

# ASAM OpenLABEL V1.0.0

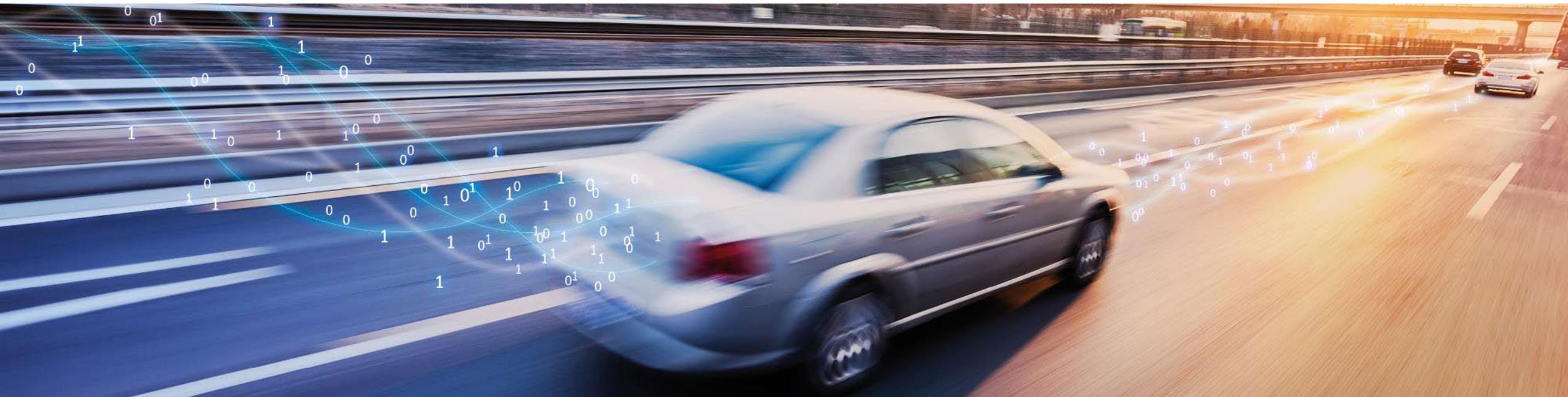
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Vicomtech

OpenLABEL V1.0.0

28. April 2022

München



# Agenda

OpenLABEL V1.0.0 Technical Seminar

<b>1</b>	<b>Motivation</b>
<b>2</b>	<b>Use Cases</b>
<b>3</b>	<b>Applications</b>

# ASAM OpenLABEL V1.0.0

## Motivation

# ASAM OpenLABEL V1.0.0 - Foundations

Project and milestones

## OpenLABEL V1.0.0 – Released Nov. 2021

- Multi-sensor Object labeling
- Scenario tagging
- JSON schema – data model and format
- TTL Ontology for scenario tagging



The screenshot shows the top portion of the ASAM OpenLABEL V1.0.0 document. On the left is a 'Table of Contents' with 7 main sections and sub-sections. The main content area features the ASAM logo, the title 'ASAM OpenLABEL', and the version 'Version: 1.0.0, 2021-11-12'. Below this is a 'Disclaimer' section with a red exclamation mark icon, followed by the heading '1. Foreword'. The foreword text describes ASAM e. V. as a non-profit organization promoting standardization in automotive development and testing.

1. Foreword
2. Introduction
2.1. Overview
2.2. Conventions and notation
3. Scope
3.1. Multi-sensor data labeling
3.2. Scenario tagging
4. Normative references
5. Terms and definitions
6. Conceptual overview
6.1. Data annotation in ASAM OpenLABEL
6.2. Annotation schema and its format
6.3. Metadata
6.4. Coordinate systems
6.5. Semantic segmentation
7. Multi-sensor data labeling
7.1. Introduction
7.2. Annotation schema
7.3. Structure
7.4. Elements

