The
Open Simulation Interface (OSI)

Kickoff Workshop: ASAM OSI

Carlo van Driesten, February 21st, 2020 Pähenkirchen

BMW GROUP THE NEXT 100 YEARS

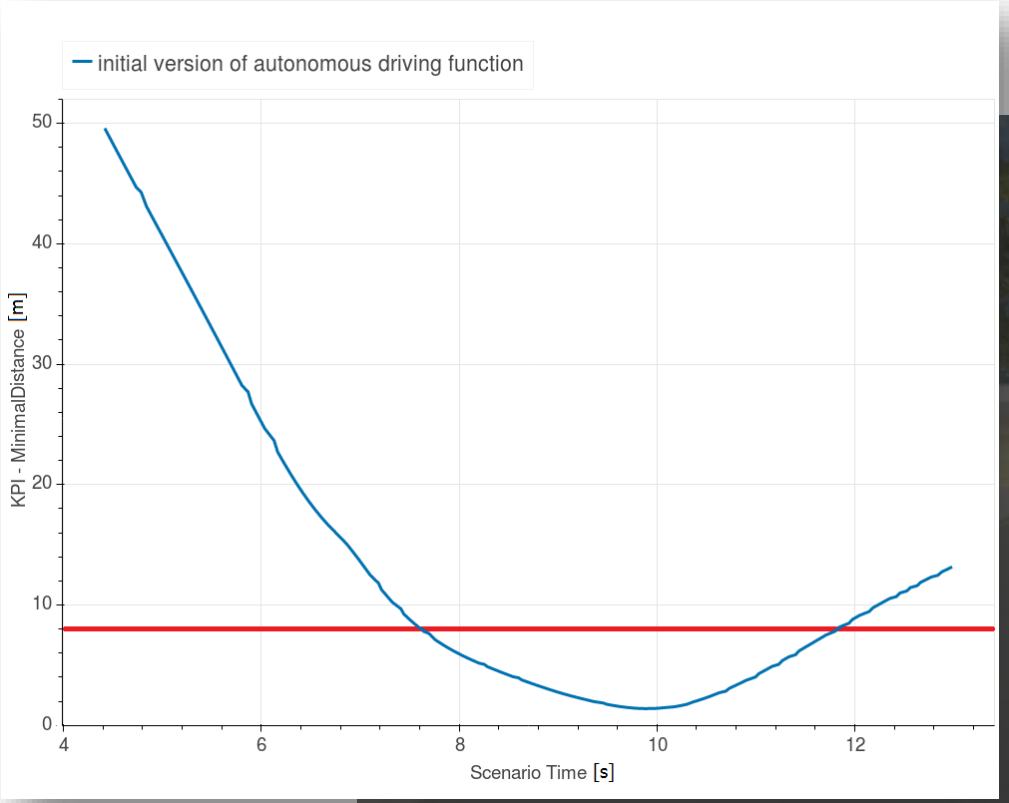
Rolls-Royce Motor Cars Limited

Warm-Up Question:

Who has worked with OSI?

"The critical path to introduce autonomous driving vehicles will not be the technology but the development of a **metric** which **empowers** for an **approval**"

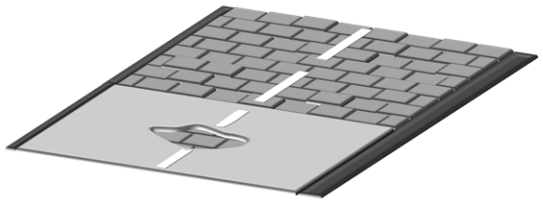
Prof. Dr. Hermann Winner


initial version of autonomous driving function
KPI - MinimalDistance [m]
50
40
30
20
10
0
4
6
8
10
12
Scenario Time [s]

M AD 9015

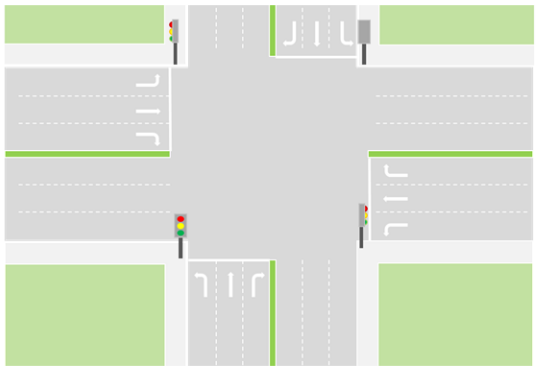
OPEN X STANDARD OVERVIEW.

