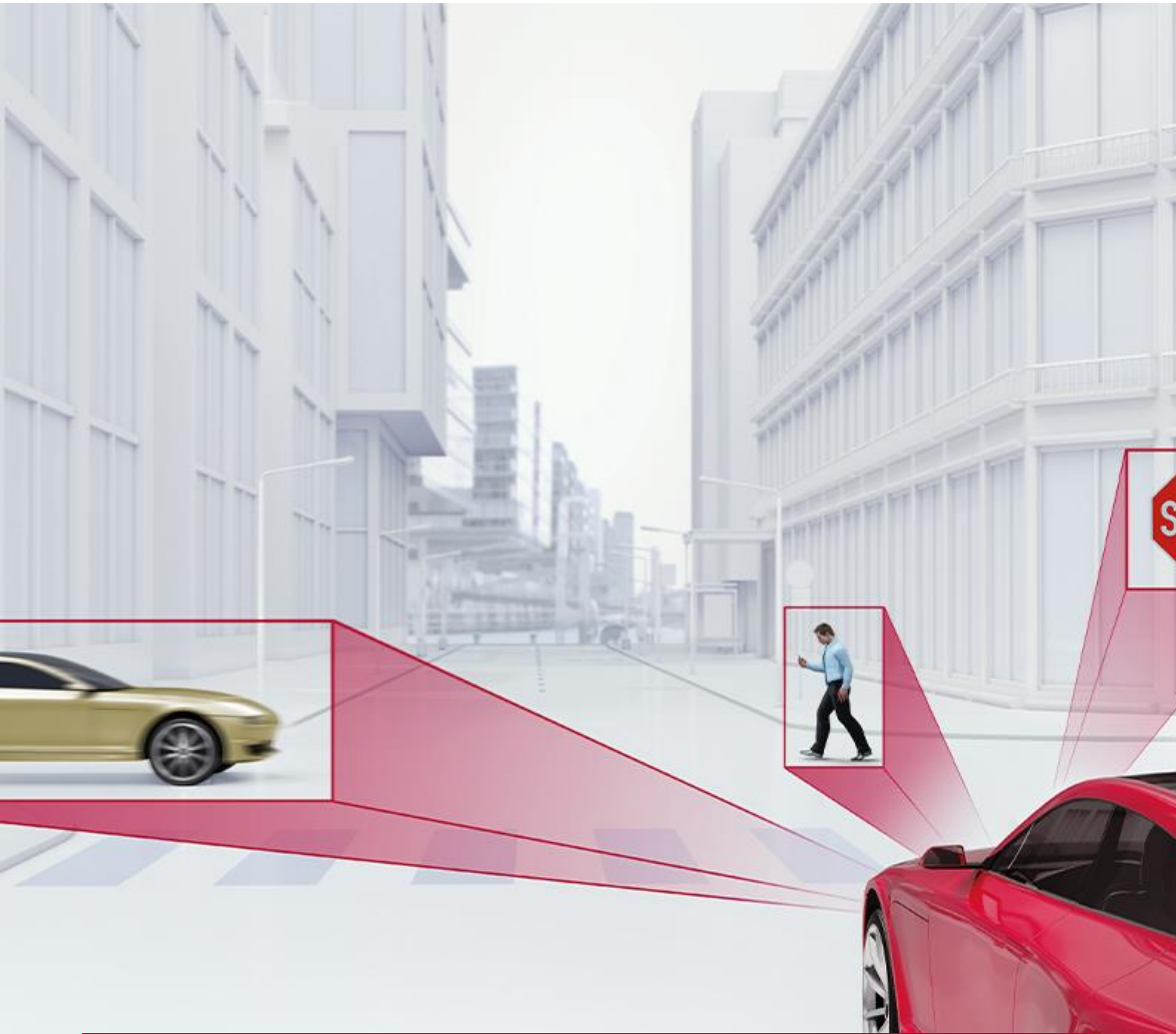

# Option Driver Assistance

Product Information

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V22 2023-12

Valid for CANape, CANape log and vSignalyzer as of version 22

# 1 Overview

## 1.1 Introduction

ADAS sensors identify objects in road traffic. The Driver Assistance option allows you to capture sensor data and conveniently verify it against reality.

This results in wide-ranging application areas for ADAS development:

> Whole vehicle logging of sensor and ground truth data.

> Scalable logger solution through Distributed High Performance Recorder (DHPR)

> Large number of supported ADAS sensors: radar, lidar, video, IMU, context cameras, ..