[https://openlabel.asam.net/V1-0-0/schema/openlabel\\_json\\_schema.json](https://openlabel.asam.net/V1-0-0/schema/openlabel_json_schema.json)  
[https://openlabel.asam.net/V1-0-0/ontologies/openlabel\\_ontology\\_scenario\\_tags.ttl](https://openlabel.asam.net/V1-0-0/ontologies/openlabel_ontology_scenario_tags.ttl)

# ASAM OpenLABEL V1.0.0 - Motivation

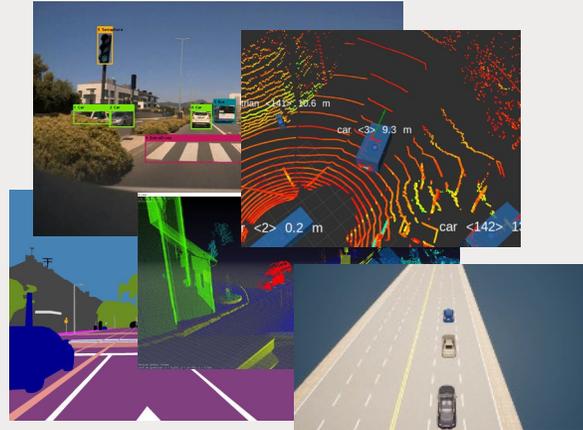
Intro & Motivation

## Industry requirements



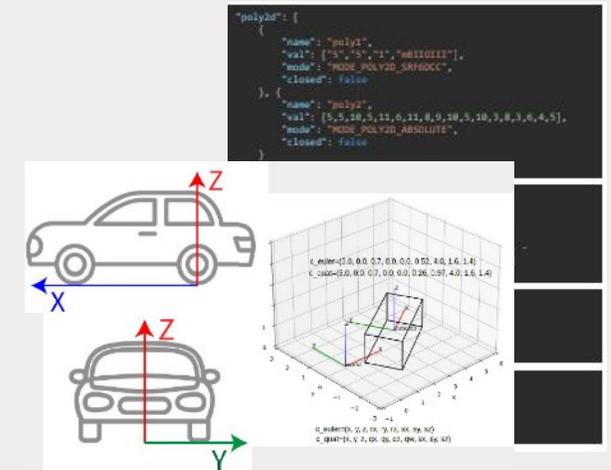
What do we need?