Static road surface description



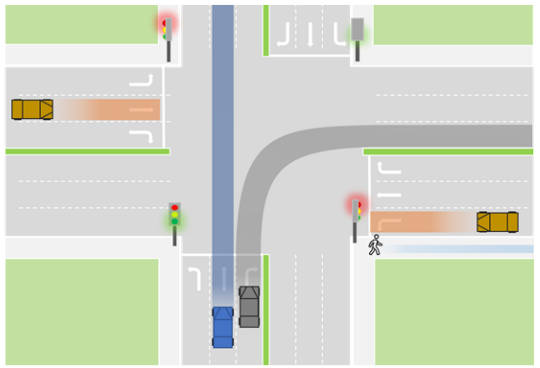
ASAM OpenCRG®

Static road network description



ASAM OpenDRIVE®

dynamic scenario description



ASAM OpenSCENARIO®

Scenario description, with dynamic and static content

The OpenXStandards are exchange formats for Simulations.
Describing different parts of a simulated scenario.
Each standard can be used stand alone or in combination with other standards.

FOR IMMEDIATE RELEASE
September 25, 2019

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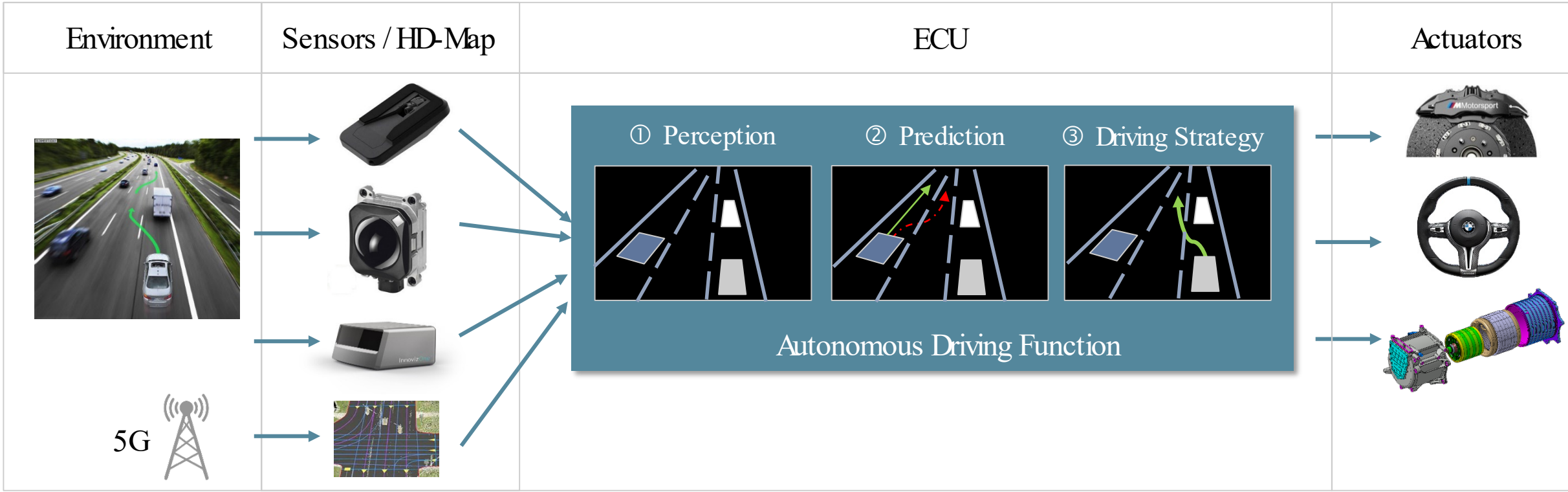
Press Release

