ASAM – Open Standards

Proposal Workshop ASAM Quality Checker

Ben Engel
CTO
ASAM e.V.

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Höhenkirchen

ASAM Association for Standardization of Automation and Measuring Systems

Where do we stand today in our projects?

>400 participants

>200 unique companies

9 Standardisation projects

2 Concept projects

1 Study group

9 Releases in 2022

1 Ongoing ideation

3 Proposals being prepared

6 Office employees supporting projects

Ongoing standardisation efforts…

SOVD
Communication with SDVs

ODS
Test data management

OpenSCENARIO
Description of dynamic content

XIL
Communication between test automation tools and test benches

OTX
Definition of test procedures

OpenDRIVE
Description of logical road networks

OSI
Interface for the environmental perception of AD functions

OpenTestSpecification
Hollistic test specification

OpenODD
Specification of ODDs

MDF
Storage of measurement data

OpenLabel
Data structure for labels & tags

OpenSCENARIO

ASAM

OpenSCENARIO Differentiation Statement

ASAM OpenSCENARIO®

OpenSCENARIO 1.x

- XML schema for describing scenarios with synchronized maneuvers of vehicles, pedestrians, and other traffic participants
- Supports specifying precise trajectories with capability to parameterize and vary their properties
- Structured format that can be validated, edited, imported, and exported by simulation tools and content editors
- Tuned to support trigger-action scenario descriptions
- Optimized for simple machine parsing and processing
- Primary use case: predictable highly precise scenarios that may be used with external test specification for V&V

OpenSCENARIO 2.x

- Domain specific programming language for describing test scenarios of synchronized maneuvers of vehicles, pedestrians, other traffic participants and ADS function control
- Supports specifying scenario intent at a higher level of abstraction along with KPIs, checks, & coverage metrics
- Built-in abstract road descriptions
- Designed to enable exploration of scenario/functionality space to identify potential unknowns
- Optimized for composability to maximize scenario reuse
- Designed as V&V programming language
- Enables higher level of automated test generation at scale
- Primary Use case: Large scale V&V

The differentiation between the two standards is by their primary use cases. A primary use case describes the main use case for which the standard is intended and a key consideration behind many design decisions. The primary use case is not exclusive, the standards may be (and are) used for a wide variety of additional use cases, with overlap, but these are not specified here.

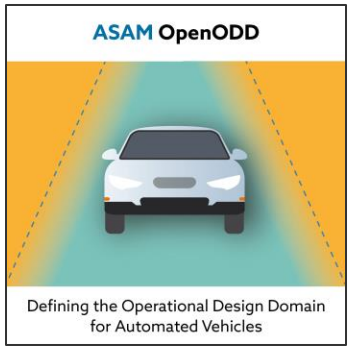
Roadmap

- The two versions, 1.x. and 2.x, shall be developed as two separate standards, with no formal migration nor convergence required by ASAM.

- Continued alignment of the two standards is encouraged but is subject to project participant interests and is not required by ASAM. This will be driven by the market/members and is not part of the formal roadmap of ASAM OpenSCENARIO.

OpenODD

What is an ODD in the context of OpenODD?



A machine and human readable format for representing a defined Operational Design Domain that is measurable and verifiable

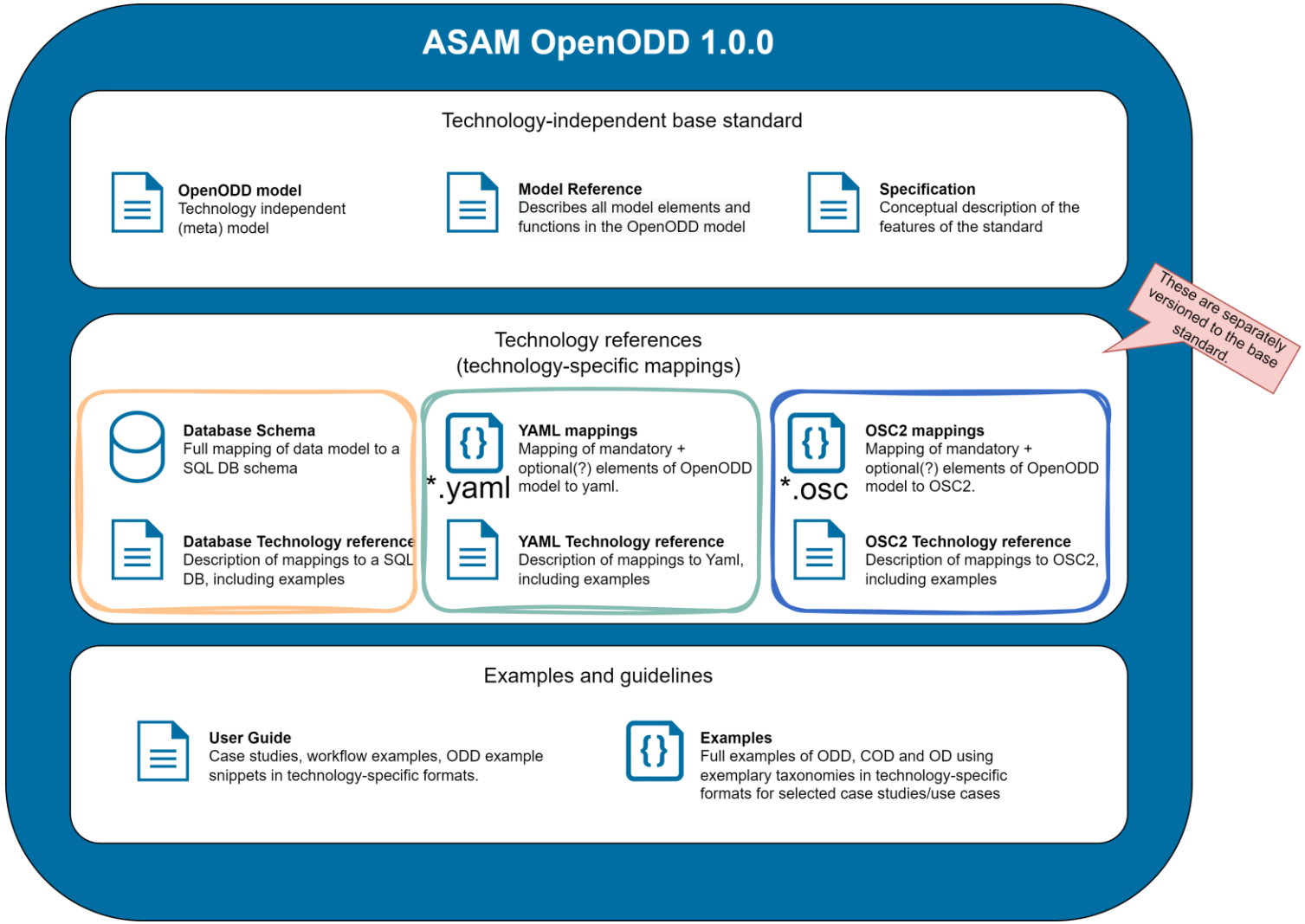
A list of attributes and values, based on a taxonomy or ontology

```
weather
  temperature:single(-20..40) [°C]
  rain
    light:(droplet_size:single,
        density:single) ((0..1),
        (0..1k)) ([mm^3], [1/m^3])
```

