

Project Proposal Summary Sheet

Project Number	P_2022_06
Domain	Simulation
Relevant Standard	OpenSCENARIO
Project Name	OpenSCENARIO FVD
Project Type	☐ Major ☒ Minor ☐ Revision ☐ Concept ☐ Implementation ☐ Study
Start Date	15.01.23
End Date	02.10.23
ASAM Funds	TBD
Proposer(s)	Andreas Rauschert, Gil Amid

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1 Executive Summary

This is a proposal to further develop the ASAM OpenSCENARIO (Abbr.: OSC) standard. OSC defines the dynamic content of the world regarding the on-road driving domain, for example, behavior of traffic participants and how these are expected to interact with each other and the environment. OSC Version 2.0.0 added definition of additional entities (e.g. non-movable objects, road abstractions), and capabilities to enable test scenario development.

The proposal is for a joint ASAM OpenSCENARIO 1.x and 2.x project. This is the first proposal to follow ASAM's roadmap for OpenSCENARIO. The proposal is for ASAM to launch a minor project, which will focus on 4 vectors (can be considered as work-packages):

1. Implement key additional features, clarifications and bugfixes from the OpenSCENARIO 1.2.0 open issues list. Features will be “must have” and minimal effort.
2. Fix errors and bugs reported for OpenSCENARIO 2.0.0
3. Improve and close gaps in the migration guidelines OSC 1.x--->2.0, identify solutions, ideally reach the goal that OSC 2 is a full superset of OSC1.
4. Design and plan the roadmap for ASAM future OpenSCENARIO project (what's next in 2.x? What's next in 1.x? Is migration done?)

The intent is to launch a short-term project, with a duration of 9 months.

Background:

OSC occupies a unique position among the ASAM OpenX standards in that ASAM's membership currently actively develops two major versions of it in parallel. For the sake of readability in this document the terms OSC 1.x and OSC 2.x represent the latest version of each. Due to the different foundations between the versions, ASAM took measures throughout the development of these parallel activities to ensure that convergence and compatibility between OSC 1.x and OSC 2.x is possible. These measures were formulated as requirements to all OSC development projects:

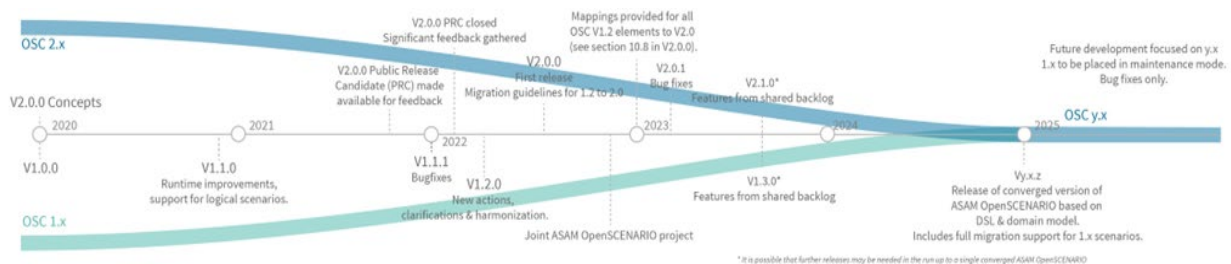
1. OSC 2.x shall be a full superset of the features of OSC 1.x.
2. Migration of an OSC 1.x scenario to an OSC 2.x scenario shall be possible.
3. Conversion of a subset of OSC 2.x that maps to the feature set of OSC 1.x shall be possible.
4. All future OSC releases shall be accompanied by an up-to-date ruleset for a migration path from OSC 1.x to OSC 2.x.
5. The runtime behavior of any scenario converted/migrated from the latest OSC 1.x to OSC 2.x shall be the same. This requirement can be influenced by

implementation-specific factors, which are not addressed here. In other words, whatever you can express in OSC 1.x you will be able to express in OSC 2.x in order to get the same runtime behavior.

These requirements still apply but are not yet satisfied with OSC V1.2.0 and OSC V2.0.0.

ASAM has published its roadmap for OSC – which calls for:

1. Future OpenSCENARIO projects to be combined.
2. Convergence goal is the DSL
3. Supply comprehensive migration solution
4. Support OSC 1.x in a minimal fashion in order to enable the industry.



ASAM aims for convergence of both parallel versions of OSC to a single version by the end of 2024.

To ensure co-development ASAM will set up a joint project. The joint project will aim to develop one converged version of OSC that is based on the DSL defined in OSC V2.0.0. This will likely be a new major version (Y.X).

