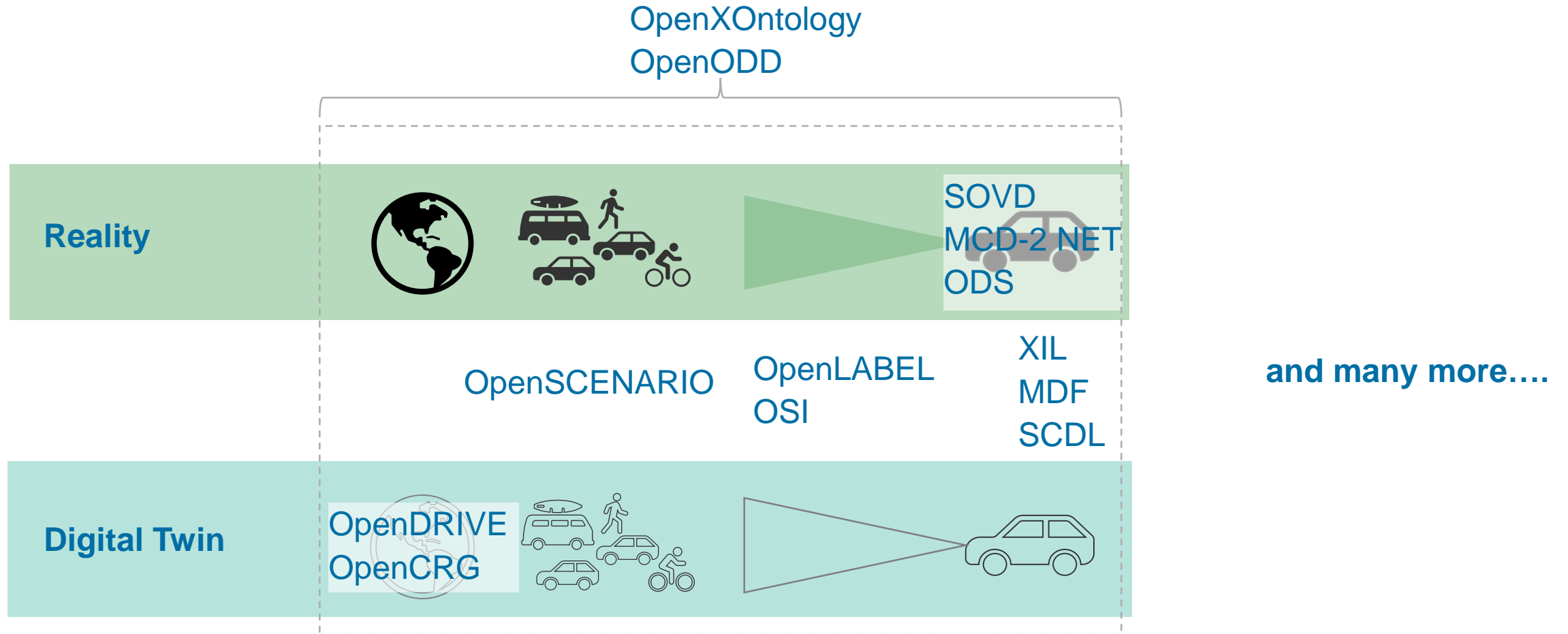
ASAM standards for ADAS/AD

Domains in detail



ASAM standards for ADAS/AD

Connecting virtual and real world

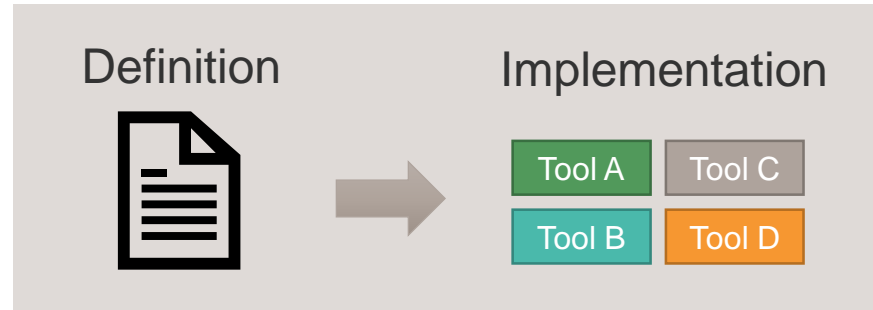


Strong standards

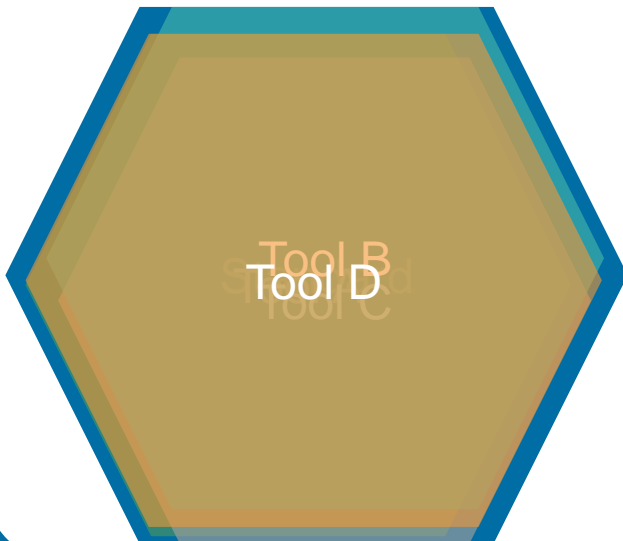
Creating credibility

Motivation