> Open interface to support additional sensors

> Visualization of sensor data in video, map and scene windows

> Verification of object recognition algorithms, e.g., for adaptive cruise control, adaptive cornering lights and traffic sign recognition, through object overlays of sensor data in video and map windows

The Driver Assistance option is available in CANape, CANape log and vSignalyzer.

| | Display of sensor data | Capture sensor data |
|---|---|---|
| CANape Option DA | x | x |
| CANape log Option DA | | x |
| vSignalyzer Option DA | x | |

## 1.2 Properties and Advantages

### 1.2.1 Validation and Visualization of ADAS Sensor Data

The detected objects are displayed as graphical symbols (e.g. as rectangles and polygons) in different display windows. Both during the measurement and based on measurement data.
A video of a reference camera recorded synchronously to the measurement serves as a basis for the verification of the sensor data. The sensors provide the coordinates of the objects, which are then displayed at the corresponding positions of the reference image. For a better overview, the sensor objects can also be displayed in a three-dimensional, freely configurable scene window.
This direct comparison between sensor data and reality allows you to verify the quality of your sensor data quickly and reliably.

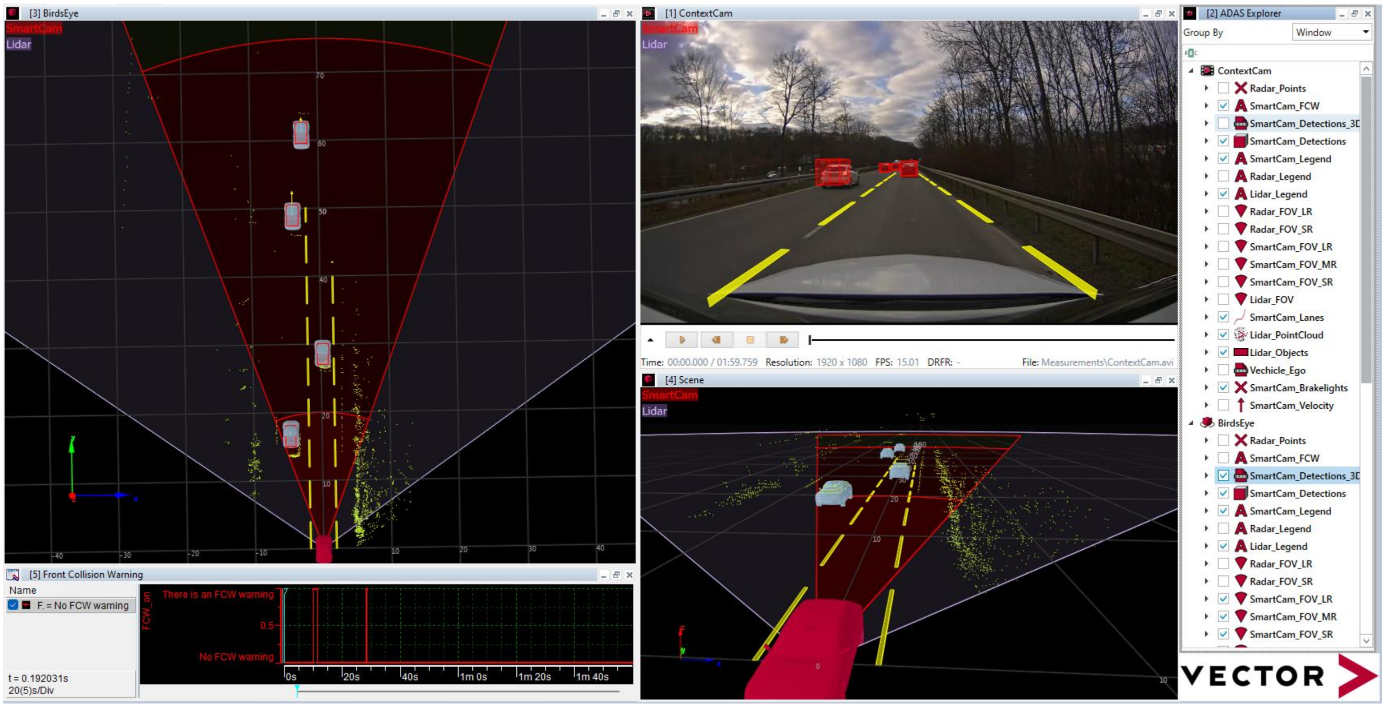


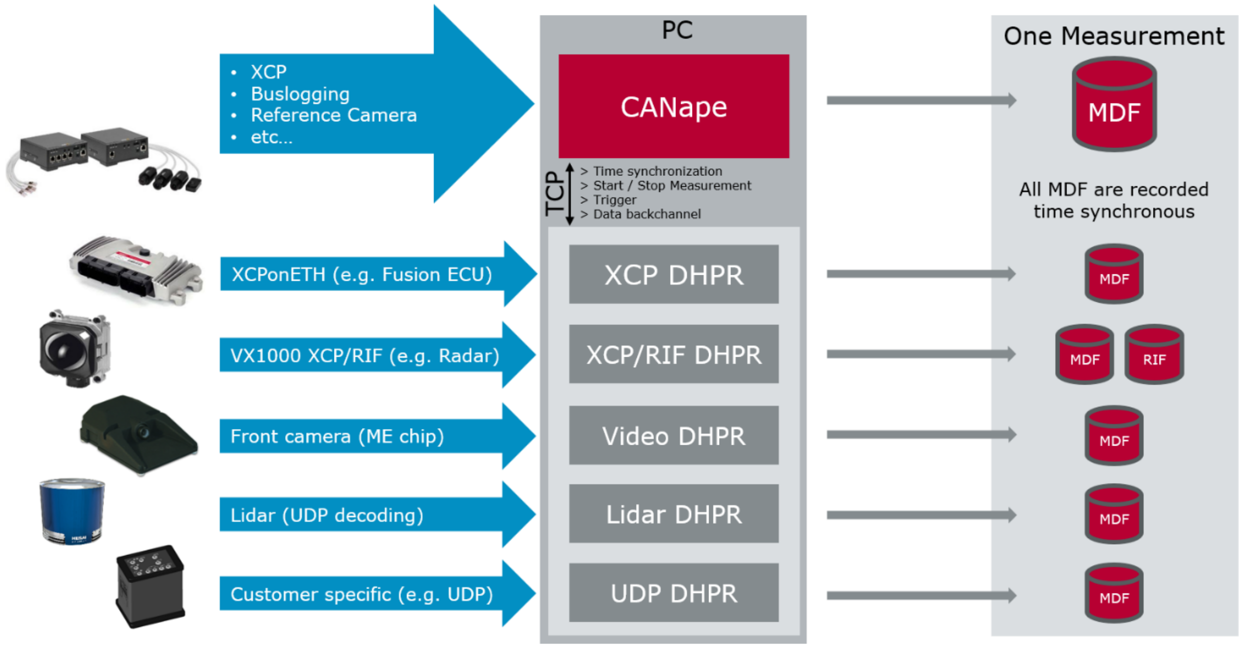
*__Figure 1:__ Display of sensor data in the video window and in two different views of the scene window. Detected objects are superimposed on the image of the reference camera and additionally displayed in a bird's eye view and a lateral perspective.*

### 1.2.2 Recording ADAS Sensors With Very High Data Rates

For the development of driver assistance systems and autonomous driving vehicles, as much raw sensor data as possible is recorded to use it later in a re-simulation for testing new software versions. The data rates from radar and video sensors are particularly high.

With the Driver Assistance option, special recorders (DHPR: Distributed High Performance Recorder) are available for the various ADAS sensors. We are happy to integrate new sensors for you at any time.

The DHPRs are controlled from CANape via TCP/IP. The entire measurement task can easily be distributed across multiple measurement computers, making it fully scalable.