+

Boundary definition

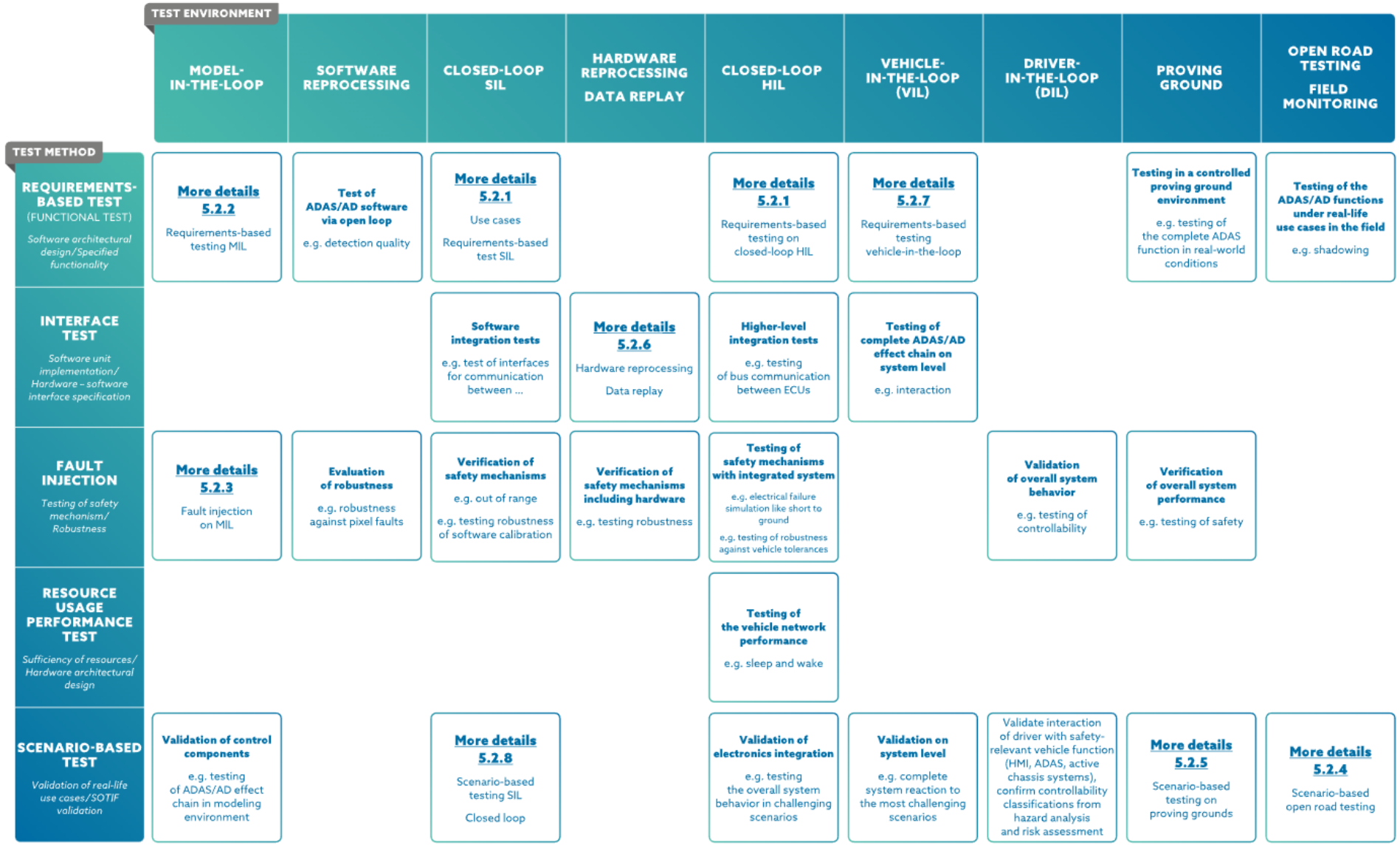
ASAM OpenODD deliverables



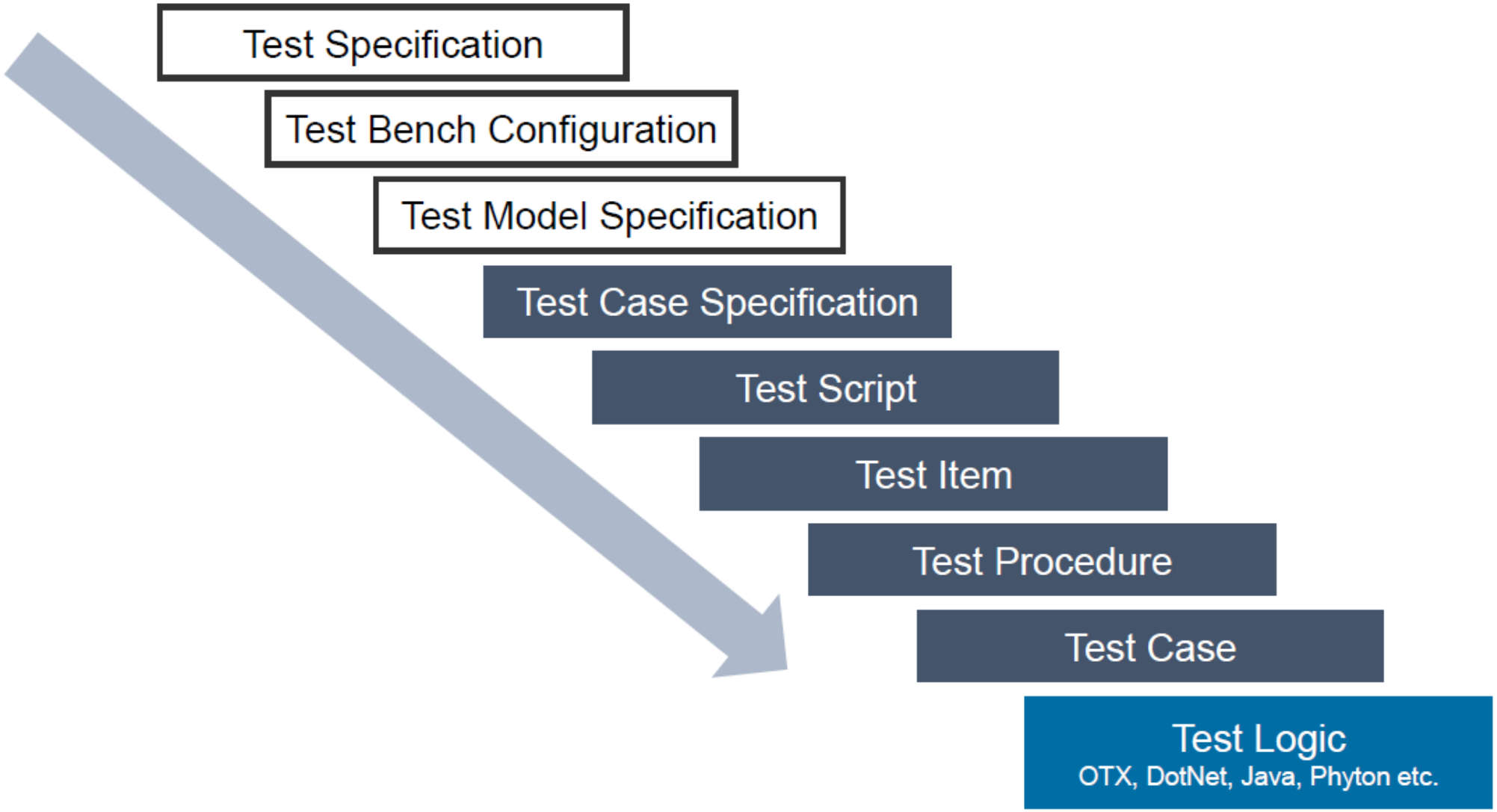
OpenTestSpecification

ASAM

Concept Project ASAM OpenTestSpecification



Concept Project ASAM OpenTestSpecification



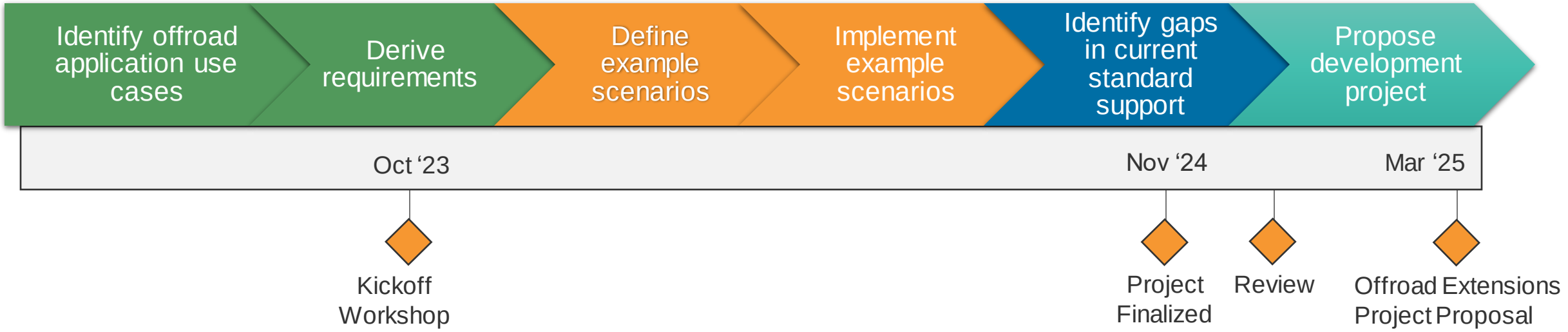
Offroad Challenges

- Complex 3D terrain
- Sensor modeling and surface materials (including link between appearance and physical characteristics)
- Object representation
  - Vegetation and other natural obstacles
  - Meshes, materials, physics
- Representation of the subsurface
  - Soil strength, density, temperature, water content
  - Effects on mobility
- Vehicle-terrain interaction and material dynamics
  - Mud and water spray
  - Mud and snow deformation
  - Accumulation of material on vehicles
- Weather conditions
- Occlusion of sensors
  - Mud, snow, dirt in the air and on camera lens

Concept Project ASAM OpenX in Offroad Applications

GOAL

- Evaluate the need for extensions to existing standards or development of new standards to support modeling and simulation of (a) vehicle mobility in off -road conditions and (b) earth moving for digging, loading, and hauling