Commits on Jan 31, 2017

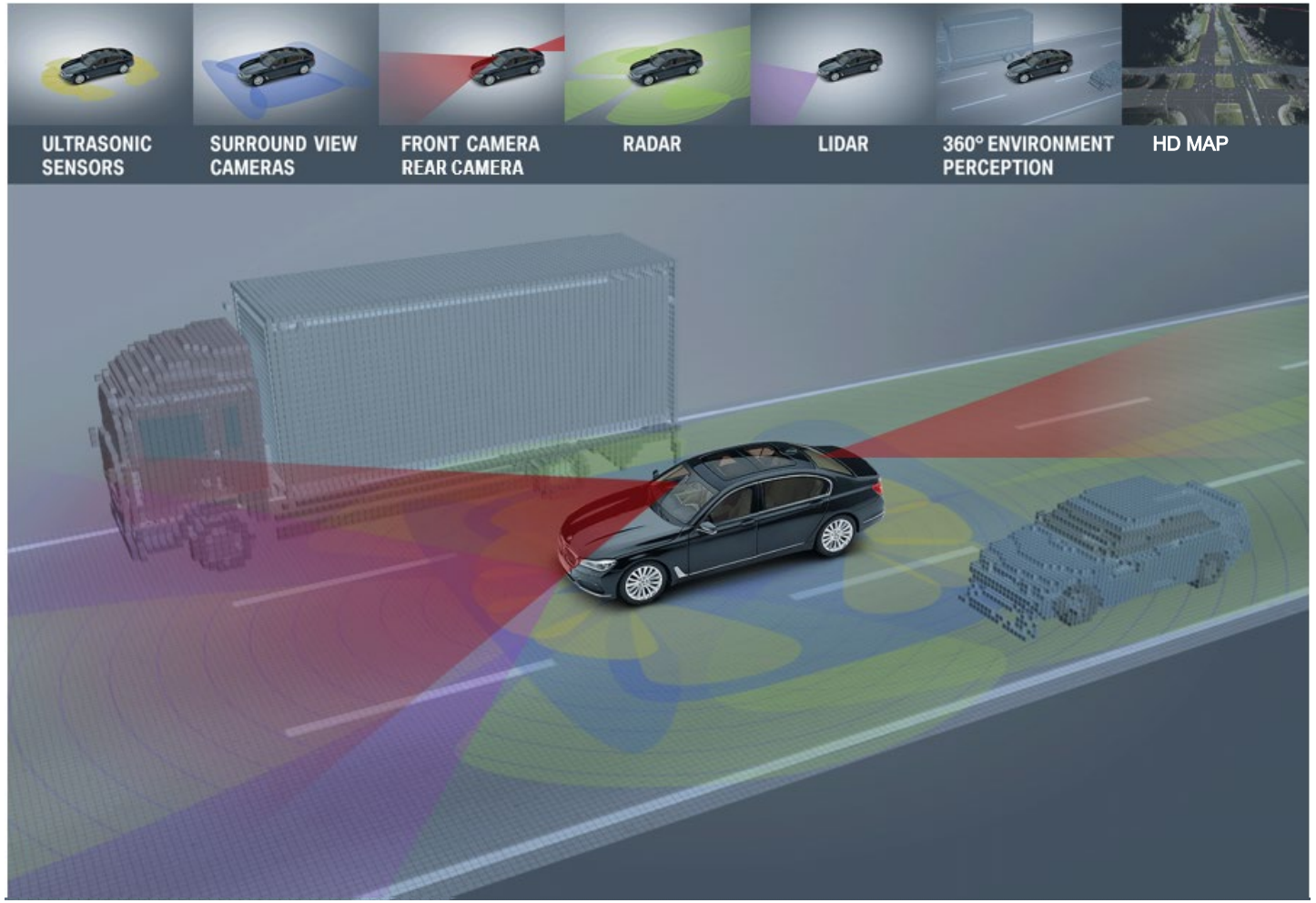
Initial commit of the Open Simulation Interface (OSI) Version 17 (#1) ...
jdsika committed on 31 Jan 2017
1 33a8efe