## Define focus areas



Focus on current needs  
Keeping it extendable for future versions

## Consensus and joint work



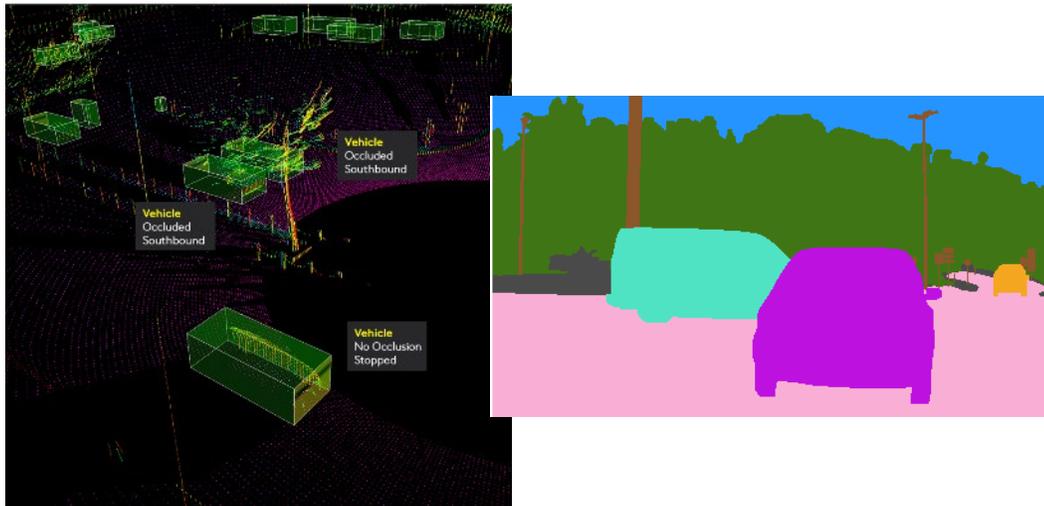
Data format  
JSON schema

# ASAM OpenLABEL V1.0.0 - Scope

Multi-sensor labeling AND Scenario tagging

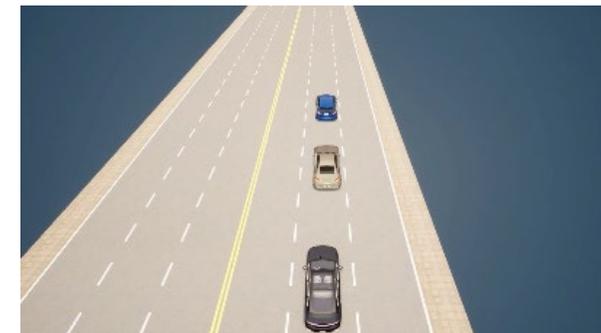
## Multi-Sensor Data Labeling

- Object labeling in images, videos, point clouds
  - 2D and 3D geometries (boxes, lines, shapes)
  - Time intervals and synchronization
  - Coordinate system management
  - Attributes (categorical, numerical, custom)
  - Linkage to ontologies
- 
- For **ground-truth generation**
  - For **training dataset** generation



## Scenario Tagging

- Test scenario tagging
  - Tag relationships
  - Ontology-based definitions
- 
- For **semantic search** of scenario conditions



Scenery

- Broken line
- Divided road
- Drive on right
- Lane dimensions [ Width (m): 3.4 to 3.7 ]
- Level plane

Environmental Conditions

- Cloudiness [ Cloud cover (okta): 0 to 1 ]
- Day
- Sun elevation [ Angle (degree): 10 to 30 ]