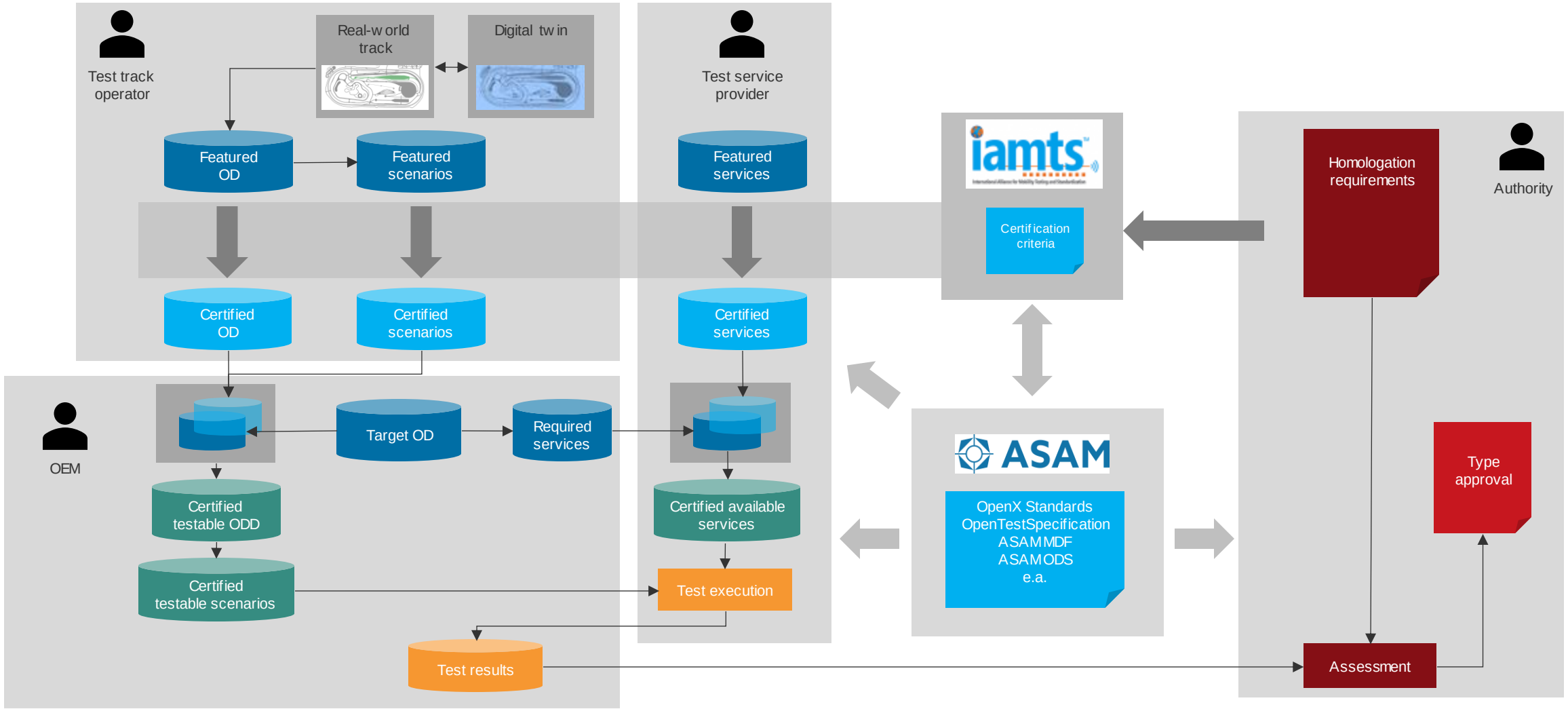
Upcoming topics

Describing and Certifying Proving Grounds with the help of ASAM standards

ASAM

Collaboration along the workflow

How it works – on OD(D) level

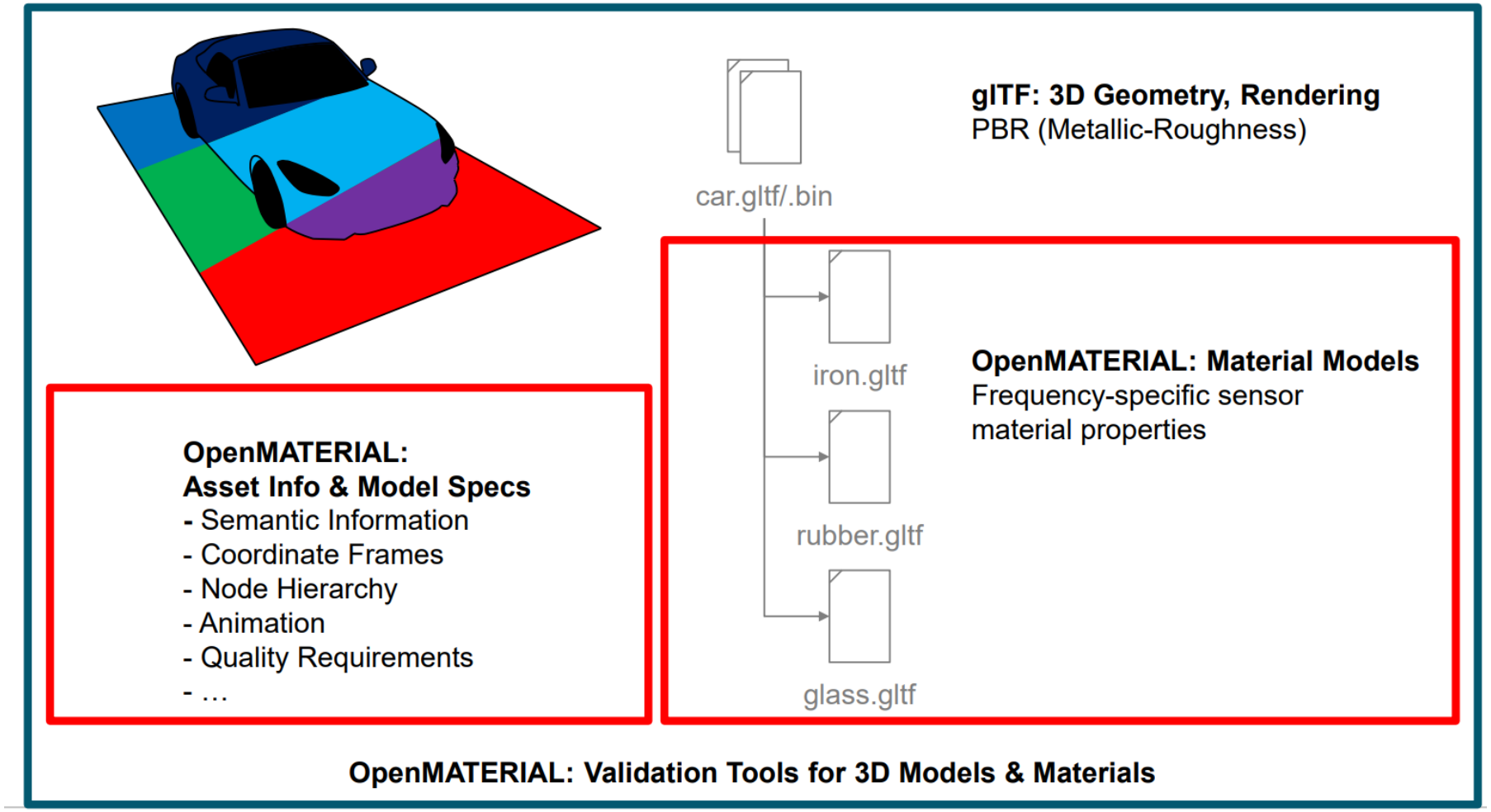


OpenMaterial

OpenMaterial

Status

Standardized data structure for materials and 3D assets



Define a format for material properties

Extend OSI Sensor View to support material properties

Define a format for data associated with assets

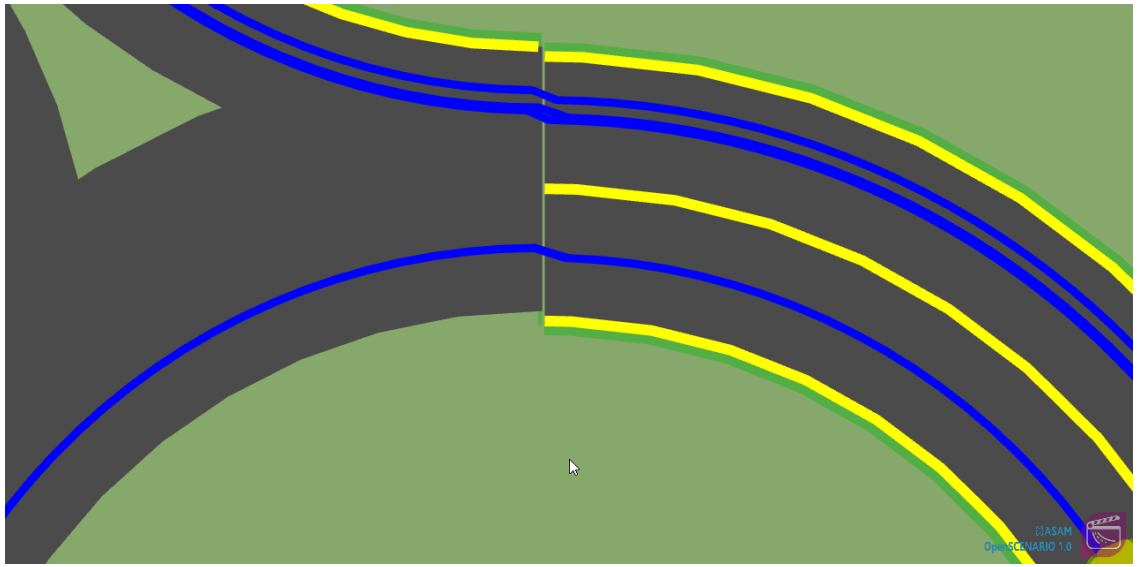
Define a data structure for 3D models