Initial commit: gitignore ...
jdsika committed on 31 Jan 2017
19e43f1

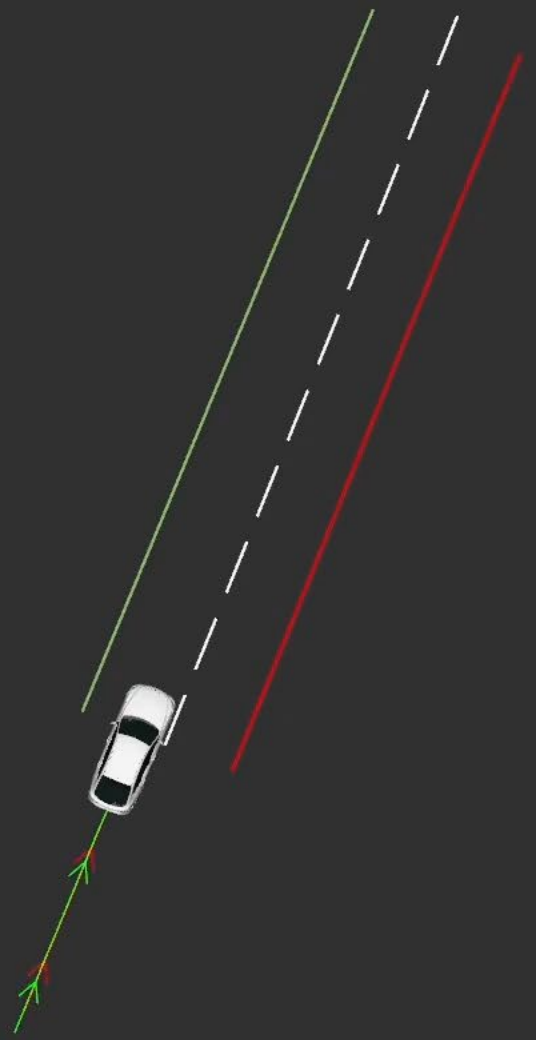
THE OVERALL CHAIN OF EFFECTS.



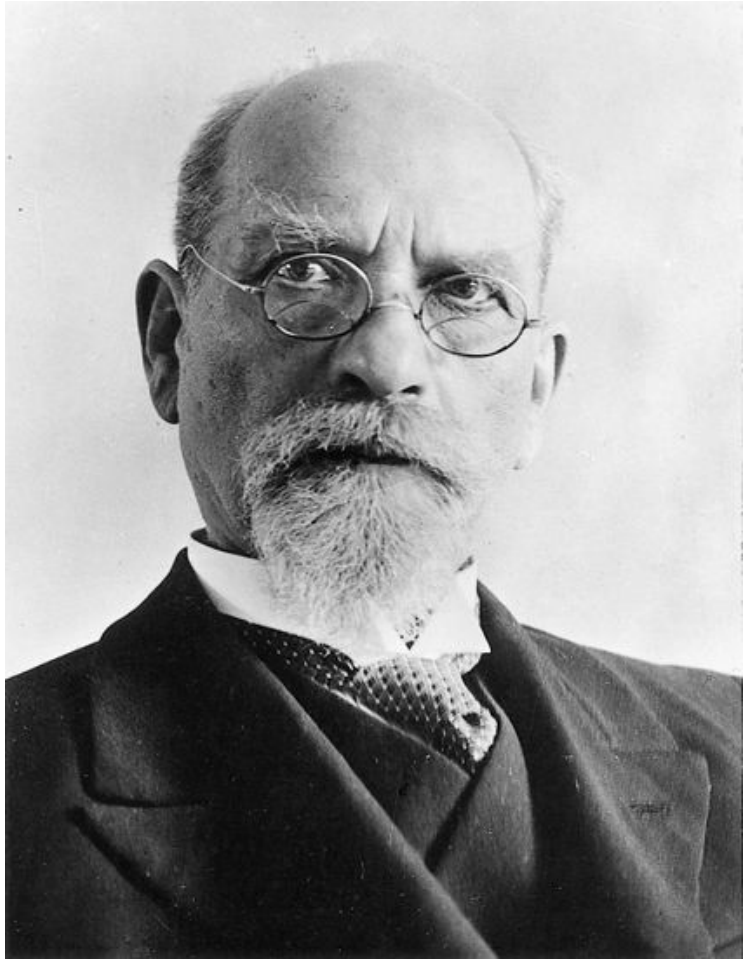
AUTOMATED DRIVING ON HIGHWAYS REQUIRES DOZENS OF SENSORS A DIFFERENT TECHNOLOGIES.