A converged version will have full coverage of the domain features in OSC 1.x as well as OSC 2.x. It will be a full superset. A converged version will have at least one clear mapping for domain features of previous versions. It is still open to which extent this will be automatable.

On the way to a converged version the project may release additional versions of OSC 1.x and OSC 2.x based on a shared backlog. At the least we expect there to be an OSC V1.3.0, an OSC V2.0.1 and an OSC V2.1.0. There may be more, depending on the backlog. A joint project may define new features during the convergence period but these must be reflected in both OSC 1.x and OSC 2.x.

Once a converged version of OSC is released then OSC 1.x will move into maintenance mode and no new features will be added to OSC 1.x. From then on new features will only be available in the converged version of OSC. The converged version will be based on the DSL and the domain model. As of now, the XML format will not be supported by the converged version.

2 Motivation

OSC 1.x is based on an XML format, the most recent version is V1.2.0. OSC 2.x is based on a domain specific programming language and includes an extendable domain model. The extension mechanism is described in [Section 9.3, "Extending the domain model"](#). The domain model represents the central concepts of the on-road driving domain, see [Section 8.1, "Domain model introduction"](#). OSC 2.x is not backwards compatible with OSC 1.x, although it may be possible to convert (i.e. translate from one language to another) certain scenarios using a subset that is directly supported by OSC 2.0.0. OSC 2.x is intended as a superset to OSC 1.x. In other words, what you can do in OSC 1.x you can do in OSC 2.x, and more. An improvement with OSC V2.0.0 is the support for abstract scenarios ^[1].

Due to the more descriptive nature of the DSL and the difference in its semantics to OSC 1.x there are often multiple options to migrate from OSC 1.x to OSC 2.x. Often elements in OSC 1.x, such as behaviors or actions do not have a one-to-one mapping, but the behavior can be replicated through combinations of language constructs in OSC 2.x. Options to do this are documented in the standard. Other times, there are elements that have no direct mapping, such as controllers, these are not domain elements and rather data model constructs specific to OSC 1.x that do not have an equivalent in OSC 2.x.

[Section 10, "Migrating from ASAM OpenSCENARIO V1.2.0"](#) provides significant detail on how users of OSC 1.x can migrate their scenarios to OSC V2.0.0. This is currently non-normative and does not yet cover all elements of OSC 1.x. [Section 10.8, "Elements from V1.2.0 not yet covered"](#) shows where coverage is not yet complete. See the roadmap for what we plan to do to improve this. OSC V2.0.0 does not yet include a normative ruleset enabling direct or automated conversion from OSC 1.x scenarios. One aim of this project is to progress toward inclusion of this in future releases.

2.1 Users

Assuming all the users listed below have at least the minimum need of being able to read and interpret scenarios and their content, the standard applies to all the users mentioned below. Some of the users will have a much more intensive use of the standard. Detailed user stories can be found in the major version project proposals for OSC 1.x and 2.0

1. Development Engineer
2. Test Engineer
3. Validation Engineer
4. Systems Engineer
5. Safety Engineer
6. Scenario Editor
7. Tool Developer

8. Data provider
9. Data analyst
10. Data Scientist
11. Infrastructure operator, regulator
12. Subject Matter Expert

2.2 Use-Cases

The standard needs to address and support the use cases of existing versions, and to expand on the migration from version 1.x to 2.x. A list of use cases from both versions is supplied here:

- Section 2.2 of OpenSCENARIO V1.x project proposal.
- Section 3.0 of OpenSCENARIO 2.0 concept document.

These use cases will not be replicated here, but rather used throughout the project & as a reference for migration purposes. A key use case of focus for the proposed project is migration:

Migrating scenarios from ASAM OpenSCENARIO 1.2 to OpenSCENARIO 2.0.x

There is a large industry usage of OpenSCENARIO 1.x files, providing additional support in migrating 1.x scenarios to 2.x will reduce the transition hurdles. A migration guide may not be a 1-1 mapping, but should supply guidelines for solutions for all OSC 1.x features.

2.3 Features

Both OpenSCENARIO versions have a list of open issues in the ASAM GitLab that will be addressed in this project. Selection and prioritization of the specific issues to handle will be done in the project proposal work shop, and in the initial phase of the project. A primary criterion will be time-line. The project time frame is 6-9 months, and thus all selected issues must fit within this.