Image credit: L. Friedmann, BMW

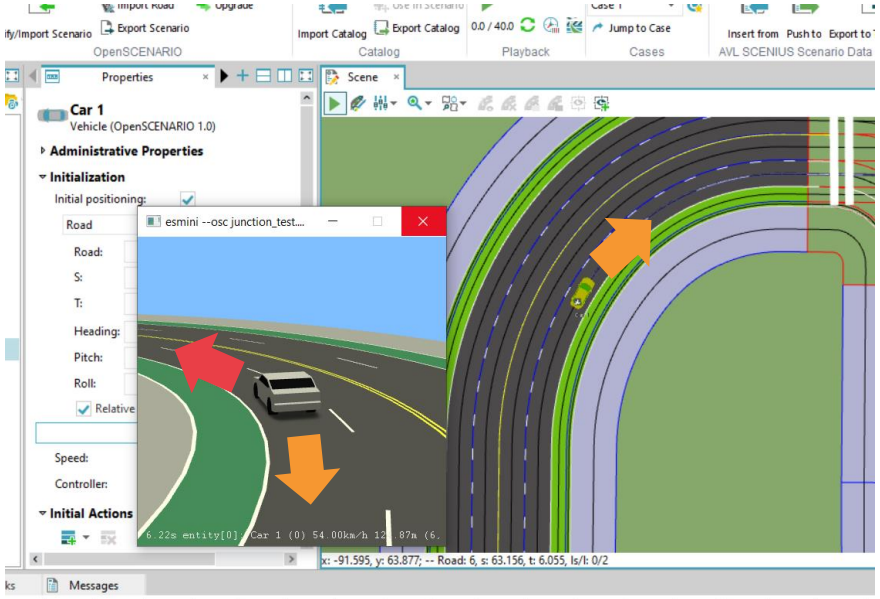
Quality Checker

Ambiguity examples

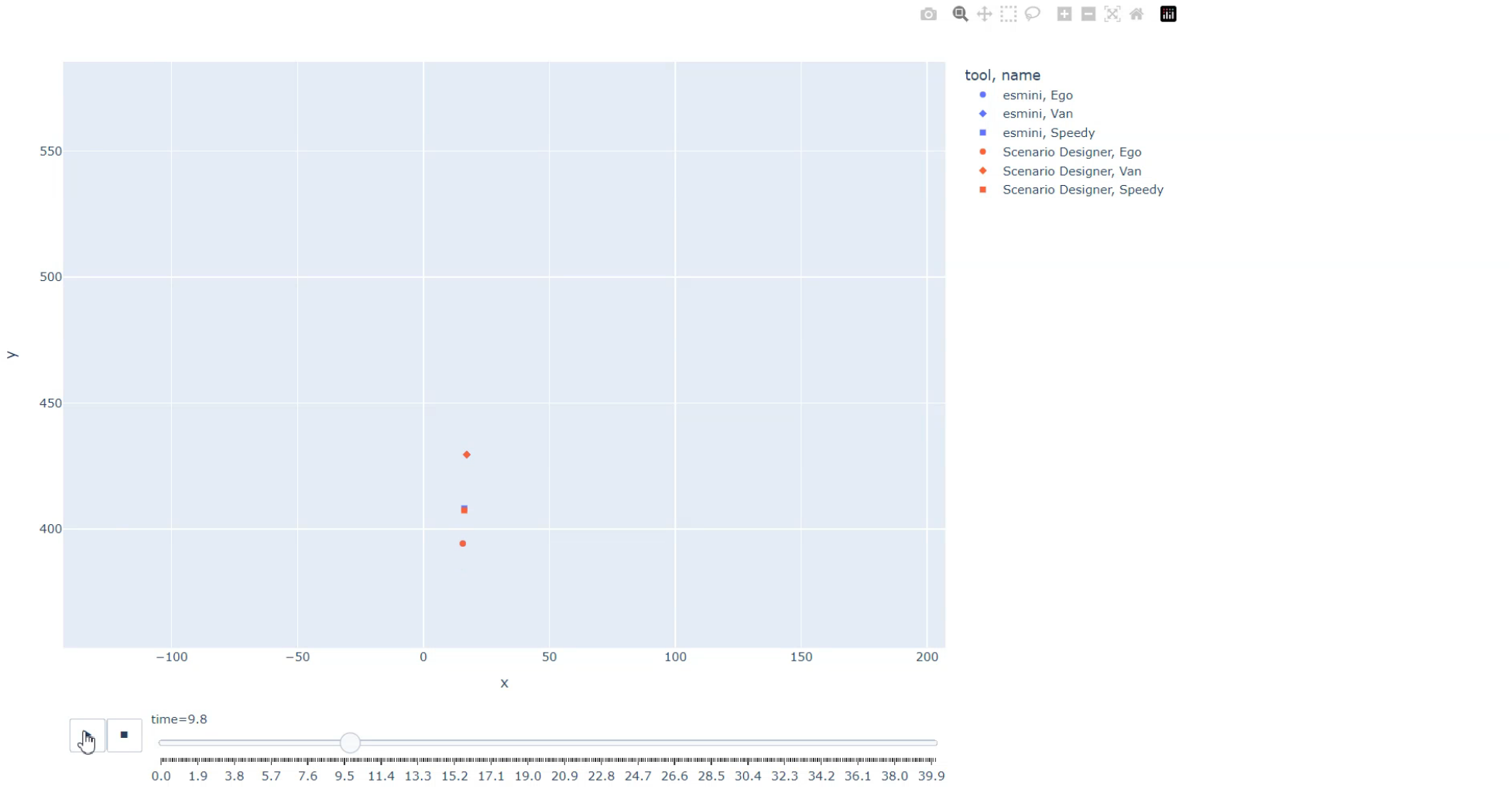
Geometric discontinuity



Default value misinterpretation – driving direction rules



OpenSCENARIO



Video credit: Simon Terres, AVL, presented at ASAM Technical Seminar 2023

Another example: Traffic participants

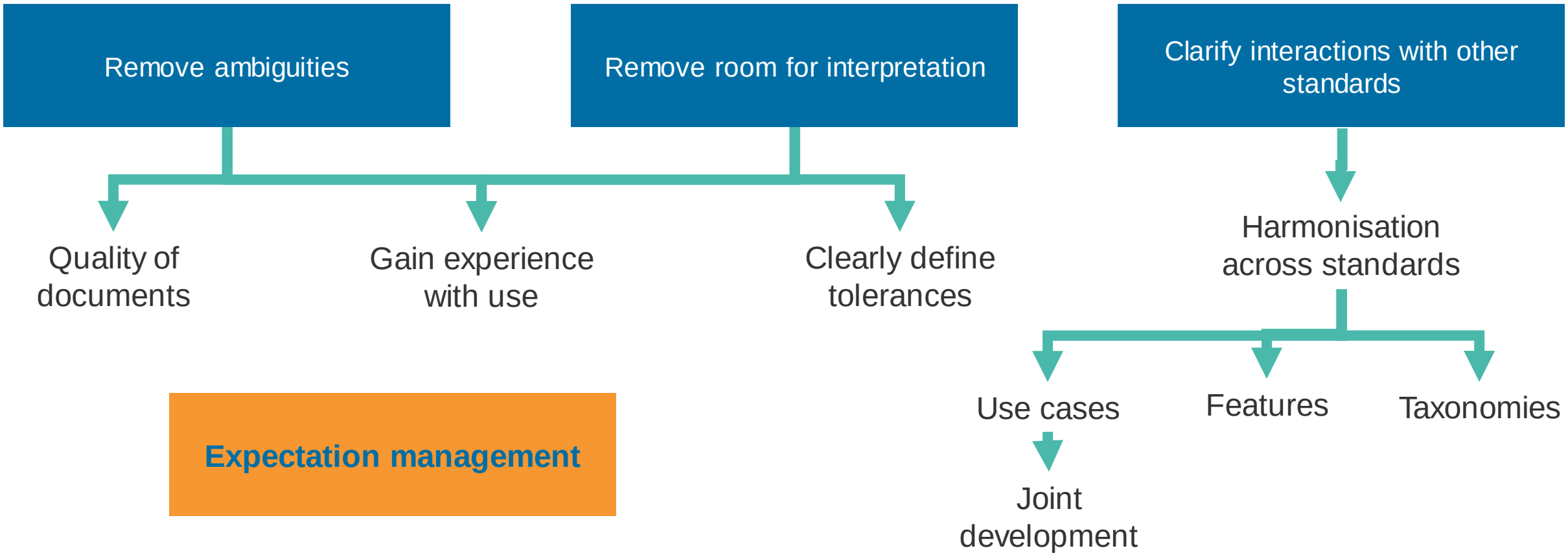
What's wrong?

A **pedestrian** in OSC 1.x and a **vehicle** in OSI.

Truck or **car with trailer** in OSC 1.x?
