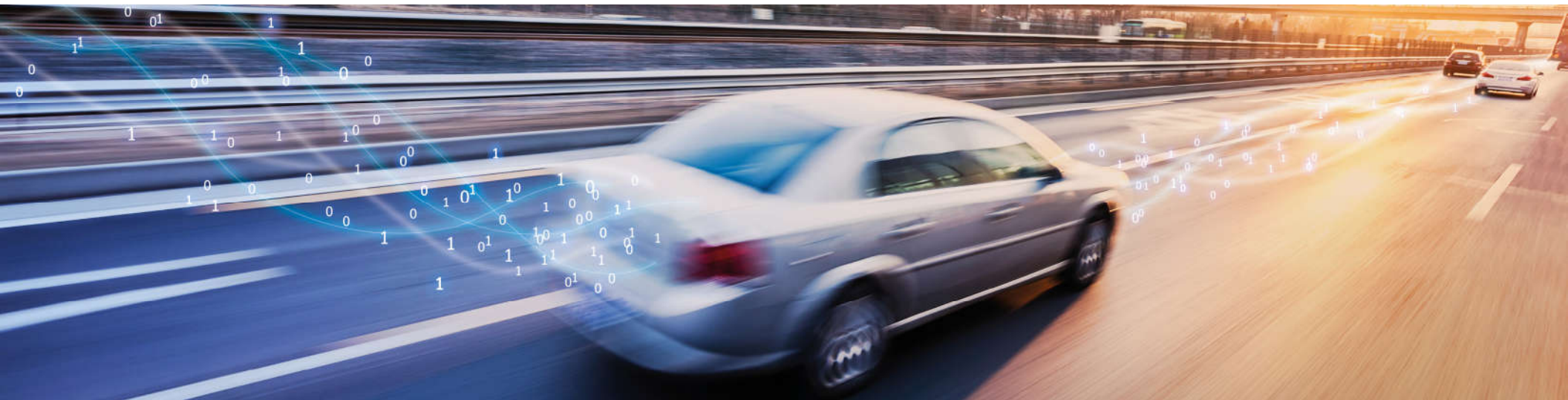# OpenSCENARIO 2.0 Concept Project
P2019-02
From discussion to action !

Gil Amid
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5. April 2019
München

ASAM Association for Standardization of Automation and Measuring Systems

Update to the discussion group

- In this presentation – summary and overview of the project proposal, as presented to ASAM TSC
- **Looking ahead:**
- You can join the project until April-12th
  - Your company must be an ASAM member
  - You are actually committing to invest time in this project – meetings, discussions, f2f , etc…
  - Sign up by sending an e-mail to Thomas Thomsen (thomas.thomsen@asam.net) or to Pierre Mai (pmai@pmsfit.de)
- Further details: https://www.asam.net/project-detail/openscenario-concept-project
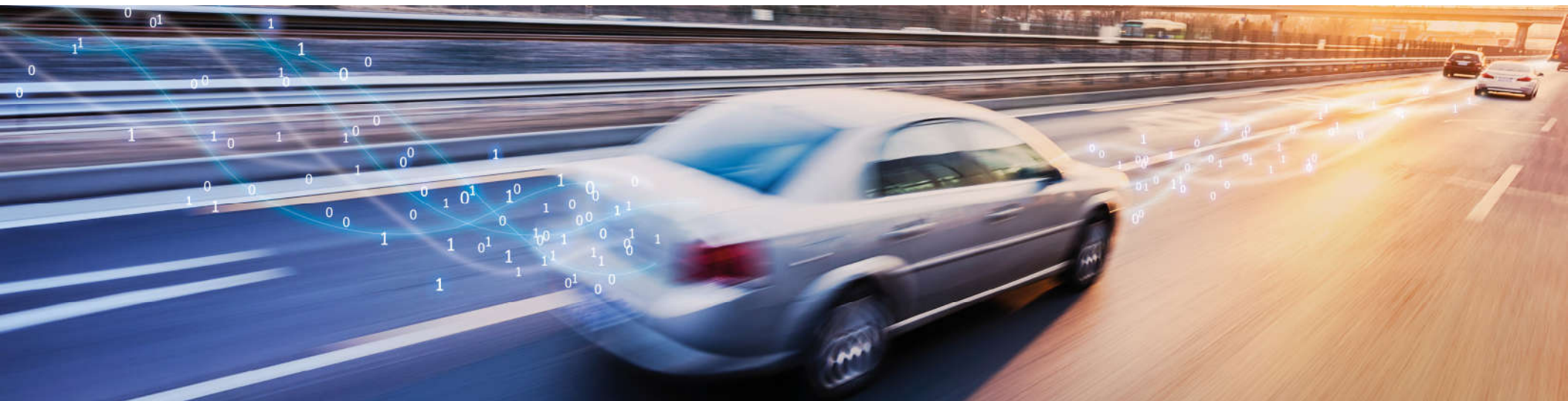
The snow ball is starting to roll

- Project kick off f2f set !
- Mon, Tue , Apr-29th / Apr-30th
- Munich – ASAM HQ

- [You need to be part of the project in order to take part in the f2f]
- In order words – this is you chance to join and influence the future of AV design !