- <https://code.asam.net/simulation/openscenario-1/openscenario/-/issues>
- <https://code.asam.net/simulation/standard/openscenario-2.0/-/issues>

2.4 Relations to Other Standards, Projects or Organizations

Relations to other ASAM standards

- ASAM OpenDRIVE 1.7.0
- ASAM OpenLabel 1.0

- ASAM OSI 3.5.0

Relations to upcoming ASAM standards or ASAM development projects

- ASAM OpenODD 1.0.0
- ASAM OpenXOntology concept

Relations to non-ASAM standards

- ISO 34501, 34502, 34503, 34504
- ISO 21448

3 Technical Content

As mentioned above, the project will focus on 4 vectors. For all issues in the work items the primary criteria for determining whether they are in scope or not will be urgency and time to implement. If issues are not suitable for resolution within a 6–9-month timeframe they will likely need to be addressed in a successor project.

1. Implement key additional features, clarifications and bugfixes from OpenSCENARIO 1.2 open issues list.
The ASAM road map currently states that OpenSCENARIO 2.0 and greater will be the main target for future feature extensions. For now, this means that for OpenSCENARIO 1.2 only “must-have” features will be added. A lot of open issues are about the possible actions of traffic participants, so there will be a focus on this part of the standard. The results of the initiative for modelling dynamic traffic signs and their switching behavior will be included with this project if the results are available as planned. It is noted that every new feature added to OSC 1.x, will need to be defined jointly with the appropriate migration solution to 2.x
2. Fix errors and bugs reported for OpenSCENARIO 2.0.0.
Since the release of 2.0.0 ASAM has been collecting feedback on the standard. These are documented as issues in the project repository. Election and prioritization of the specific issues to handle in this project will be done in the ramp-up & scope finalization phase of the project.
3. Improve and close gaps in the migration guidelines OSC 1.x--->2.x
Ideally reach the goal that OSC 2 is a full superset of OSC 1. Besides the migration of all features of OSC 1.2 also all new features, which are introduced to OSC 1.x within this project must be ported/introduced to OSC 2. Selection and prioritization of the specific issues to handle will be addressed as previously detailed.

4. Update and further detail out the roadmap for ASAM OpenSCENARIO projects
This will build on the roadmap released with ASAM OpenSCENARIO 2.0.0 ([link here](#)).
It will aim to provide the future direction of 1.x & 2.x as well as mapping open issues to upcoming releases. Should there be any remaining issues open with respect to migration from 1.x to 2.x these will be clearly delineated as well.

4 Project Resources

In addition to the work package structure proposed in 4.1 below, the project is requesting a ramp-up and scope finalization phase, mandatory for all participants. This phase will be used to ensure a shared knowledge base of all participants, determine in-scope issues for the work packages and align on any further items. This ramp-up phase is WP 0 Stated below.

4.1 Work Packages

4.1.1 WP 0 – Ramp up and scope finalization

This work package is mandatory to all project participants. The work package include knowledge sharing and leveling activities and presentations, to be followed by prioritizing and selecting the features and corrections to be implemented in each OSC version (setting the scope to WP 1 and WP 2). Time constraints of the project will be a major factor in the decisions.

Deliverables: List of features and corrections to be implemented in each standard.

Effort (Man-days) : 90 (assuming 30 participants, 3 days per participant)

4.1.2 WP 1 - OpenSCENARIO 1.x

Resolve issues and add key features. Based on the features identified and selected in WP 0, develop detailed definition and migration plan for each

[See note below on proposed development process for this project]

Deliverable: Adjustments in the UML Model, User Guide and examples of OSC 1.X

Effort (man-days): 225 (assuming 15 participants, 15 days per participants)

WP Lead: Andreas Rauschert (BMW Group)

4.1.3 WP 2 - OpenSCENARIO 2.x

Process feedback and correct errors/bugs. Identify recorded correction in the issues list, define the corrections and implement them. It may be that based on WP 0 or migration requirements – a critical feature may be added.

[See note below on proposed development process for this project]

Deliverable: Fixes to the standard document and accompanying files,

Effort (Man Days) : 225 (assuming 15 participants, 15 days per participants)

WP Lead: TBD (Default: Gil Amid)

4.1.4 WP 3 - Migration

This work package is actually divided into two phases: Phase 1 will focus on separating the migration guidelines from OSC 2.0.0 standard document and converting it into a standalone informative document. This phase also includes adding migration guidelines that were not covered in OSC 2.0.1, and adding migration guidelines for new features defined in this project. Phase 2 of this work package will focus on both completing the guidelines for newly defined features, as well as identifying further steps to support required migrations. This may include collaterals, launching an implementers forum and such.