Luxury_Sedan with Trailer in OSI?

Slide credit: Jakob Kaths, Vector

Mitigating the differences



ASAM Checker & Validation Tooling

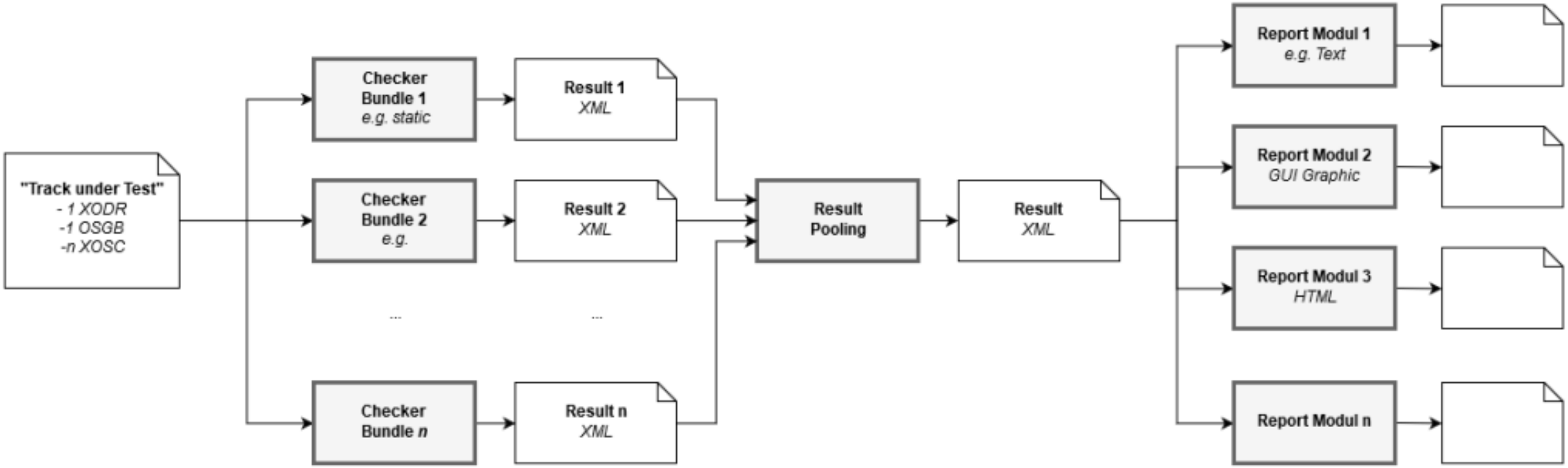


Image credit: CARIAD, presented at ASAM technical Seminar 2023

Upcoming topics

SCDL
Formal notation for ISO26262 safety concepts

OpenMaterial
Description of material properties & 3D model data structures

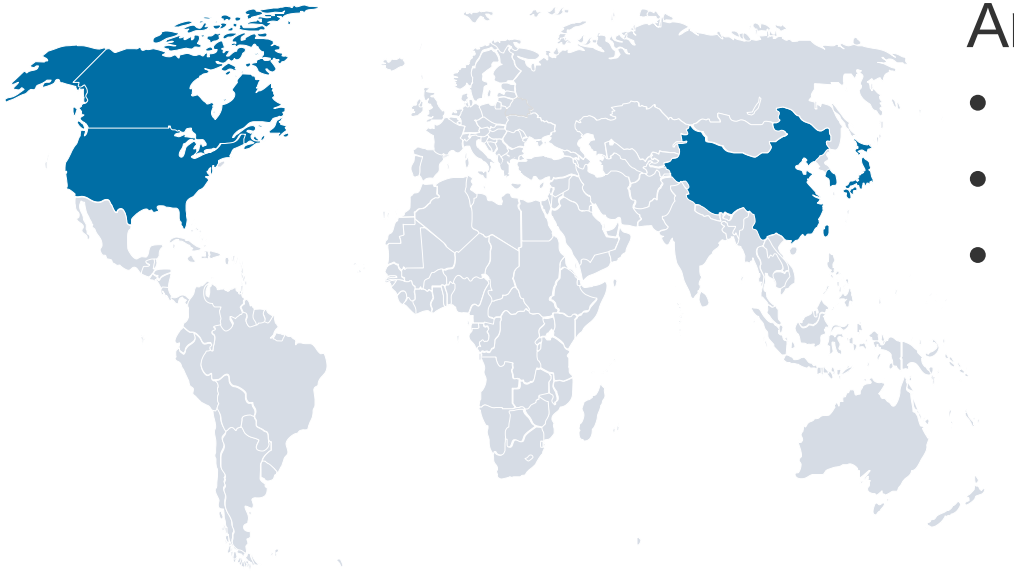
ASAM Quality Checker
Checking & validation framework for ASAM standards

Offroad
Application of OpenX in other domains

What else?