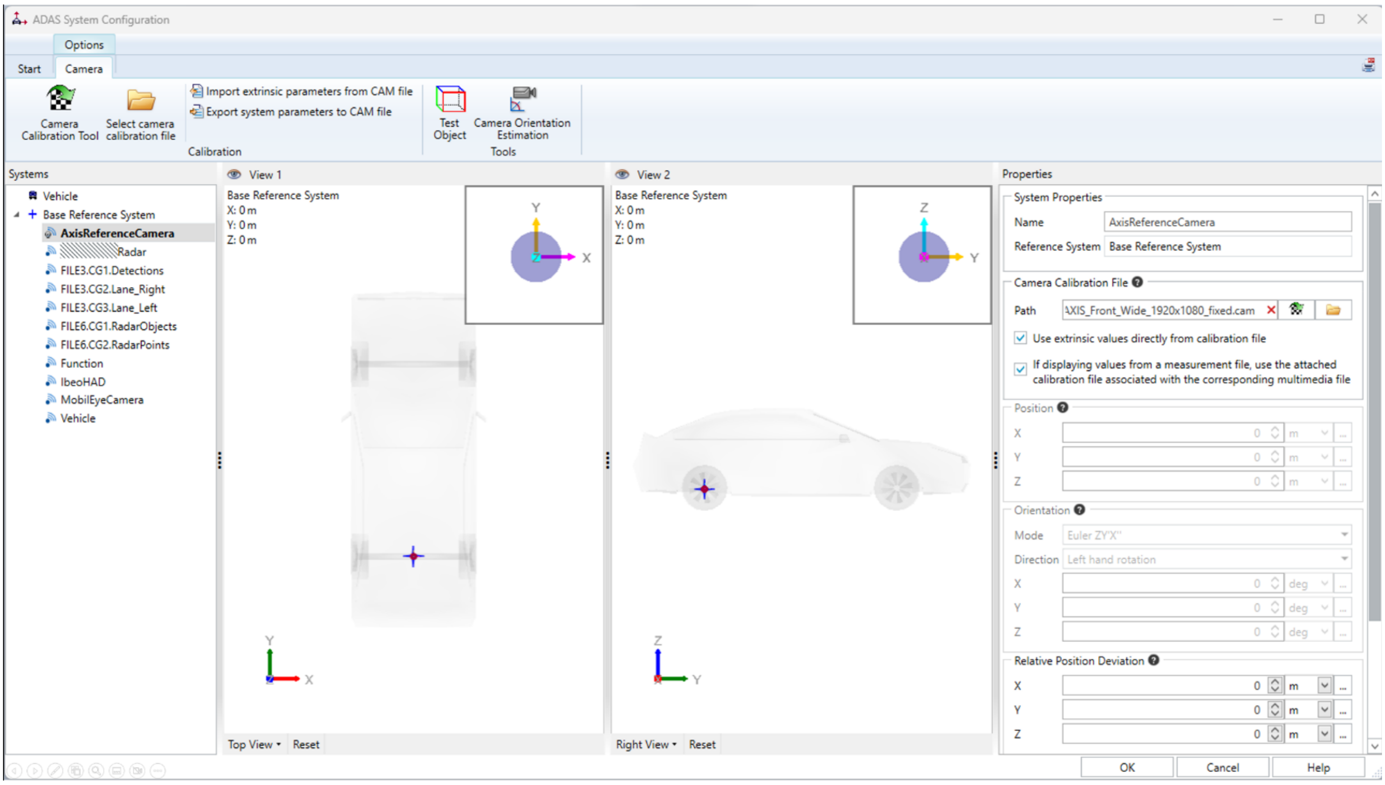


## 2 Configuration Creation for Object Verification

2.1 Managing multisensor setups ADAS sensors provide information about the vehicle's surroundings. With the help of distance information, they describe, among other things, where additional road users and obstacles are located. The distance information refers to the internal coordinate system of the sensor, which initially has its origin at the position of the sensor. To be able to relate the values of several sensors to each other, the distances and orientations are mapped to a basic reference system in the vehicle.

With the help of the ADAS system configuration, you can enter the installation positions and orientations of the sensors in the vehicle. From the inputs, CANape calculates the transformations between the sensors and the base reference system, so you don't have to worry about them. This enables holistic visualization of the sensor data in the Scene and Video windows. Dynamic coordinate systems can also be defined by linking them to measured variables. For example, a detected pitch angle of the vehicle can be considered in the visualization and thus enable a more accurate representation. The transformations are included in the measurement files.

In a later offline analysis, the information from the measurement files is used directly. This allows you to conveniently visualize and evaluate the various measurement setups.

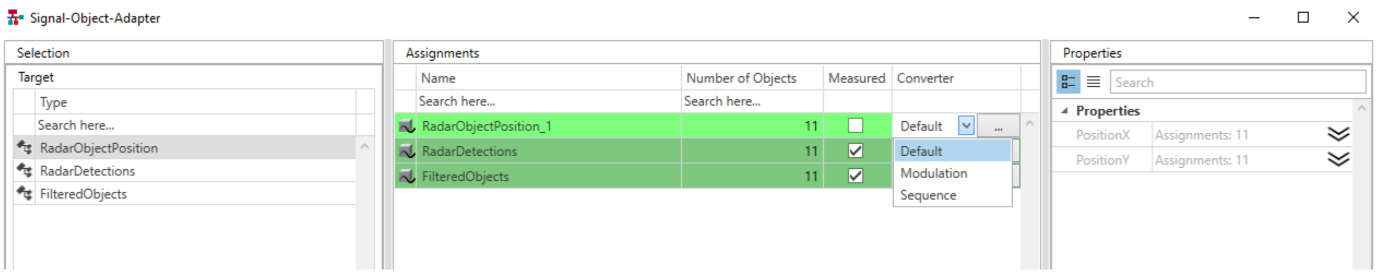



### 2.1 From Detected Road User to Data Object

Sensors describe objects by several attributes, such as coordinates, probability, and type classification. Depending on the sensor, however, the information arrives in CANape in different ways.