Image



PHENOMENOLOGY.



Edmund Husserl (1859 – 1938)

SENSOR MODELING.
A REFLECTIVE STUDY.

Stochastical Model

"Data &Statistics"

- Object misses

Idealized Model

"Technical Datasheet"

- Mounting position
- Field of view (FOV)
- Resolution

Physical Model

"Equations"

- Range dependency of Radar return power
- Lidar intensity return for different materials

Development progress & modelling depth

THE INTERFACES.

Interface

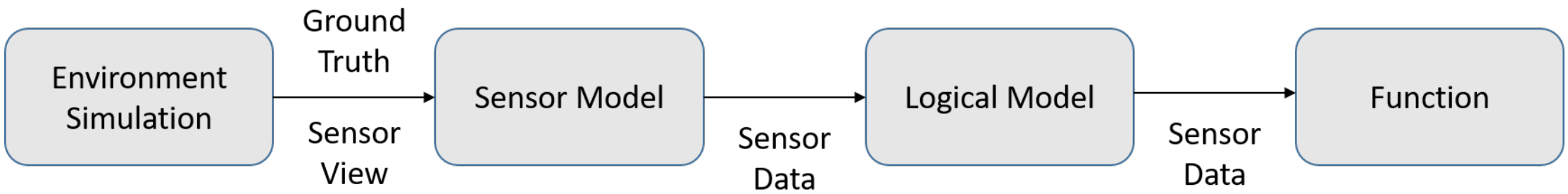
"The message definitions"

- Protobuffer as DDL
- In- and outputs of the models
- Focus on comprehensibility

Packaging

"The model definition"

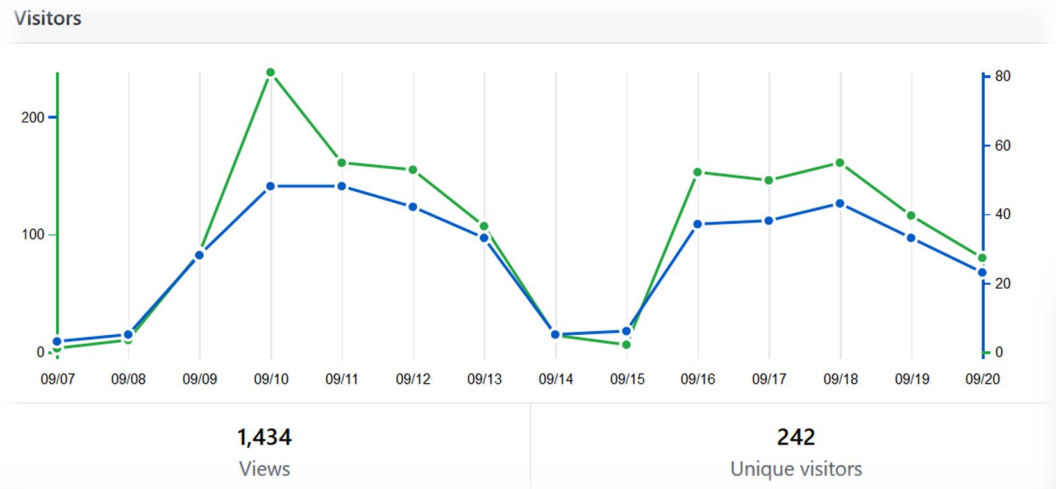
- Functional Mockup Interface (FMI)
- Models to exchange between external partners

