ASAM OpenDRIVE and ASAM OpenCRG

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ASAM

Association for Standardization of
Automation and Measuring Systems
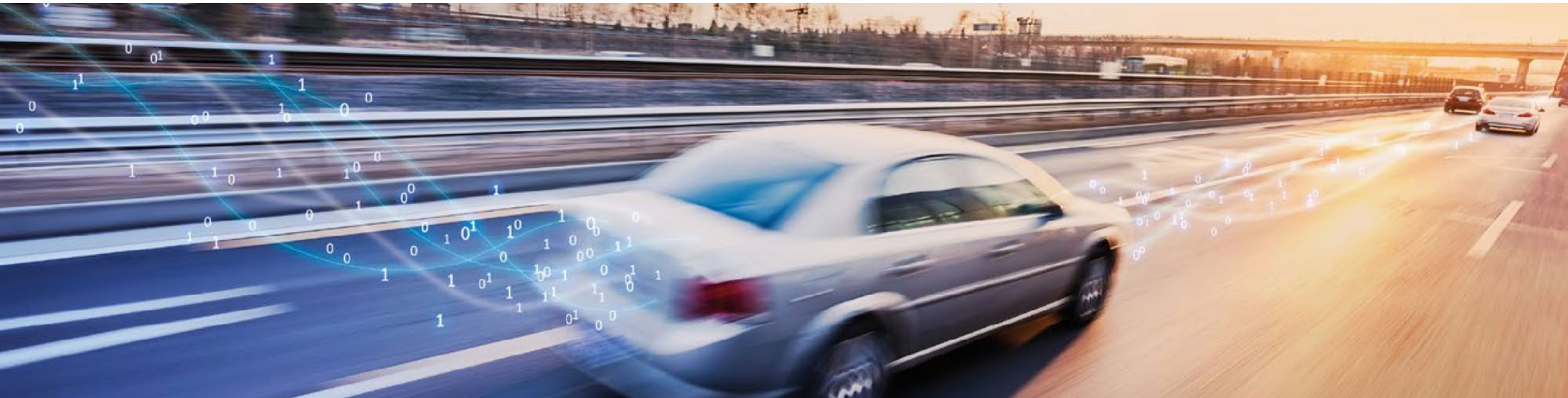
Agenda

1	**New Standardization Domain: Simulation**
2	**ASAM OpenDRIVE**
3	**ASAM OpenCRG**

*) Open Simulaton Interface

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ASAM Standards Portfolio

Data Management & Analysis
CEA ODS

Test Automation
ACI ASAP 3 ATX GDI
MCD-3 D MCD-3 MC XIL

Software Development
CC FSX ISSUE LXF
MBFS MDX

Measurement & Calibration
MCD-1 POD MCD-1 CCP / XCP
MCD-2 MC MCD-2 CERP MDF
CDF CPX

Diagnostics
MCD-2 D OTX Extensions

ECU Networks
MCD-2 NET

Simulation

New Domain at ASAM: Simulation

Simulation

- Standards for simulation model data exchange.

- High demand for standards for new type of simulation: Drive and Traffic Simulators.

- Public specs driven by tool vendors have emerged in recent years.

- Specs are now being transferred to ASAM in order to:
  - be hosted by a neutral NPO
  - become an official standard for the industry
  - guarantee long-term and professional further development

- Current projects to be transferred to ASAM:
  - OpenDRIVE
  - OpenCRG
  - OpenSCENARIO

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Positioning of OpenX-Standards

OpenDRIVE
- Road Network

OpenCRG
- Road Surface

OpenSCENARIO
- Driving Maneuvers

Static Content

Dynamic Content

Motivation

- Exchange of data between creation tools (e.g. road network editors) and simulators.
- Use of the data in simulators from different vendors.
- Use with other public standards, such as OpenFlight.

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Agenda

OpenDRIVE

OpenDRIVE: <u>O</u>pen <u>D</u>ynamic <u>R</u>oad <u>I</u>nformation for <u>V</u>ehicle <u>E</u>nvironment

- File format for the **description of road networks**.

- Initiative started in 2005 by Daimler and VIRES.

- Used for simulators in the area of
  - Drive simulation
  - Traffic simulation
  - Sensor simulation

- Based upon XML and a hierarchical data model.