**Data transmission by signals**

ADAS sensors send the object descriptions signal-based via available bus systems such as CAN, FlexRay or Ethernet. The Signal-Object Adapter in CANape provides a convenient interface for creating object descriptions or object lists from these signals. Signals can be assigned to objects both online during the measurement and later from the measurement data. The created measurement objects are stored in the measurement file.




### Data transmission in structures with static sizes

In the sensor, the object attributes are mapped in the software in the form of structures. They are described, for example, in an A2L file and measured via XCP as an array of structures.

### Protocols with dynamic objects

A LIDAR, for example, supplies its object information via a manufacturer-specific protocol. In CANape, when integrating a LIDAR, you select the appropriate device driver that can interpret the respective data stream. Thus, the supplied data objects are already available in CANape.

## 2.2 Creating Graphical Overlays for the Display Windows

In the GFX configuration, the assignment of a data object to its symbolic representation is done.Numerous predefined drawing objects, such as point clouds, crosses, squares, triangles, or polygons, are available. In addition, you can also display bitmaps and CAD models. Each drawing object can be assigned a suitable coordinate system, such as geographic, Cartesian, pixel.

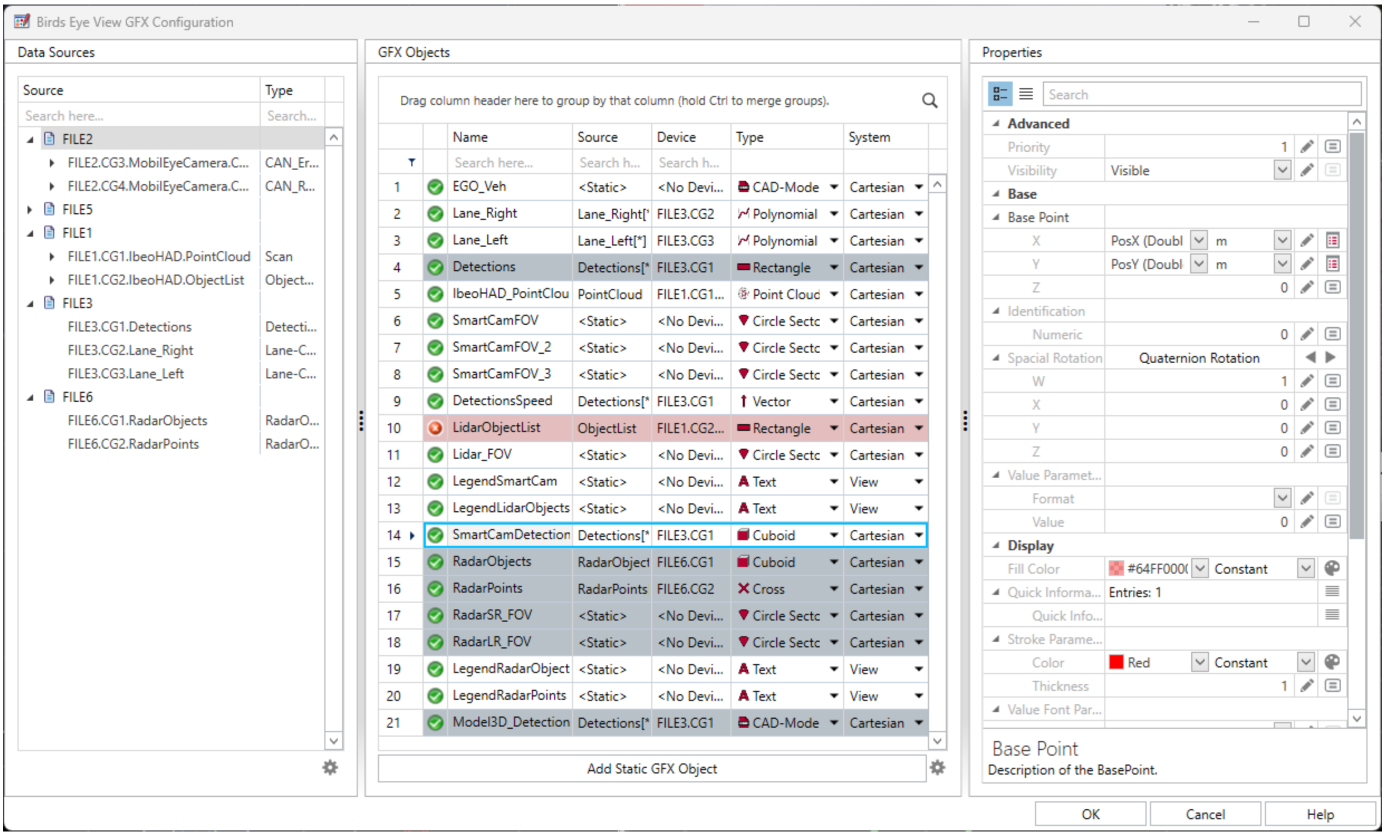



***Figure 2:*** *Convenient assignment of measurement signals to display objects*

# 3 Presentation and Evaluation

Data objects are represented as graphical elements and superimposed on other information:

> Perspective, time-synchronous display of the evaluated object information in the video image, scene or map window.

> Objects can be individually activated or deactivated in the individual windows via the ADAS Explorer for optimized display during measurement or measurement data evaluation.

> Objects, texts and parameter values can be drawn as additional information at a fixed or variable pixel position

> Relative speed or lateral deviation can be displayed as horizontal and vertical deflection lines

> Additional text and numeric information can be displayed for the object

> Arbitrary zoom and rotation mechanisms in the scene window provide exactly the section you need for your evaluation

> Subsequent adjustment of all object parameters (size, color, text/digit field, etc.) for measurement data evaluation

> The visualization of measurement data from LIDAR sensors (e.g. from Velodyne, Ibeo and Quanergy) is carried out via the scene window, in which the received point cloud objects are displayed in 3D.

## 3.1 Keep an Overview of ADAS Windows and Objects: ADAS Explorer

The ADAS Explorer gives you an overview of all objects you see in the different ADAS windows. Activate and deactivate the displays comfortably from this one window.

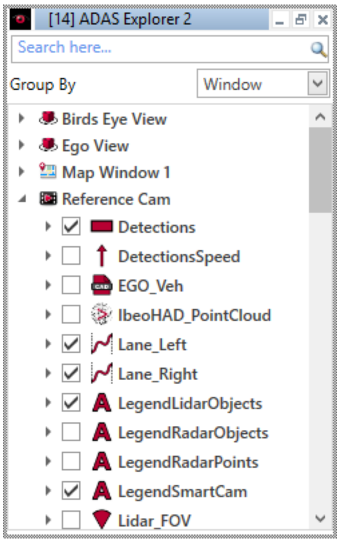



***Figure 3**: Select the objects you want to see in the windows.*

### 3.2 The Map Shows You the Exact Position

In the Map Window, you can display the associated position data and use it for evaluation. In addition, detected objects can be displayed in the Map Window.

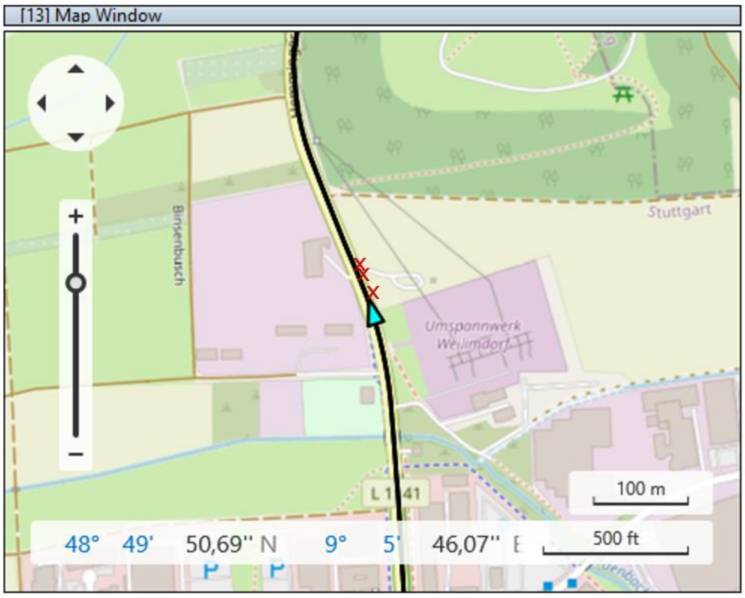



*Figure 4: The total route with the current position of the vehicle is displayed. The red crosses represent detected vehicles.*

### 3.3 For Universal Use: The Scene Window

From different angles (e.g. top view, driver's view, ..) the Scene Window shows the different sensor data of e.g. radar or LIDAR. The window offers a range of functions for analyzing content.