[See note below on proposed development process for this project]

Deliverable: Revised migration guidelines as a standalone document,

Effort: 275 (man-days) (assuming 25 participants, 11 days per participant)

WP Lead: TBD

This work package is actually divided into two phases: Phase 1 will be improving the migration guidelines

4.1.5 WP 4 - ASAM OpenSCENARIO roadmap.

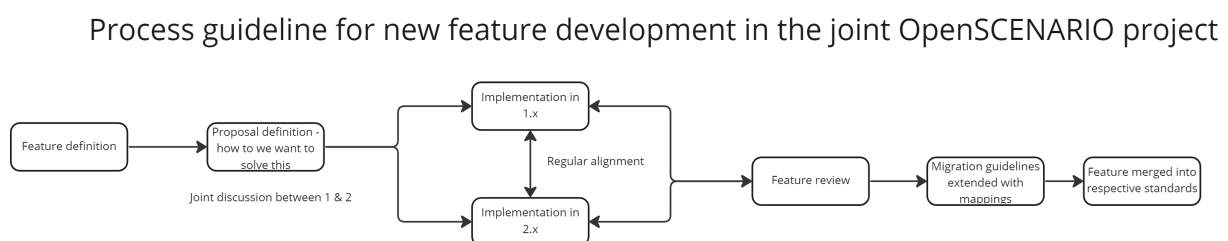
Design and plan the roadmap for ASAM future OpenSCENARIO projects (what's next in 2.x? What's next in 1.x? Is migration done?)

Deliverables: Revised ASAM OpenSCENARIO roadmap

Effort: 75 (man-days) (assuming 25 participants, 3 days per participant)

WP Lead: TBD

The flow chart below describes the proposed development process for this project. The unique nature and goals of this project requires synchronization between the various work packages, specifically WP 1 and WP2



4.2 Company Commitments

For details, see enrollment list (live) linked from project sharepoint.

As of 18.11: 30 unique commitments from 20 ASAM member companies

<i>WP</i>	<i>Unique commitments [# of individuals]</i>	<i>Total Commitments [person days]</i>
WP0 Ramp up	30	90
WP1 1.x	16	240

WP2 2.x	15	225
WP3 Migration	18	198
WP4 Roadmap	18	54
Totals	30	807

4.3 Effort Summary

<i>WP</i>	<i>Project Members</i>	<i>Service Provider</i>	<i>Total</i>
WP0 Ramp up	90		90
WP1 (OSC 1.X)	225	60	285
WP2 (OSC 2.X)	225	40	265
WP3 (Migration)	275		275
WP4 (Roadmap)	75		75
Totals	890	100	990

4.4 Budget

Prior experience in other projects has shown a need for 25h/week in technical documentation efforts. Over the course of 26 weeks this amounts to a total effort of 80 person days. Additional effort is required for implementing changes in the OSC1 UML model.

Task description	Effort [person days]	Cost [EUR] [€1000 / day]
Technical documentation	80	80 .000
Modeling OSC1	20	20.000
Total	100	100.000

5 Review Steps

As quality assurance for minor/patch releases an internal (project level) review is planned.

6 Deliverables

At the end of the project, the project group will hand over the following deliverables to ASAM:

Table 1 Deliverables

Item No.	Description
1	OpenSCENARIO 2.0.x standard document and supplementary files.
2	OpenSCENARIO 1.2.1 or 1.3 standard documents (User Guide, UML Data Model, XSD Schema Files, UML Model Documentation, Examples, Migration documentation from OSC 1.2.0 to next OSC 1.x, UML Modelling Guidelines)
3	Improved OSC 1.x-->2.X migration document (standalone document, non-normative, not included in the standards themselves.)
4	Detailed ASAM OpenSCENARIO roadmap

7 Project Plan

The work packages shall be carried out as per the following time schedule:

Week Start Date	2-Jan	9-Jan	16-Jan	23-Jan	30-Jan	6-Feb	13-Feb	20-Feb	27-Feb	6-Mar	13-Mar	20-Mar	27-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun	3-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	
Week Num (ISO 8601)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Project Kickoff																																									
WP0 Ramp up, scope finalization																																									
WP1 1.x development																																									
WP2 2.x development																																									
WP3 Migration (Guidelines)																																									
Review of release candidate 2.0.1																																									
Submit revised migration guidelines to TSC																																									
Submit RC 2.0.1 to TSC																																									
Review of release candidates 2.1 & 1.3																																									
Submit revised migration guidelines to TSC																																									
Submit RC 2.1 & 1.3 to TSC																																									
WP3 Migration (Further steps)																																									
WP4 Roadmap																																									
Submit roadmap & followup proposal																																									