

ASAM OpenSCENARIO[®] DSL 2.1.0

Release Presentation

Andreas Rauschert
BMW Group

Gil Amid
Foretellix Ltd

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Agenda

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Introduction

ASAM OpenSCENARIO DSL is specifically designed for large-scale verification and validation (V&V) purposes to test safety and functionality of autonomous vehicles (AV) , Automated Driving Systems (ADS) and advanced driver-assistance systems (ADAS/DCAS).

ASAM OpenSCENARIO DSL defines:

- A domain-specific language (DSL), with the characteristics of a human and machine-readable software programming language
- An extendable domain model, which represents the central concepts of the on-road driving domain

The standard emphasizes composition and reuse of scenario descriptions, allowing simple scenarios to serve as building blocks for more complex ones. It enables both location-specific as well as map/ODD-agnostic scenario descriptions, enabling wide applicability. The language supports various concrete, logical and abstract scenario descriptions. These scenarios include maneuvers that involve multiple vehicles, other traffic participants, complex environmental interactions, complex variations of testing parameters, and the evaluation and analysis of complex or compound measurement criteria. The language enables creating abstract scenarios, focusing on the scenario intent.

ASAM OpenSCENARIO DSL is designed to support and represent test scenarios which include KPIs, checks, & coverage metrics reflected on the dynamic behaviors and actors.

The standard offers built-in abstract road descriptions, thus scenarios are map and ODD agnostic

The standard is used in virtual development, testing, as well as validation of functions for driver assistance, automated driving, and autonomous driving. However, it is also suitable for testing on test tracks or proving grounds, for testing in a mixed environment (HiL), and for decoding real-world driving data.

Motivation for new release

The first revision of ASAM OpenSCENARIO DSL was released in July 2022 (using the name ASAM OpenSCENARIO 2.0.0). This release did not include all planned features, and it was expected that further releases will improve the standard. Obviously, there were few errata in the released standard that were discovered and need to be corrected.

As the standard is gradually being adopted and more solutions are developed using it, the growing user community is asking for better alignment with concepts and entities used in ASAM OpenSCENARIO XML, such that characteristics of entities will be same or similar.

There is still a list of pending features, which will have to wait for next revision of the standard.

ASAM OpenSCENARIO XML (formerly ASAM OpenSCENARIO 1.x) and ASAM OpenSCENARIO DSL (formerly ASAM OpenSCENARIO 2.x) are separate yet coexisting standards. ASAM OpenSCENARIO DSL 2.1.0 has been updated accordingly. The previous migration document is no longer part of the deliverables this is now only applicable for the transition from ASAM OpenSCENARIO (XML) 1.2.0 to ASAM OpenSCENARIO (DSL) 2.0.0.

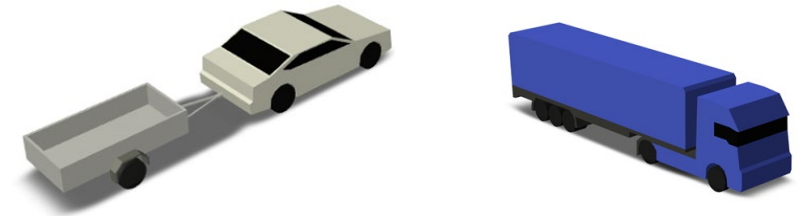
New features

Namespace definition and support

- **Keywords:** namespace, use, export
- Any user-defined identifier can be put in a namespace to avoid name conflicts and maintain backwards compatibility
- Namespaces can “use” identifiers that are exported by others so names don’t always have to be explicitly prefixed

Trailer support

- Trailers can be modeled as vehicles with trailer hitch and coupler
- Trailers can be connected to and disconnected from towing vehicles



Traffic lights support

- Traffic lights defined in the map can be controlled from the scenario
- Complex traffic light phases and cycles can be defined by a scenario



New features

Behavioral model interface

- Support for custom behavioral models for any physical object
- Behavioral models can be pre-selected before scenario execution and switched during execution

NaN, Inf as float literals

- The special values NaN (not a number) and Inf (infinity) can be used in expressions
- Supported both for float and for physical types

Alignment with ASAM OpenSCENARIO XML

(See Harmonization next slide)

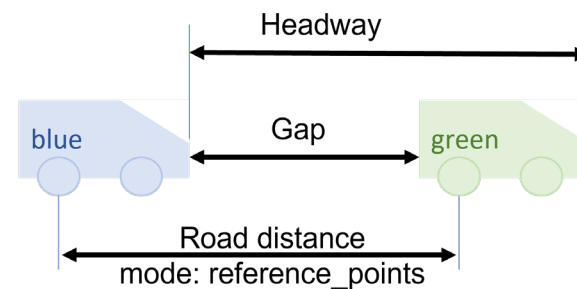
- Implementation of new features is coordinated with ASAM OpenSCENARIO XML
- If applicable, the aspects of those features are implemented in the same way

Harmonization

- Traffic lights support (ASAM OpenDRIVE, ASAM OpenSCENARIO XML)
- Trailer support (ASAM OpenSCENARIO XML)

Alignment with ASAM OpenSCENARIO XML:

- TTC method interface
- Position types
- Color enumerated type
- Support for Geographic coordinates
- Support for freespace parameter
- Role enumerated type



$$time_headway = \frac{Headway}{speed_{blue}}$$

$$time_gap = \frac{Gap}{speed_{blue}}$$

$$time_to_collision = \frac{Gap}{speed_{blue} - speed_{green}}$$

Other changes

Clarifications:

- Order of arguments (scenario invocation)
- Various typos and textual clarifications
- "standard.osc" divided into two subfiles "types.osc" and "domain.osc"

Updates:

- Automatic generation of "standard.osc" and subfiles
- Updated Landingpage, Foreword, Introduction to be conform with ASAM Editorial Guide

Fixes:

- Migration guidelines removed from the document set
- Updated EBNF (Extended Backus-Naur form)

Backward compatibility

Disclaimer: ASAM OpenSCENARIO DSL is an extendable language and domain model. The released version may impact self-extensions made by users of the standard (e.g. name collision). It is the responsibility of users of the standard to verify their own proprietary extensions for backward compatibility.

ASAM OpenSCENARIO DSL 2.1.0 contains additions which are not expected to impact backwards compatibility but may collide with private extensions that were developed to represent these additions (e.g. colors) for usage with the previous release.

It also contains clarifications and refinement of definitions – these are not expected to impact backward compatibility.

Relation to other standard

ASAM OpenSCENARIO DSL can be complemented with other logical road network and 3D model formats – this is implementation specific. The following list gives some examples:

Logical road network (as the standard is map agnostic – these are application dependant)

- ASAM OpenDRIVE
- Navigation Data Standard (NDS) Log

Simulation interfaces

- ASAM OSI

3D models of road, scenery and objects (as the standard is map agnostic – these are application dependant)

- USD (Universal Scene Description)
- CityGML
- OpenSceneGraph
- glTF (Khronos Group)
- FBX (Autodesk)
- 3ds (Autodesk)
- SCENIC (Berkley)

Deliverables

The standard comprises the following content:

Documents:

- Specification

Additional items:

- Scenario examples
- Use cases and workflows
- Domain model library (standard.osc) (informative)
- Consolidated EBNF (informative)