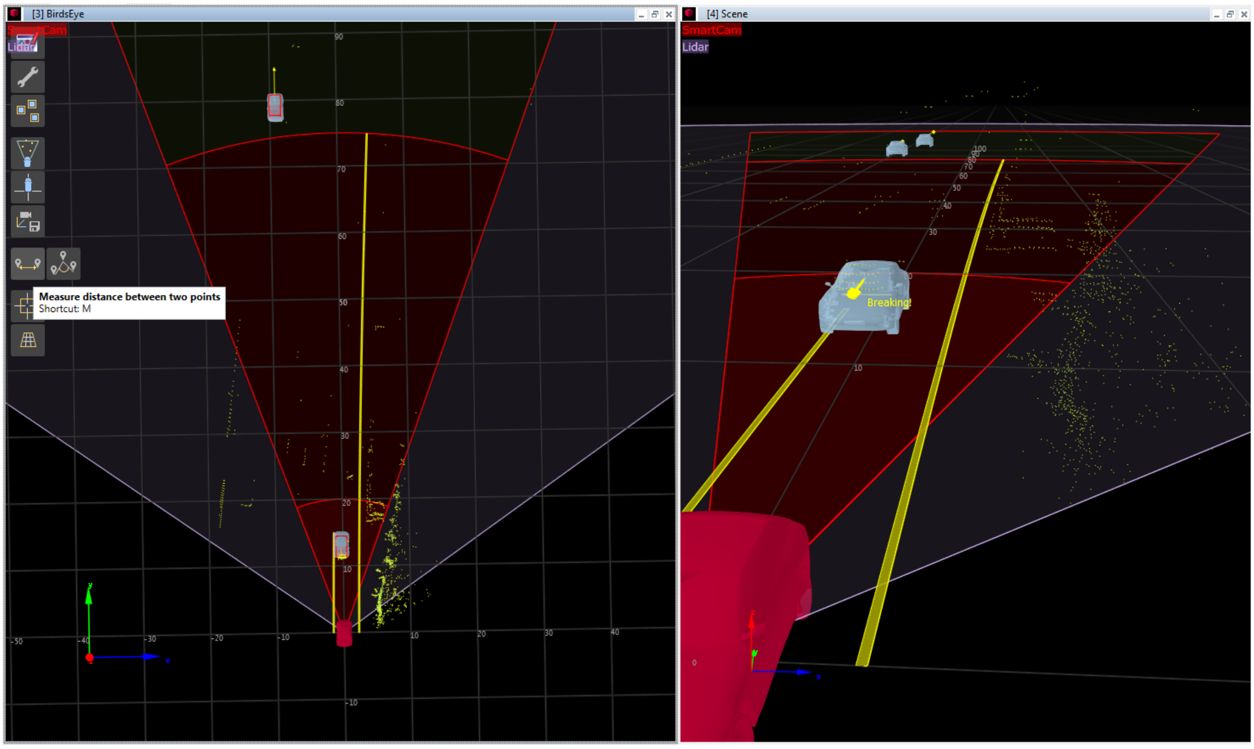



*Figure 5: The same scene twice from different angles and a different selection of objects.*

## 3.4 Image Display in the Video Window

The video window is used to display images from reference cameras and video sensors. By overlaying the GFX objects over the video image, you can see directly where your sensor has detected an object.

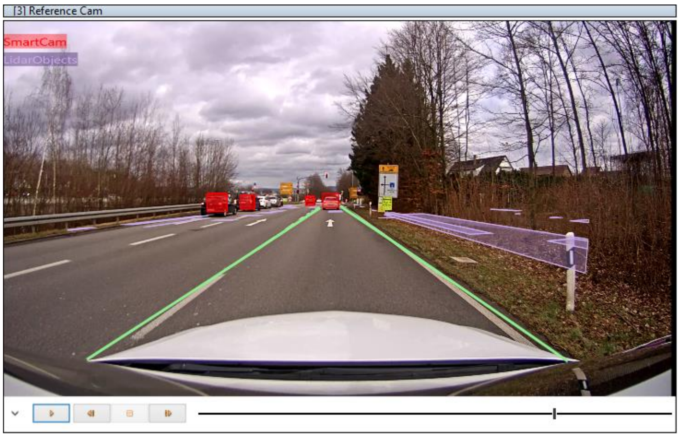



***Figure 6:*** *Video window shows the image of the reference camera and the overlay objects.*

## 3.5 Data From GFX Objects and Their Source Objects

To keep the overview of the numerous possible sensor data within a window, you can have the information on each individual object displayed directly.