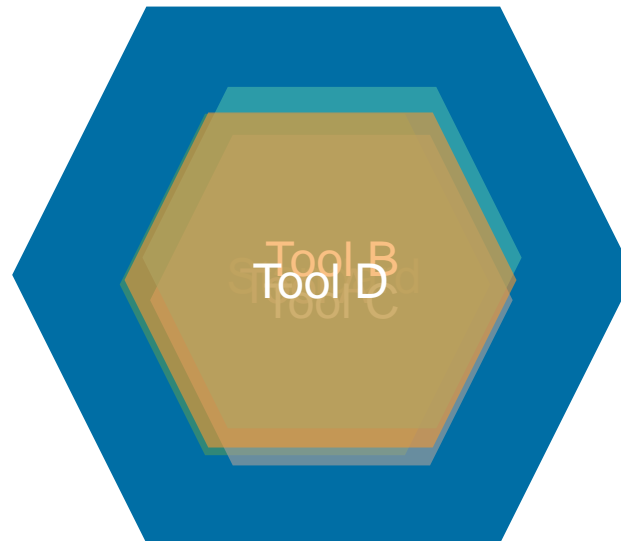
Creating strong standards



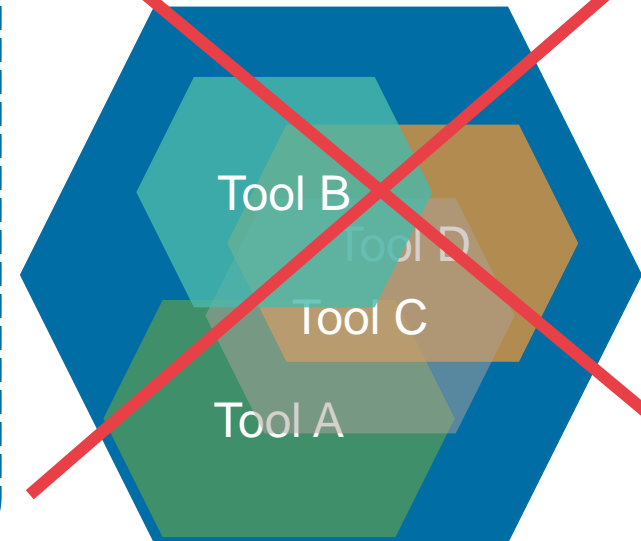
Strong established standard
(large and consistent adoption rate)



Strong emerging standard
(moderate but consistent adoption rate)



Weak standard
(small and inconsistent adoption rate)



What to avoid...