Agents

- Stop

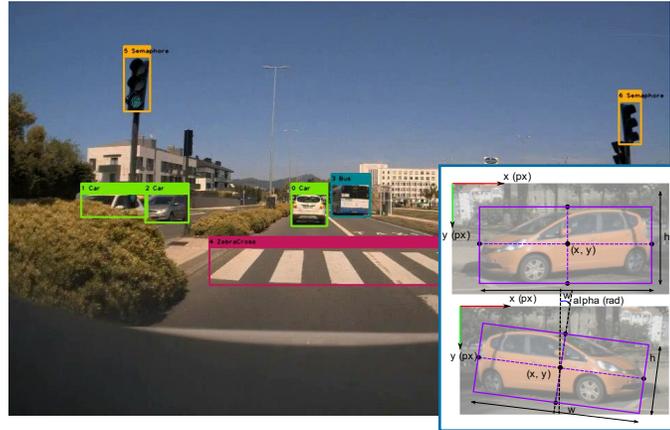
# ASAM OpenLABEL V1.0.0

Use cases

# Object labeling

Spatio-temporal, 2D, 3D, multi-sensor, multi-coordinate system

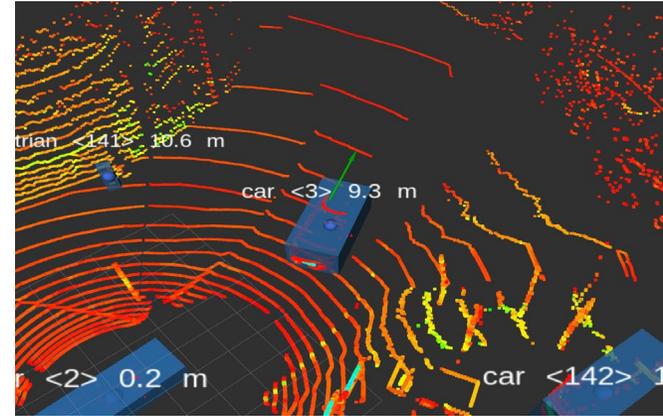
2D Bounding box



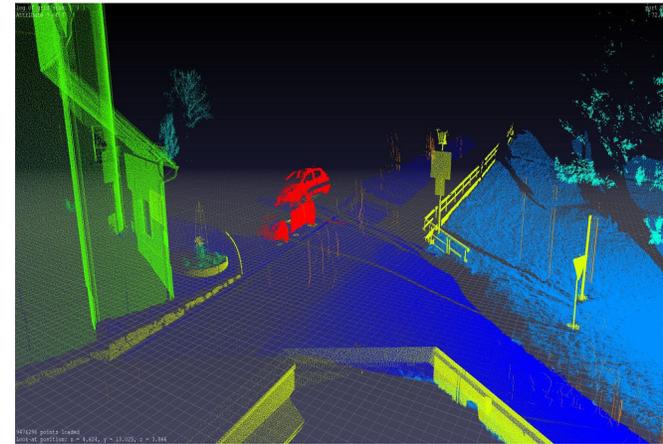
2D Semantic segmentation  
(instance, panoptic)



3D Bounding box  
(cuboid)



3D Point cloud  
segmentation





# Scenario tagging

ODD, Behaviour and Admin Tags

```
example.xosc
<?xml version="1.0" encoding="utf-8"?>
<OpenSCENARIO>
  <FileHeader revtag="1"
    revline="0"
    date="2020-06-16T10:00:00"
    description="Example Scenario"
    author="John Doe">
  </FileHeader>
  </ManeuverGroup>
  <StartTrigger>
    <ConditionGroup>
      <Condition name="ExampleCondition"
        delay="0" conditionEdge="rising">
        <ByValueCondition>
          <SimulationTimeCondition value="0"
            rule="greaterThan" />
        </ByValueCondition>
        </Condition>
      </ConditionGroup>
    </StartTrigger>
  </Act>
  </Story>
  <Story name="CutInStory">
    <Act name="CutInAct">
      <ManeuverGroup maximumExecutionCount="1"
        name="CutInSequence">
        <Actors selectedTriggeringEntities="false">
          <EntityRef entityRef="CutInVehicle" />
        </Actors>
      </ManeuverGroup>
    </Act>
  </Story>
</OpenSCENARIO>
```

← tags

```
example.json
{
  "openlabel": {
    "metadata": {
      "schema_version": "1.0.0",
      "tagged_file": "../resources/scenarios/example.xosc"
    },
    "ontologies": {
      "0": {
        "uri": "https://openlabel.asam.net/V1-0-0/ontologies/openlabel_ontology_scenario_tags.ttl"
      }
    },
    "tags": {
      "0": {
        "type": "RoadTypeMinor",
        "ontology_uid": "0"
      },
      "1": {
        "type": "MotionCutIn",
        "ontology_uid": "0"
      },
      "2": {
        "type": "ScenarioVersion",
        "ontology_uid": "0",
        "tag_data": {
          "text": {
            "type": "value",
            "val": "1.0"
          }
        }
      }
    }
  }
}
```

----- refers to ----->

```
openlabel_ontology_scenario_tags.ttl
@base <https://openlabel.asam.net/V1-0-0/ontologies/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .

<RoadTypeMinor> a rdfs Class ;
rdfs:subClassOf <DrivableAreaType> .

<MotionCutIn> a rdfs Class ;
rdfs:subClassOf <BehaviourMotion> .

<scenarioVersion> a rdfs Property ;
rdfs:label "Scenario version"@en ;
rdfs:domain <Scenario> ;
rdfs:range rdfs:Literal .
```



↓ conforms to

```
openlabel_json_schema.json
{
  "openlabel": {
    "properties": {
      "metadata": { },
      "ontologies": { },
      "tags": { }
    }
  }
}
```

ODD Tags	Behaviour Tags	Admin Tags
<p><b>Operational Domain Design (ODD) tags:</b> ODD tags describe the environmental conditions and road features present in a scenario, such as rainfall and junction. The ASAM OpenLABEL ODD tags are aligned with and share their definitions with the BSI PAS 1883 ODD Taxonomy,</p>	<p><b>Behavior tags:</b> Behavior tags describe the types of road users and the behaviors exhibited by them in a scenario, such as a pedestrian who is walking</p>	<p><b>Administration tags:</b> Administration tags describe things about a scenario which cannot or may not easily be derived from a scenario, such as the creation date of a scenario</p>