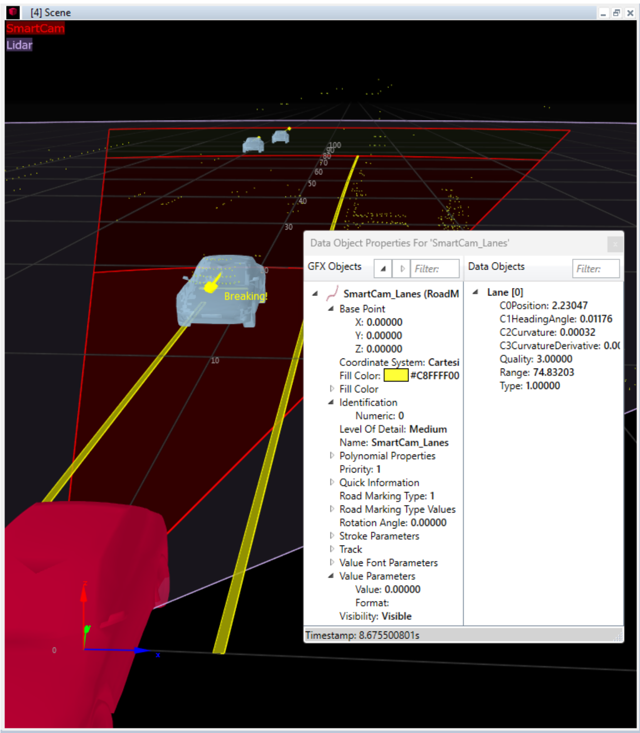



***Figure 8:*** *Select an object and have the attributes displayed in detail.*

## 4 Calibration of Context Cameras

To display object data from the control unit as geometric elements in the video window, the spatial coordinates must be projected into the video image as pixel positions.

With cameras, a distinction is made between intrinsic and extrinsic values. Intrinsic values refer to the design of the camera, e.g. the type of lens. Extrinsic settings refer to the mounting angle resulting from installation in the vehicle.

To determine the intrinsic values, a grid - like a chessboard - is held in front of the reference camera and several images are generated. The coordinate transformation is then calculated automatically. The calibration process is only required once, provided the system configuration (camera or lens type) does not change.

The extrinsic values can be set both in the Camera Calibration Tool and in the ADAS System Configuration.

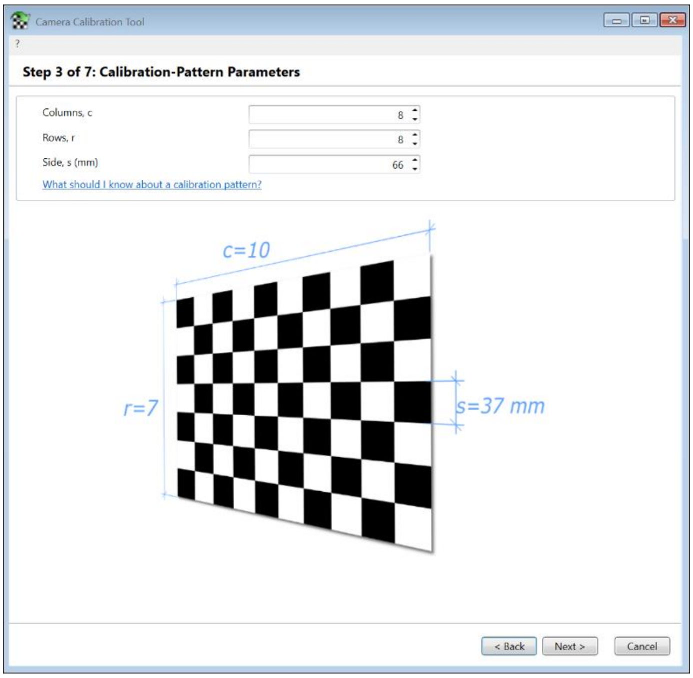



***Figure 9:*** *Calibrating a reference camera in the Camera Calibration Tool.*

A display of the video image including a test object is available for this purpose. The angle can optionally be determined with AI support to avoid complex test setups.

## 5 Further Solutions for ADAS Development

Vector offers you comprehensive solutions in the form of software and hardware tools as well as embedded components for the various tasks involved in the development of driver assistance systems (ADAS) and systems for autonomous driving:

> measurement acquisition of sensor data up to complete ADAS logging solutions
> verification and optimization of ECU function
> software components

More information on ADAS solutions at: **www.vector.com/adas**.

## 6 Trainings

Within the scope of the training offer, we offer various workshops and trainings in our seminar rooms. Specially tailored training courses, in which the contents are combined or expanded according to your ideas, are also possible - of course also at your site in English or German.

More information on the individual training courses and the dates can be found on the Internet at: **vector-academy.com**

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