

VERSION 1.0.0  
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## ASAM OpenLABEL

### Standardized Labeling for Objects and Scenarios

ASAM OpenLABEL is currently under development. The project aims to standardize the annotation format and labeling methods for objects and scenarios. ASAM OpenLABEL will provide a guideline on how the labeling methods and definitions should be used.

From working with different customers, a significant fragmentation emerged in the way each individual organization categorizes and describes the objects populating the driving environment. Such categorizations and descriptions are the fundamental building block of any Autonomous Driving System's (ADS) perception stack, since it is through them that an ADS comes to a basic and profound understanding of the status of around its surrounding.

#### The lack of a common labeling standard in the industry is the root cause of several different issues:

- **Hampered Vehicle2Vehicle Interaction:** The different descriptions and understandings of surroundings may cause casualties in complex situations involving two or more different ADSs
- **Precluded sharing:** It is a highly difficult if not impossible task to share data across organizations that adopted different labeling taxonomies and specifications
- **Reduced annotation quality:** Each individual labeling task requires ad-hoc training and even development of custom software functions that translate into a higher probability of errors and thus a threat to safety
- **Deprecation of old labels:** Long-term operation of ADS development imply changes in quantity and comprehensiveness of labels to be produced considering the evolution of the driving scenes, new sensors, and scenarios. As a consequence, a flexible descriptive language is required to absorb future extensions and modifications of labels and guarantee backward-compatibility.

```

1  {
2    "openlabel": {
3      ...
4      "objects": {
5        "1": {
6          "name": "van1",
7          "type": "Van"
8        },
9        "2": {
10         "name": "cyclist2",
11         "type": "Cyclist"
12       },
13       ...
14       "16": {
15         "name": "Ego-vehicle",
16         "type": "Car"
17       },
18       "17": {
19         "name": "road17",
20         "type": "Road",
21       }
22     }
23   }
24 }
```

ASAM OpenLABEL JSON format snippet

### JSON Format

The use of a standardized format will help save cost and resources in converting annotated data. ASAM OpenLABEL will be represented in a JSON format and can therefore be easily parsed by tools and applications. ASAM OpenLABEL will specify which coordinate systems are used as reference for the label. This already facilitates the conversion a lot.

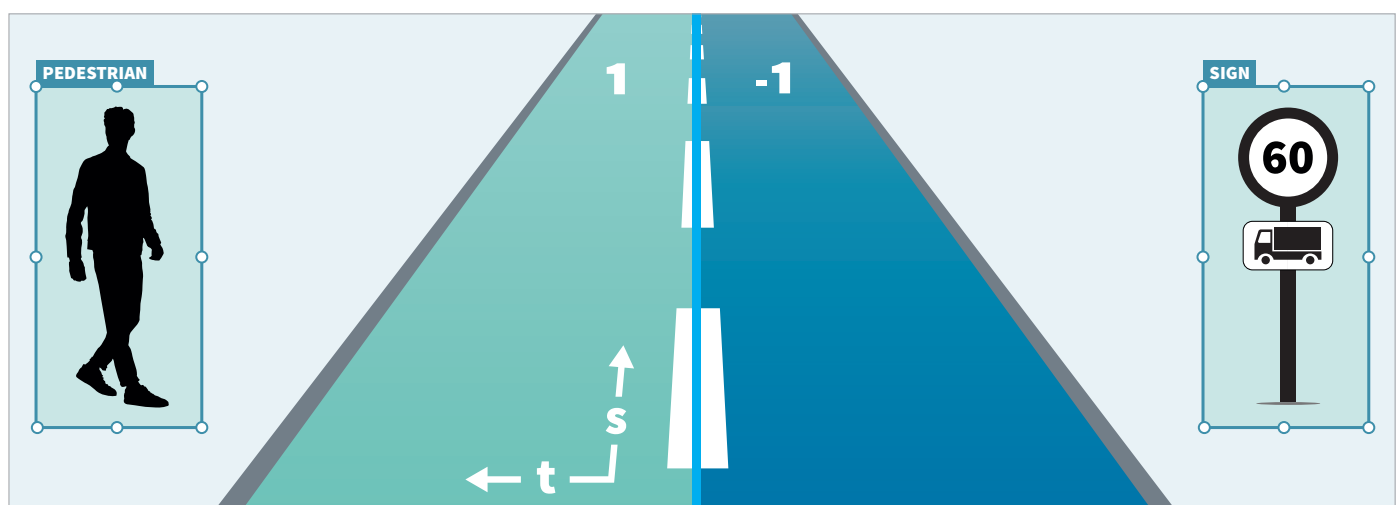
### Extended Labeling Objects

ASAM OpenLABEL will also provide methods to label objects in a scene (one point in time/ frame) as well as across multiple scenes by enhancing the methods to label actions, intentions and relations between objects.

### Labeling Different Data Types

The ASAM OpenLABEL format will be capable of managing different types of labeling methods, for different types of data. This includes 2D and 3D bounding boxes, the rotation of 3D bounding boxes, semantic segmentation of images and point clouds. These semantic segmentations can be either instance classes, single/multi-class, partial or full classes.

## Example Tags for an Annotated Scene



It is important that the labeling fits into the taxonomy definitions of a user/company. For that reason, the project group intends to provide ASAM OpenLABEL with the ability to import ontologies and taxonomies for the labeling process. The ASAM OpenLABEL project group is closely interacting with the ASAM OpenXOntology project to align ASAM OpenLABEL with the OpenX domain model and to provide requirements for the ASAM OpenXOntology standard. As ASAM OpenLABEL and ASAM OpenXOntology are currently being developed in parallel, the ASAM OpenLABEL standard will be developed with an external ontology. The experience on using ASAM OpenLABEL with different ontologies can be used to give the user a guideline on how to import their own ontology and use this with ASAM OpenLABEL. It might be possible that the use of foreign ontologies will require a certain standardized ontology format.

The development of ASAM OpenLABEL started in January 2021. The standardization will be based on the concept paper and contain the following work packages:

- 1. USER GUIDE:** The User guide will help future users of ASAM OpenLABEL to apply the standard for their use cases. The User guide will be accompanied by examples.
- 2. HARMONIZATION:** The main task of this work package is to ensure the alignment of ASAM OpenLABEL with the other standards in the ASAM domain Simulation.

- 3. LABELING:** The Object and Scene Labeling work group shall create the specification for the labeling of objects identified in a scene (one point in time).

- 4. OBJECT LABELING:** This subgroup focusses on describing how single objects can be labelled.

- 5. SCENE LABELING:** This subgroup focusses on how the labeled objects can be labeled in the context of a scene. This work package has several perspectives: conditional labels, event labels, action labels, relation labels.

- 6. SCENARIO LABELING:** This work group will define scenario labels on a meta level. This includes labels that can be derived from the content of the scenario as well as labels which are non-derivable.

- 7. DATA FORMAT:** The work package will create the JSON format based on the input given in the concept paper and provided by the specification work groups (2 – 4).

- 8. STANDARD DOCUMENTATION:** This work package has a close interaction with all other work package and is responsible to create the final standard document. It will be mainly executed by a service provider.

The first version of ASAM OpenLABEL is foreseen to be released in Nov 2021.