ASAM

OpenSCENARIO 2.0 Concept Project
P2019-02

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ASAM Association for Standardization of Automation and Measuring Systems

Agenda

	Motivation
	Technical Content
	Deliverables
	Schedule
	ISO

ASAM

Motivation

- AV development and certification requires massive usage of scenario driven simulation.
  Exhaustive simulation is a MUST HAVE for development and qualification of AD and Autonomous driving systems

- OpenSCENARIO 1.x is in its stabilization phase,
  - during various workshop it became clear there are additional needs, which may not be met by evolution

- **Overall Goal: A standard with all the required features to enable testing and validation of ADAS systems and autonomous vehicles**

- OpenSCENARIO 2.0 should serve as the format and mechanism to supply dynamic content and functional behavior to all testing and execution platforms, for all driving scenarios ranging from simple motor-way interactions to long-running, complex inner-city traffic scenarios.

Technical Content

- OpenSCENARIO 2.0 needs to support:
  - Definition of tests and scenarios for the full development process of autonomous vehicles, and
  - the full complexity of real-world scenarios, including complex inner-city traffic

- Required use cases: span from pure software-based simulation, through SIL, HIL, VIL hybrid testing models, up to test tracks and street driving

- **Concept project focus:**
  - **Focus on the set of 12 features as defined in the proposal work shop**
  - **Define architecture for the main scenario models, and interface to other required models (e.g. Environment, Driver, Traffic)**
  - **Address varying levels of requirements for parametrization, accuracy**
  - **Address different use cases of scenarios.**

TABLE: FEATURES

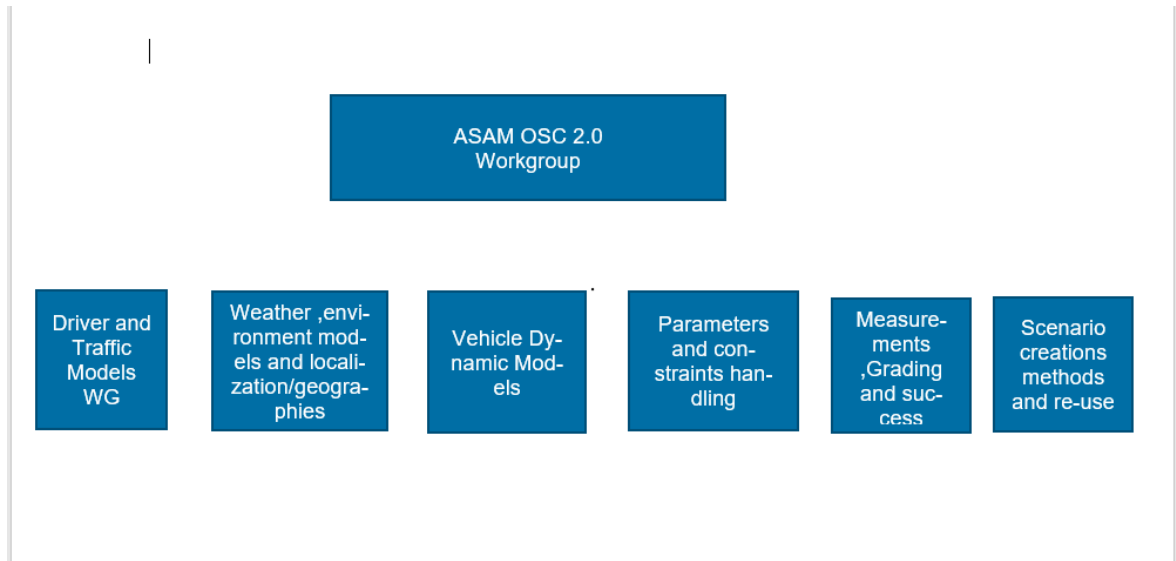| Feature	Type
F001: Maneuver model	Change
F008: High level maneuver descriptions	New
F003: Traffic Model	New
F007: Parameter stochastics	New
F002: Driver Model	New
F004: Environmental Condition Model	New
F009: Replay of Recorded Scenarios	New
F010: Automatic parameter calculation	New
F005: Infrastructure Event Model	New
F006: Vehicle dynamics model	Change
F011: Additional metadata for parameters	New
F012: Language Constructs for Localization	New

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General Requirements

- The requirement span over many use cases, and many needs.