- Basic elements:
  - Roads
  - Junctions
  - Controller

- Not covered: entities acting on or interacting with the road network.
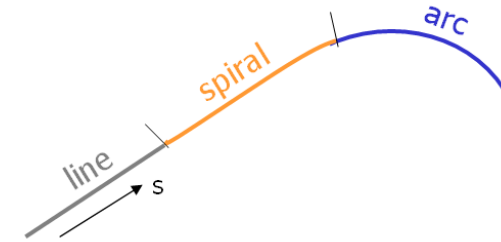
ASAM
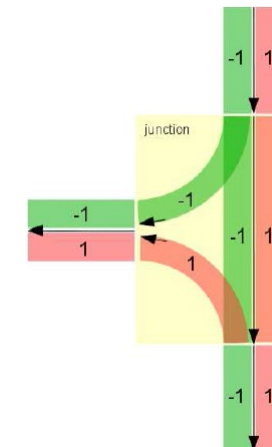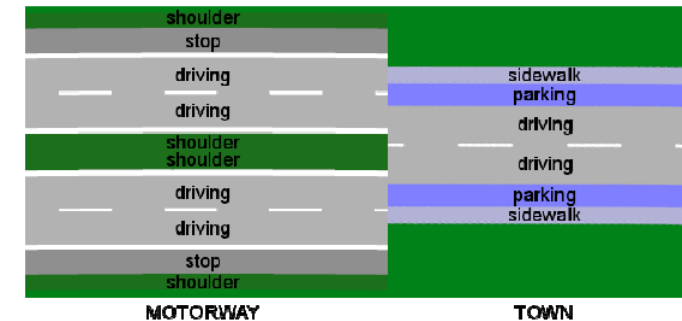
Principal Design Pattern for Roads

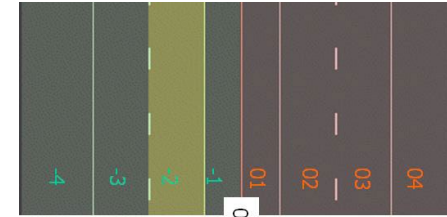| 1: Create Reference Line |
|---|

Primitives:
- Line
- Arc
- Spiral
- Poly3

↓

2: Add Lanes Along the Reference Line

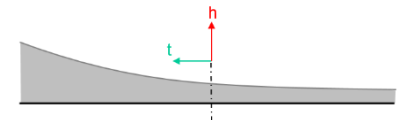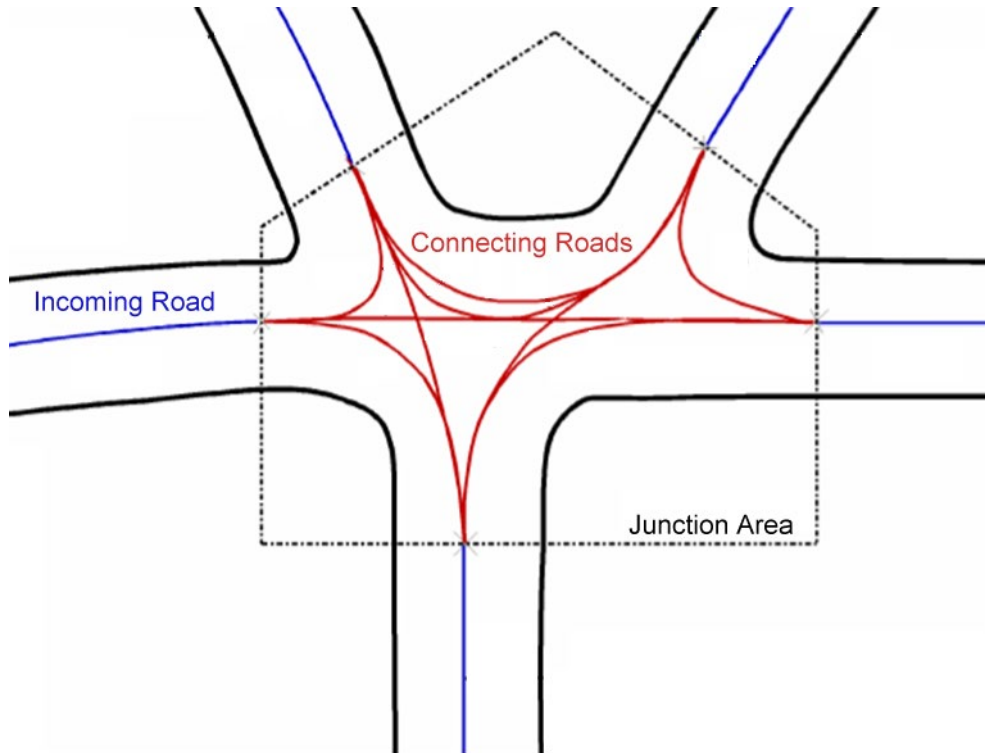Elements:
- Width
- Link
- Material
- Roadmarks