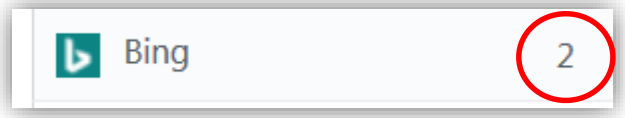


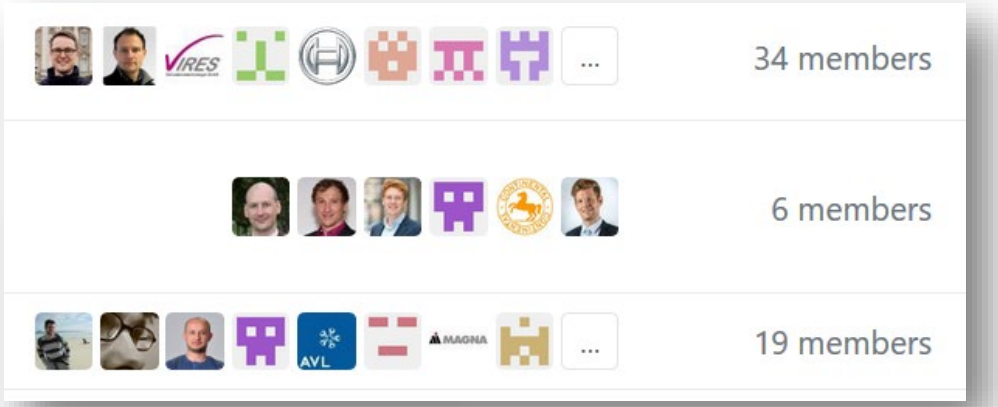
What can we do to get people easily started on standards?

1000 pages of PDF?

GITHUB







Open Simulation Interface (OSI)

https://www.hot.ei.tum.de/forschung/automoti...

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open-simulation-interface

A generic interface for the environmental perception of automated driving functions in virtual scenarios.

Python

osi-sensor-model-packaging

This document specifies the way how sensor models are to be packaged and used in simulation environments with FMI.

osi-validation

Tools around the OSI used to verify the content of messages and more.

Python 1 3

Interface

Packaging

Tools

open source initiative®

THE MESSAG DEFINITION.

```
// \brief The conditions of the environment.
//
// \image html EnvironmentalConditions.svg
//
// Definition of light, weather conditions and other environmental conditions.
//
// \note These conditions apply locally around the host vehicle.
//
message EnvironmentalConditions
{
    // Atmospheric pressure in Pascal at z = 0.0 m in world frame (about 101325 Pa) [1, 2].
    //
    // Unit: Pa
    //
    // \note 100000 Pa = 1 bar
    //
    // \par References:
    // [1] DIN Deutsches Institut fuer Normung e. V. (1982). <em>DIN 5031-3 Strahlungsphysik
    // [2] Rapp, C. (2017). Grundlagen der Physik. In <em>Hydraulik fuer Ingenieure und Natu
    //
    // \rules
    // is_optional
    // is_greater_than_or_equal_to: 90000
    // is_less_than_or_equal_to: 200000
    // \endrules
    //
    optional double atmospheric_pressure = 1;
}
```

RULES AS REGULAR EXPRESSIONS.