A real-world example from another domain

Definition



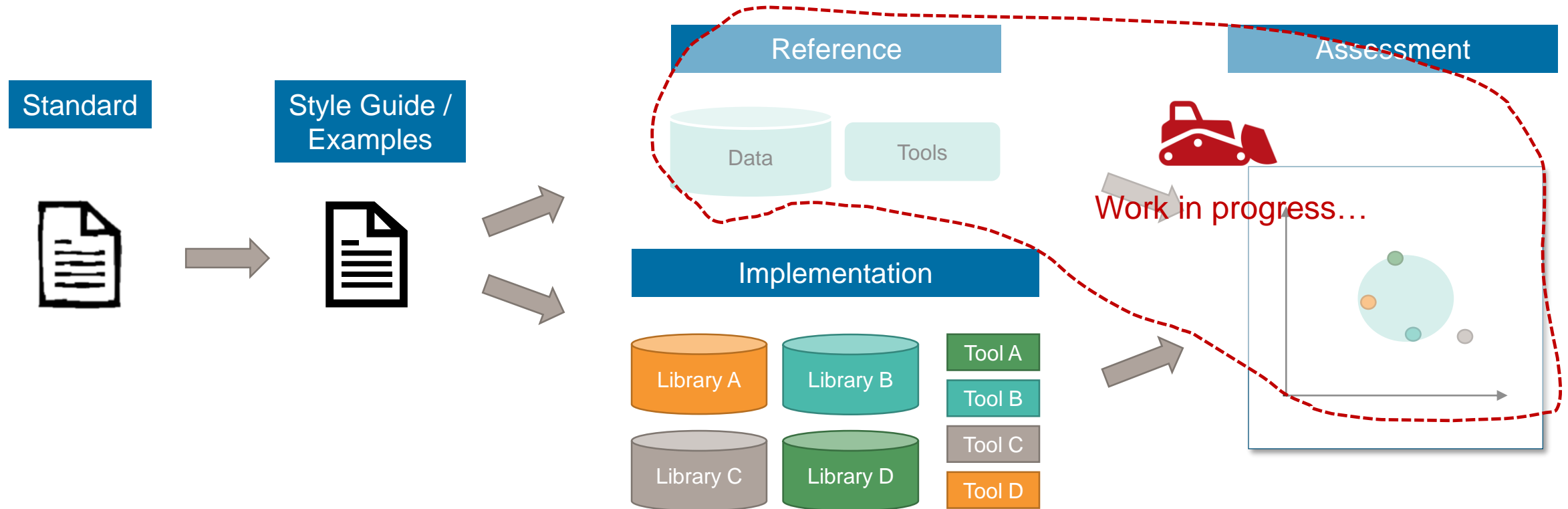
Implementation



Eight options to buy a single coffee

Proposed solution

Creating strong standards



Outlook

Continuous development

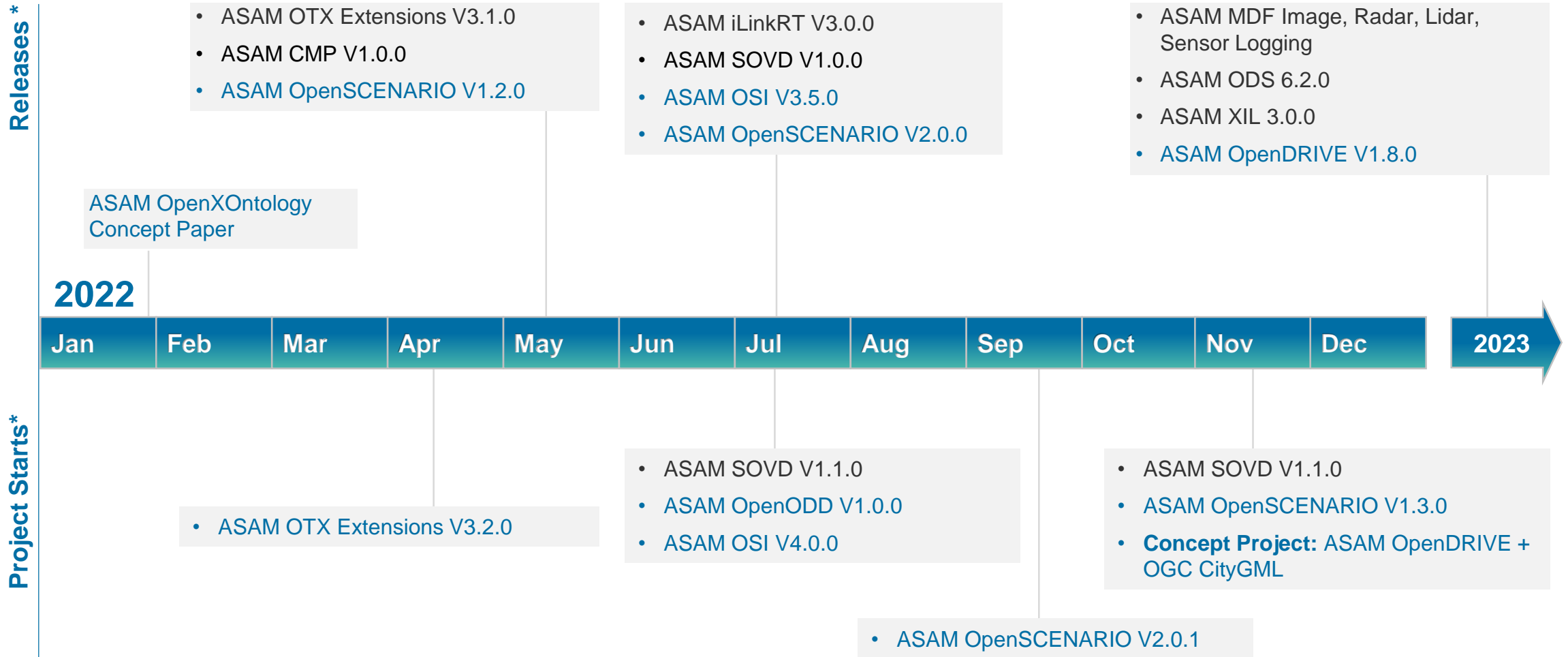
The big picture

Testing software-centric vehicles

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

Release and Project Roadmap 2022

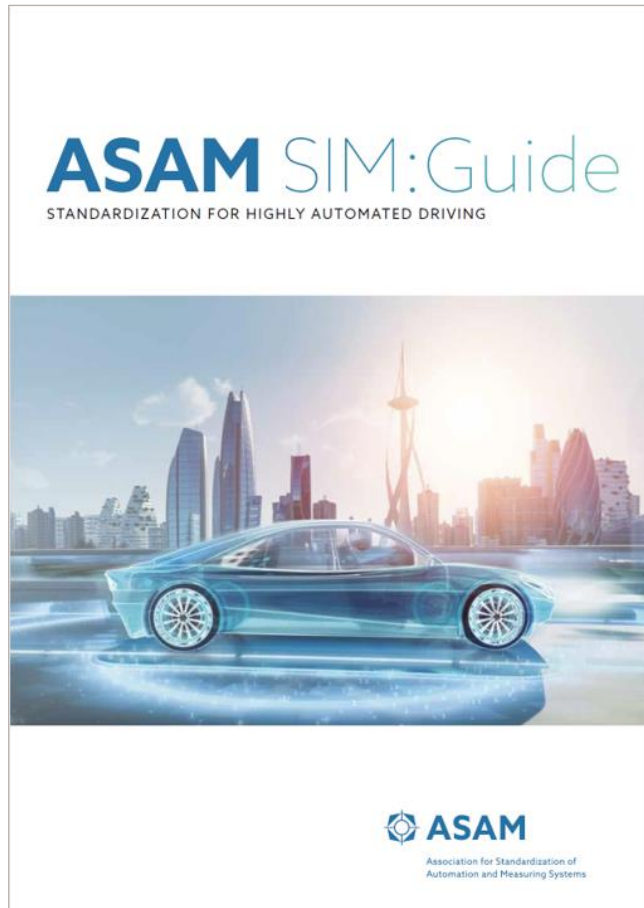
This year, we had two completely new standards releases (ASAM CMP, ASAM SOVD).



Status: Jul 05, 2022

ASAM SIM:Guide

Standardization for highly automated driving



The guide contains

- Introduction to the ASAM domain "Simulation"
- All current standardization activities by ASAM in the domain
- Current standardization activities outside of ASAM
 - > places the ASAM OpenX standards in the larger context of a global standardization landscape
- Application stories from our members
 - > how do our members use the OpenX standards
 - > how have these standards helped to improve processes
 - > how are they facilitating customer projects

Order your copy today:

www.asam.net/asam-guide-simulation

ASAM International Conference 2022

On Nov 29 – 30, 2022, ASAM will hold its 5th International Conference as a face-to-face meeting

Nov
29-30
2022

**Towards ADAS and AD certification –
Integrated development and testing based on standards”**

Dresden,
Germany



Conference...



Trade Show...

Networking...

Conclusion

Why ASAM?

Conclusion

ASAM provides the



- Motivation
- Know-how
- Framework and
- Community

for efficient development, deployment and maintenance of standards that are relevant to making Automated Driving a reality – today and tomorrow!

Thank you for your attention!

Marius Dupuis

CEO
ASAM e.V.

email: marius.dupuis@asam.net

Dr. Klaus Estenfeld

Executive Advisor
ASAM e.V.

email: klaus.Estenfeld@asam.net