↓

3: Add Features

Elements:
- Sign
- Signal
- Object
- Elevation

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Junctions

Incoming Road

Connecting Roads

Junction Area

Elements:
- Link to lane
- Priority
- Group

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Further Development of OpenDRIVE

Results of the proposal workshop:

Features

F001: Junction Model

F002: Road Geometry Models

F003: Arbitrary Spaces Model

F004: International Signs Model

F005: Environment Representation

F006: Roundabouts

F007: Parametrization & Variation

F008: Georeferencing

Requirements

R001: Add more model parameters

R002: Remove or reduce redundant information

R003: Harmonize OpenDRIVE with other standards

R004: Remove or reduce different ways to model

Other Topics

- Reference Visualization and Checker Tool
- Reference Examples
- Best Practices Guide

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Roadmap

Standard Transfer Project

- Write missing chapters
  (e.g. introduction, glossary)
- Clarifications on
  semantics and syntax
- Formal data model
  (e.g. UML, XSD code gen.)

OpenDRIVE
1.5

OpenDRIVE
1.6

Standard Further Development

- New feature concepts
- Implementation of new
  concepts into standard

OpenDRIVE
2.0

Concept Development

- New feature concepts

OpenDRIVE 2.0
Concept

Tool Evaluation

- Requirements
- Evaluate existing tools
- Select tool
- Decide on further SW
  development model

Member tools

Tool Transfer Project

- Requirements
- SW implementation
- Beta testing
- Release

SW donation

"Tool" 1.6

Tool Further Development

- Requirements
- SW implementation
- Beta testing
- Release

"Tool" 2.0

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Status of Projects

OpenDRIVE Transfer Project

- 10 participating companies, among them 2 OEMs
- First meeting on Mar. 13, 2019
- Project lead: Vires
- Project end: Sep. 2019

OpenDRIVE Concept Project

- 17 participating companies, among them 4 OEMs
- Collaboration between 11 European and 6 Japanese companies
- First meeting on Mar. 14, 2019
- Project lead: tbd
- Project end: Dec. 2019

OpenDRIVE Tool Evaluation Project

- In proposal stage

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Agenda

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OpenCRG

OpenCRG: <u>O</u>pen <u>C</u>urved <u>R</u>egular <u>G</u>rid

- File format and source-code for the **detailed description of road surfaces**.

- OpenCRG initiative was started in 2008 by Daimler together with AUDI, BMW, Porsche and Volkswagen.

- The file format of OpenCRG is integrated in OpenDRIVE.

- Used for the description of patches of road surfaces in a very detailed manner, so that it can be used for:
  - Tire simulation
  - Vibration simulation
  - Driving simulation, etc.