New topics

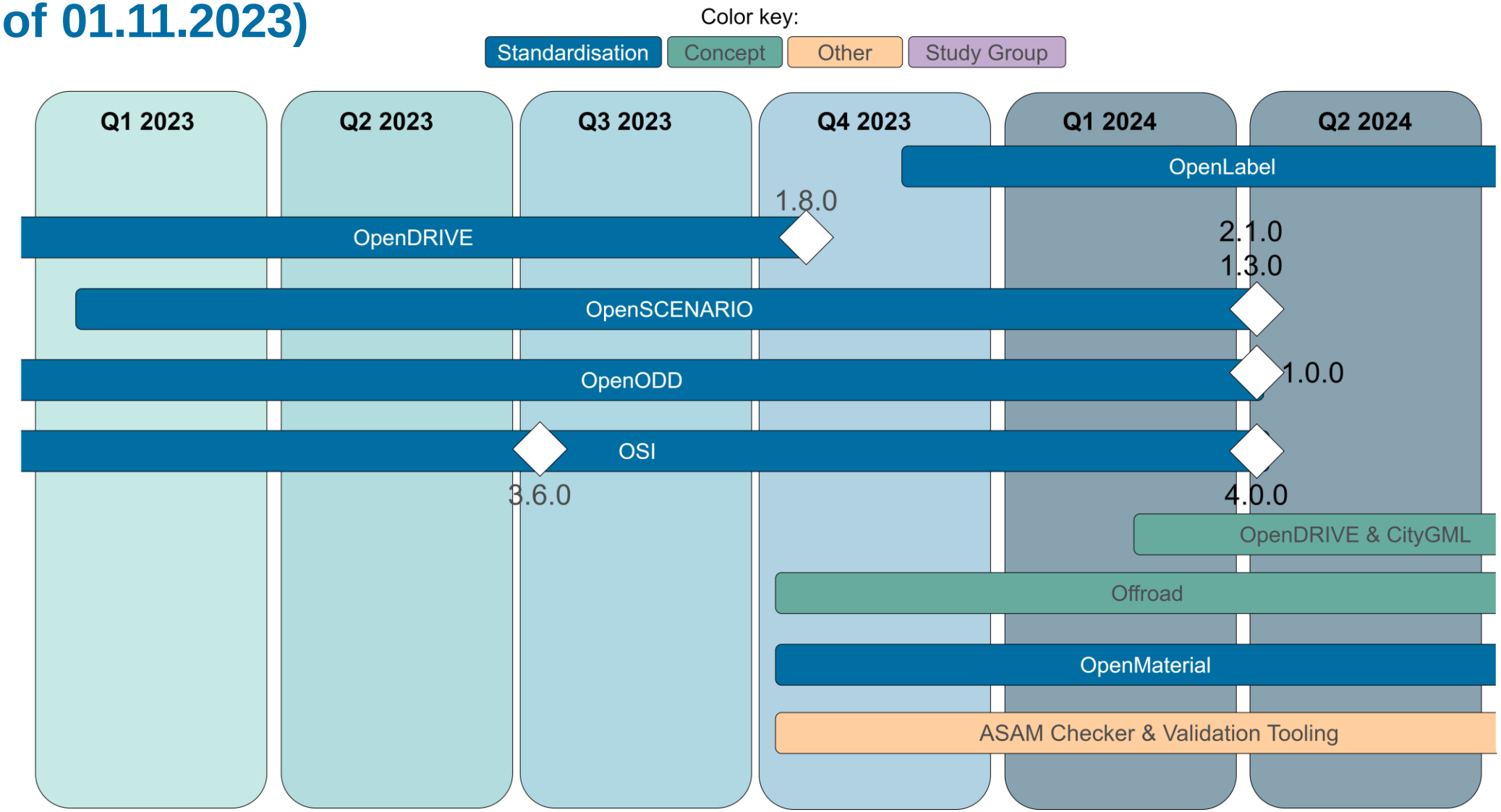
More targeted regional efforts



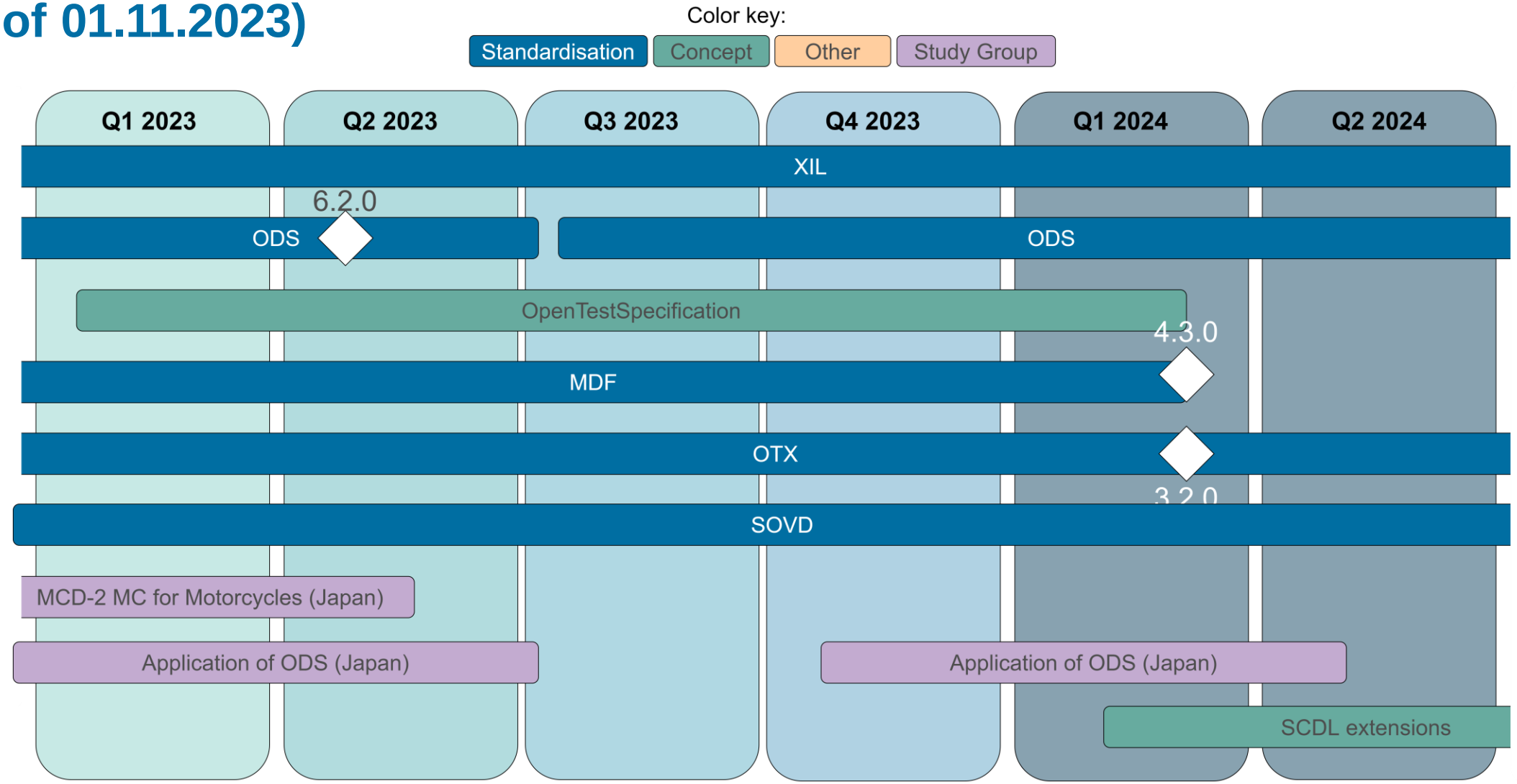
And more…

- Growing the team
- Harmonisation
- Supporting research projects

Project roadmap 2023 (simulation) (as of 01.11.2023)



Project roadmap 2023 (all other domains) (as of 01.11.2023)



Thank you for your attention!

Benjamin Engel
CTO
ASAM e.V.

benjamin.engel@asam.net

Getting involved in ASAM

Putting ASAM into perspective

- Understand the goals & strengths of each organisation

Our main driver: leverage each organization's strengths and expertise!

Why become a member?

Access to all ASAM standards

Global community of experts

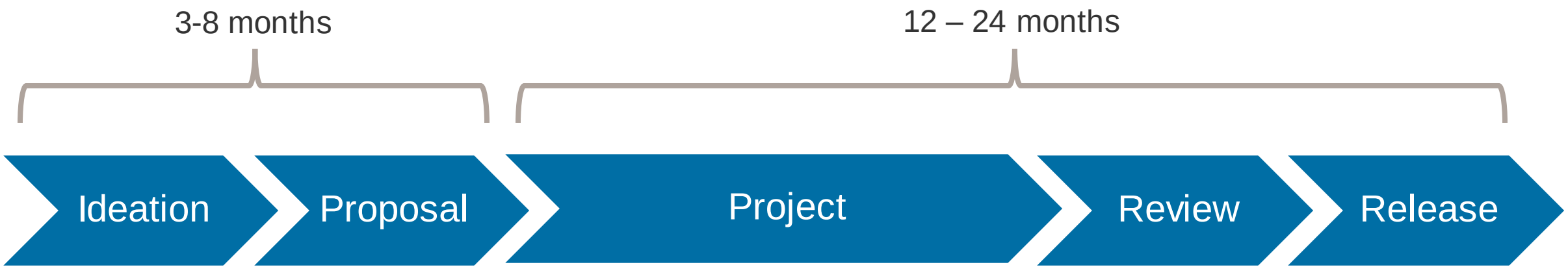
Participate in projects

„Early access“ to new features

Fast, lean processes & toolchains

Ensure ASAM standards cater to your use cases & requirements