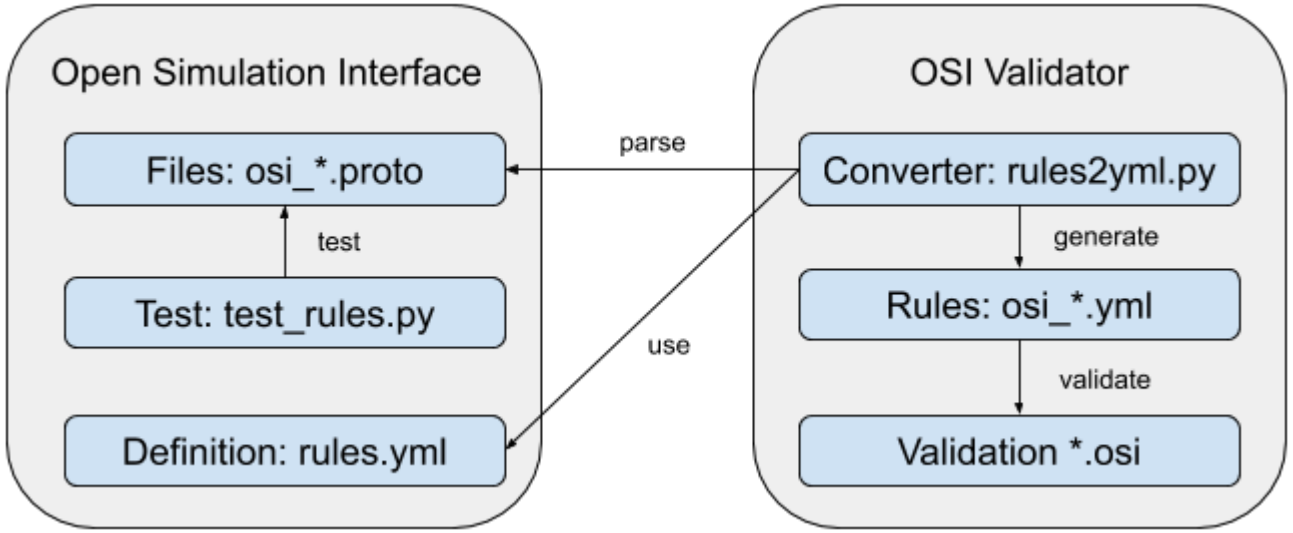
```
'is_greater_than':              r'^[ ]\b(is_greater_than)\b: ([\s\d]+)$'
'is_greater_than_or_equal_to':  r'^[ ]\b(is_greater_than_or_equal_to)\b: ([\s\d]+)$'
'is_less_than_or_equal_to':     r'^[ ]\b(is_less_than_or_equal_to)\b: ([\s\d]+)$'
'is_less_than':                 r'^[ ]\b(is_less_than)\b: ([\s\d]+)$'
'is_equal':                     r'^[ ]\b(is_equal_to)\b: ([\s\d]+)$'
'is_different':                 r'^[ ]\b(is_different_to)\b: ([\s\d]+)$'
'is_global_unique':             r'^[ ]\b(is_globally_unique)\b'
'refers':                       r'^[ ]\b(refers_to)\b'
'is_iso_country_code':          r'^[ ]\b(is_iso_country_code)\b'
'first_element':                r'^[ ]\b(first_element)\b'
'last_element':                 r'^[ ]\b(last_element)\b'
'check_if':                     r'^[ ](\bcheck_if\b)(.*\belse do_check\b)'
```

VALIDATION.

OSI Validator

build passing

OSI Validator checks the compliance of
customization of the rules is available h



Usage

```
usage: osivalidator [-h] [--rules RULES]
                    [--type {SensorView,GroundTruth,SensorData}]
                    [--output OUTPUT] [--timesteps TIMESTEPS] [--debug]
                    [--verbose] [--parallel] [--format {separated,None}]
                    [--blast BLAST] [--buffer BUFFER]
                    data
```

LET‘S HAVE A LOOK AT GITHUB

Thank you for your attention.