# ASAM OpenLABEL 1.0.0

## Applications

# Labeling tools

2D bounding boxes, 2D image segmentation, 3D cuboids, 3D polylines

The screenshot displays the PROVEN WebLabel interface. The top bar shows the application name and navigation icons. The main area is split into two views: a left view showing a 3D scene with a blue car and a right view showing a 2D image of the same scene with a red car. The left view has labels for 'Car\_0', 'Truck\_4', and 'Person\_2'. The right view has labels for 'Person\_2' and 'Car\_1'. Below the views is a detailed panel for 'objects / Car\_0' with the following data:

Property	Value
Color	dark
Moving	true
right	1154.87, 501.798, 122.703, 37.3692
left	
front	444.580, 494.128, 142.593, 40.1750
rear	
finished	false

# Labeling tools

Frame intervals, Actions

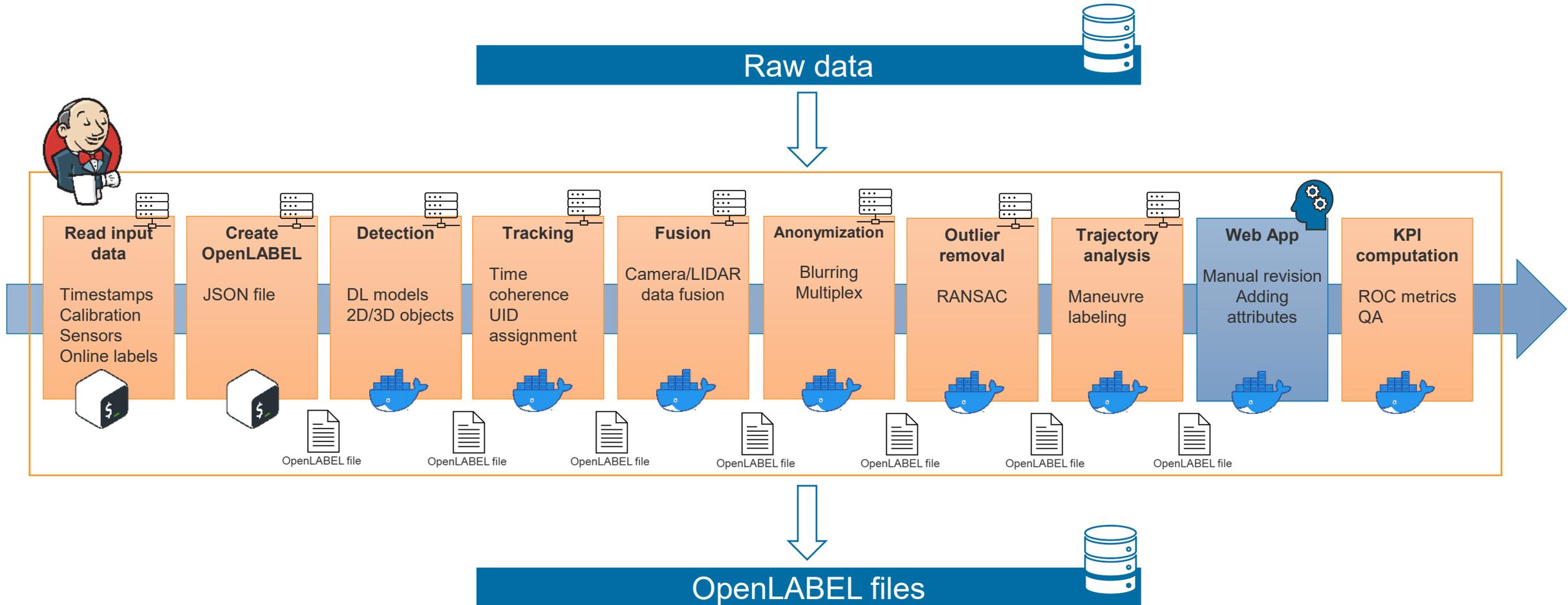
The screenshot displays the PROVEN WebLabel software interface. The top bar shows the application name and navigation icons. The main window is divided into several sections:

- Annotations Panel (Left):** Contains a list of labeled objects and actions. The objects are "Driver\_1: driver" and "Bottle\_1: bottle". The actions list includes:
  - Action\_1: driver\_actions/safe\_drive
  - Action\_6: driver\_actions/radio
  - Action\_7: driver\_actions/reach\_side
  - Action\_8: driver\_actions/unclassified
  - Action\_9: driver\_actions/drinking
  - Action\_10: driver\_actions/talking\_to\_passenger
  - Hands\_on\_wheel\_1: hands\_and\_wheel/both
  - Hands\_on\_wheel\_2: hands\_and\_wheel/only\_left
- Stream Viewer (Center):** Displays a video stream of a driver in a car. A text overlay in the top right corner of the video provides bounding box data:

```
Frame offset:  
Face: 0  
Body: 16  
Hands: 24  
Frame: 19
```
- Timeline (Bottom):** Shows a video progress bar with a search icon and a timeline scale from 1375 to 1520. The current frame is 19 out of 6,766.

# Labeling data exchange format

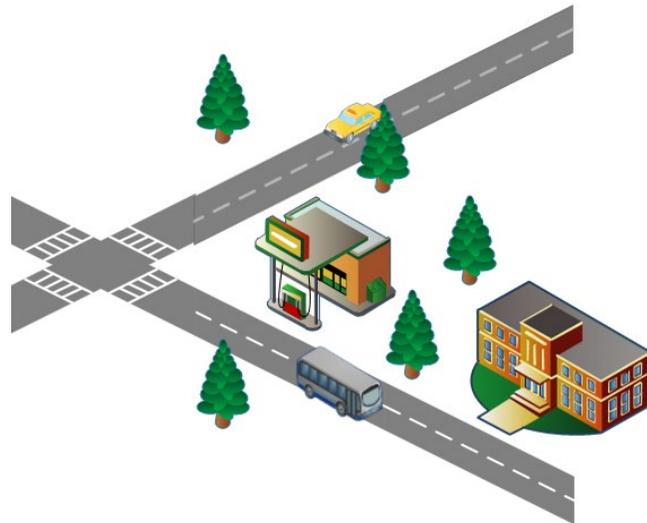
OpenLABEL as data exchange format in data processing pipelines



# Scenario search

Tagging and ontologies

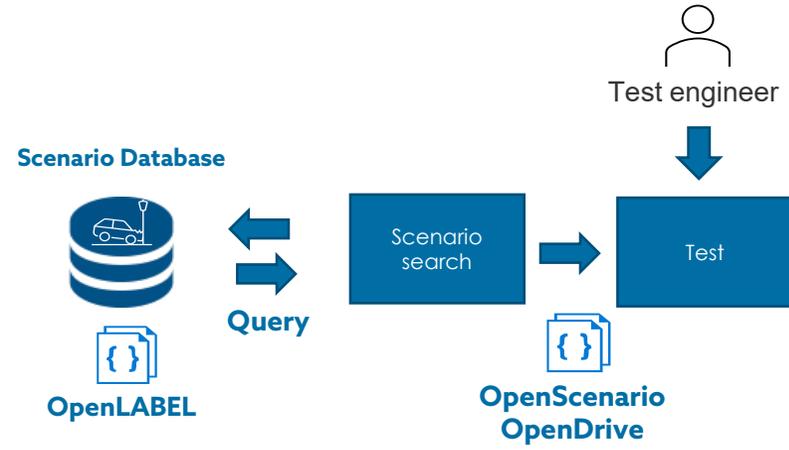
- OpenLABEL to host tags for scenario files
- Semantic search of scenarios
  - *ODD tags*
  - *Behaviour tags*
  - *Admin tags*



Scenario – OpenScenario  
HD Map – OpenDrive  
Scenario tags – OpenLABEL



Virtual testing



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