- Source-code included:
  - C API for data read/write and evaluation
  - MATLAB API for data read/write, evaluation, generation, modification and visualization
  - Library of sample data
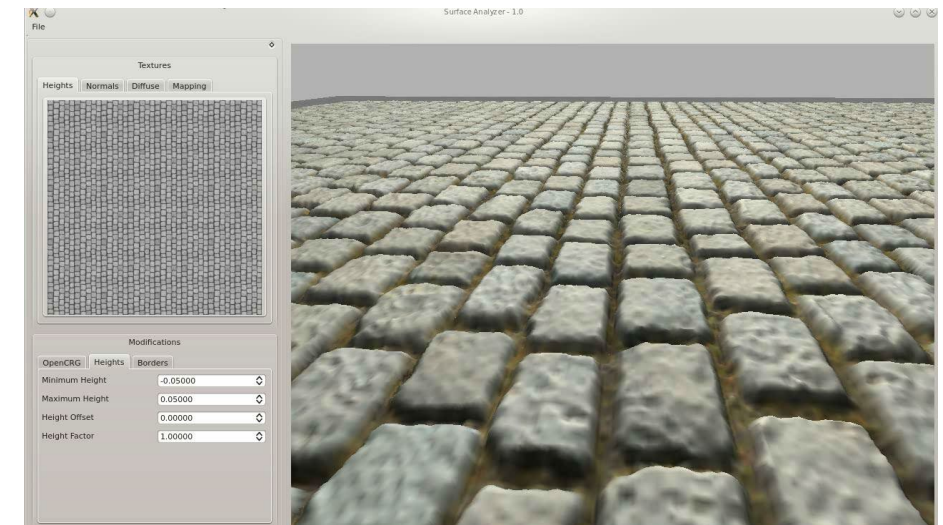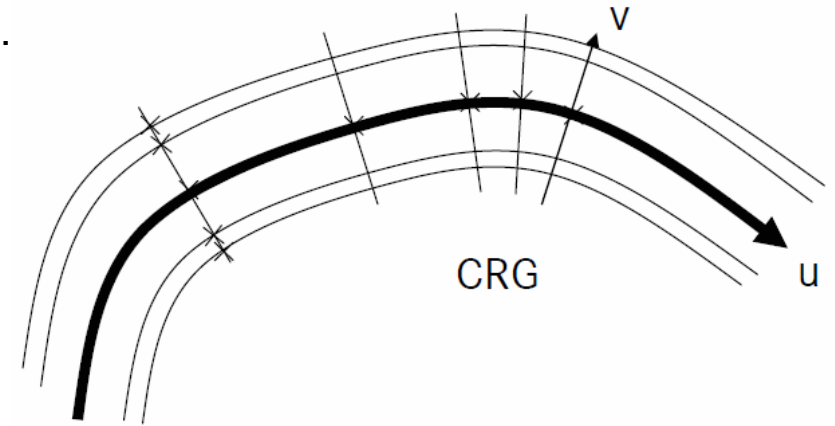
Further Development of OpenCRG

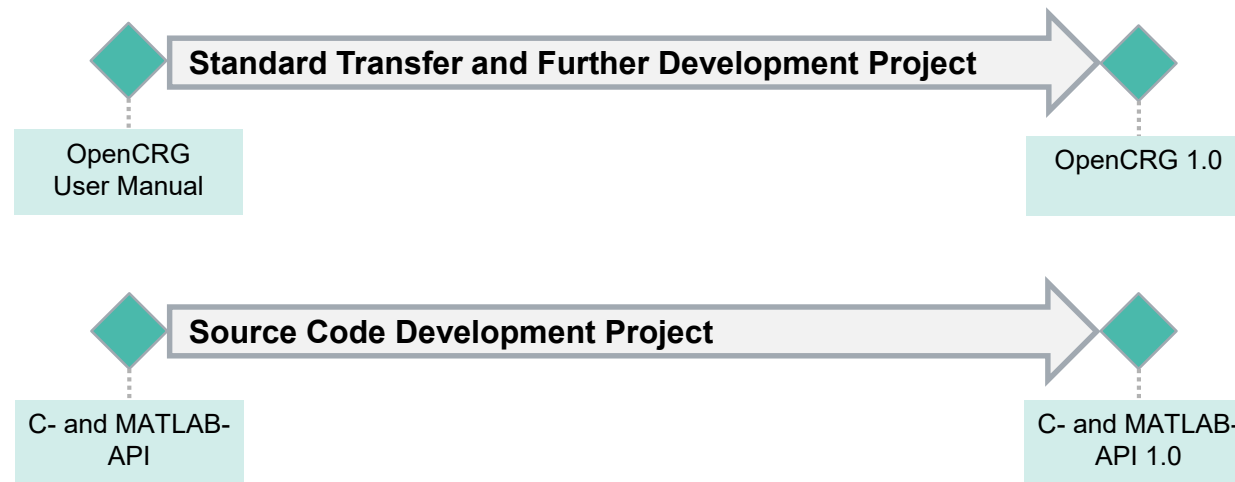Results[*] of pre-standardization meetings with industry-experts:

Features

F001: Georeferencing

F002: Multiple Data Layers

F003: Special Areas

Other Topics

- Further Development of the API Source Code

Roadmap

Standard Transfer and Further Development Project

OpenCRG
User Manual

OpenCRG 1.0

Source Code Development Project

C- and MATLAB-
API

C- and MATLAB-
API 1.0

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Thank you!

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For more information
on ASAM visit

www.asam.net

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