TABLE: ISSUE DESCRIPTIONS

ID	Title/Description
R001	Avoid Different Ways to Model
R002	Define Elements as 'Mandatory' Only When Absolutely Needed
R003	Maintain Independence and Open Linking Between Standards.
R004	Define Three Levels of Control for Ego Vehicles.
R005	Allow Tool-Vendor Specific Extensions.
R006	Allow Definition of Feature Subsets
R007	Define Semantics to Enable Reproducibility and Single Interpretation. (Workshop phrasing was: Well Defined Semantics Requirement)
R008	Allow both Open-loop and Closed-loop Simulation by the Same Maneuver Descriptions. (Workshop phrasing: Maneuver Description Shall be Suitable for Open-loop and Closed-loop Simulation)
R009	Define Parameter Boundaries
R010	Synchronize Maneuvers and Events
R011a	Allow Definition of Success Criteria for Individual Maneuvers, and for Full Scenarios and Tests – DUT criteria
R011b	Allow Definition of Success Criteria for Individual Maneuvers, and for Full Scenarios and Tests – non-DUT criteria
R012	Allow Textual Editing of the Format. (Workshop phrasing was: Suitability for textual editing)

Proposed structure

- Given a wide scope, it is expected that the project will be split into sub-groups, for refinement of the overall concept.

- **Top-level group owns overall architecture concept and interface, sub-groups refine the details.**

- **The top-level workgroup is expected to include about 10 key members (including the leaders of the sub-groups).**

- **Final structure will be set at the kick-off f2f**

ASAM OSC 2.0 Workgroup

| Driver and Traffic Models WG | Weather ,environment models and localization/geographies | Vehicle Dynamic Models | Parameters and constraints handling | Measurements ,Grading and success | Scenario creations methods and re-use |

Deliverables

- The overall expected outcome of the project is a wide set of concept documents.
  It is expected that the content of these document will be close to a draft proposal for a standard.

- **Full/Primary Concept document containing:**
  - High-level description of the full system
  - Block diagram of the models and their interactions
  - Description /Definition of a suite of tools (optional) that may be required for a complete solution (Architecture diagram)
  - Suite of Examples
  - Migration and/or backward compatibility concept description
  - Optional: Proposals for possible starting points and sources of IP – e.g. a number of participating companies might be interested in contributing existing in-house developments in terms of languages or frameworks to the standard.
- Driver and Traffic model concept document.
- Weather, Environment models and Localization/Geographies concept document(s).
- Vehicle Dynamics Model concept document.
- Parameters and constraints handling concept document.
- Measurements, Grading and Success criteria concept document.
- Scenario creations methods and reuse concept document.

Schedule

- We must meet an aggressive schedule, and present something to the world toward the end of Q4/2019:
  - **Core architecture and core concepts to be completed until Q4/2019**

- Tentative project duration until Q2/2020, so that not so critical subgroups (or topics) can continue their work if needed, while standardization projects based on already clarified concepts can start earlier.

- Timeline is only tentative, and will be revised based on the actual number of participants and the success of splitting up work in the initial meetings, which will determine how parallelized the work is going to be: If everything works out well, option to shorten timeline of project.

- **The approach taken is to assign a very aggressive schedule**
- **Work in agile methods of speculative execution and convergence.**
- .

A concept project of this size and scope is a novum for ASAM, hence there is increased timeline risk, which is taken into account in this tentative planning.

TABLE: TIME SCHEDULE

WP-No.	Title / Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Top level concept Development	☐	☐	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐
2	Driver and Traffic model	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	⋯	⋯
3	Weather, Environment models and localization/geographies	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	⋯	⋯
4	Vehicle Dynamics Model	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	⋯	⋯
5	Parameters and Constraints Handling	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☐	☐
6	Measurements, Grading and Success Criteria	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	⋯	⋯
7	Scenario creation methods and reuse	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	⋯	⋯

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Relation to ISO

- Interact and align with ISO TC 22/SC 33/WG 9 "Test Scenario of autonomous driving vehicles"
- Carlo Van-Driesten is a member of this WG
- Gil Amid is a member of this WG
- A communication and synchronization mechanism is being discussed these days (-> Category C Liaison).

- Focus of WG 9 on architecture and framework, potential to specify ASAM OpenScenario as relevant format standard.

Thank you for your attention!

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