How does a project work?



All projects are **member-driven**

Average commitment / yr **25-30 person days**

Work involves: Expert **discussion**, content **authoring**, **review**

Other topics

OpenMaterial

Status

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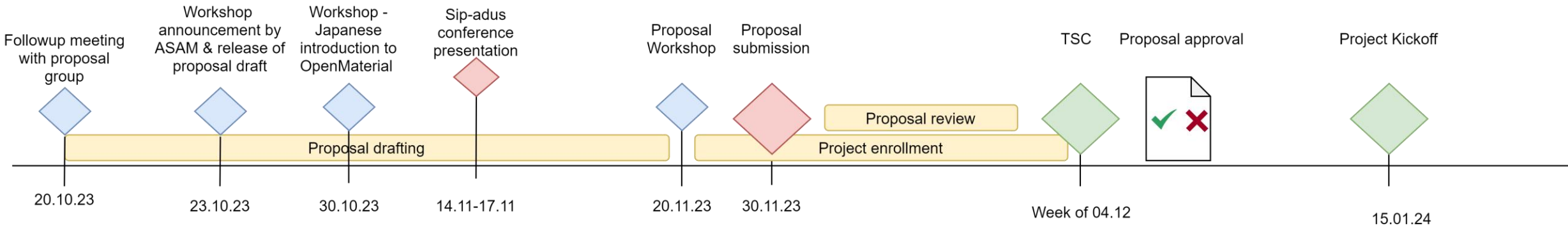
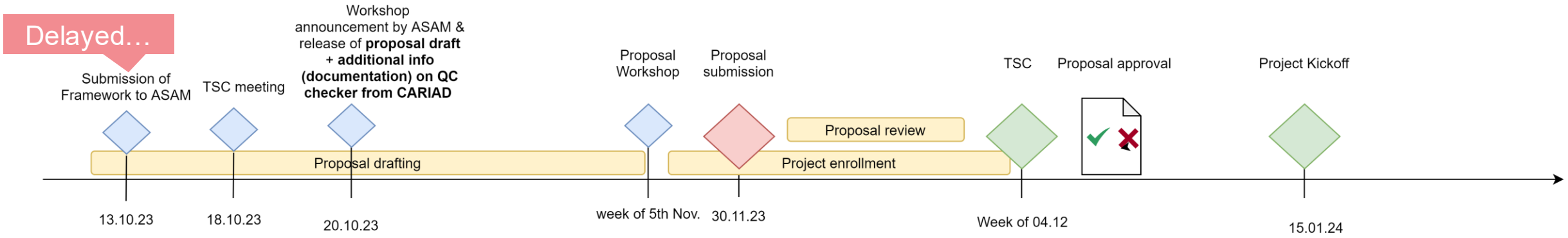


ASAM Checker & Validation Tooling

- Scope of the activity
  1. Checker framework (standard independent)
  2. Checker libraries for OpenSCENARIO XML/DSL, OpenDRIVE, OpenCRG

- Followups may address additional libraries or standards

- Project participants to define requirements towards a framework and an initial set of checks for OSC & ODR
- Software development to be performed by a service provider (framework & check implementation



All dates are preliminary!