

# 1 Automotive Sensor System Architectures

## 1.1 Vehicle (Moving Platform) Applications

In vehicle (moving platform) applications, usually the sensor output is a list of detected **targets** (reflectors) on the sensor CAN bus (referred to as *internal CAN*) with the parameters

- Range
- Angle (Position)
- Radial Speed
- Reflectivity level
- Type of Target (Reliability Figure).

In addition to that, status and diagnose data from the sensor are reported.

For experimental vehicles the tracking (filtering and smoothing of all detected reflectors over time) is done in an additional unit (central ECU BUMPER-08xx or a PC or the like). In most cases, however, those tracking algorithms will be integrated in the sensor.

The result of the tracking is an **object** list with the following parameters:

- x position
- y position
- x component of the velocity
- y component of the velocity
- type of reflector
- size of reflector.

When multiple sensors are applied, the sensor data fusion algorithms may be run on a data fusion PC or the data fusion central ECU BUMPER-08xxxx. In most cases, however, those data fusion algorithms will also be integrated in the sensor.

In any case, a visualization both of the **targets** and the **objects** is possible using the **DriveRecorder** software in any PC equipped with a CAN card.

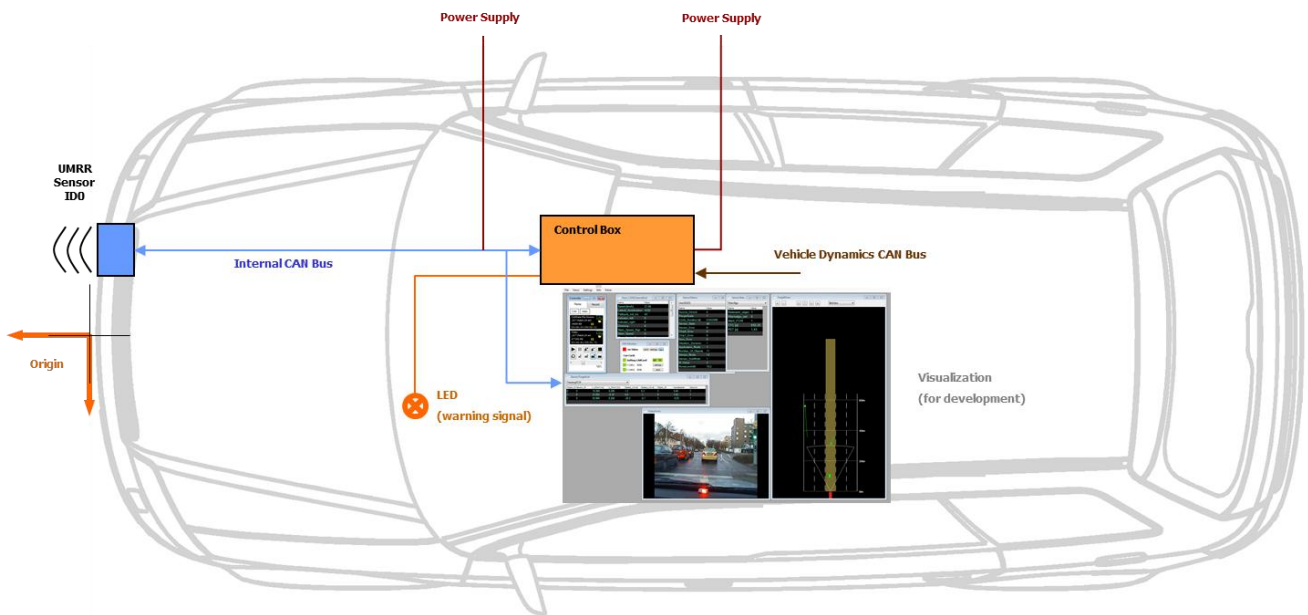
In vehicle applications certain data have to be transmitted to the sensor(s) and (if existing in the system architecture) the fusion / tracking / central ECU.

Every sensor requires the information: actual ego velocity of the host vehicle and yaw rate of the host vehicle.

### 1.1.1 Single Sensor Setup (FCW or ACC)

The sensor will integrate:

- detection software
- tracking software
- execution of the fusion of vehicle dynamics data and the radar data
- path prediction
- object to lane mapping
- selection of most relevant object in lane ahead
- calculation of a warning algorithm.

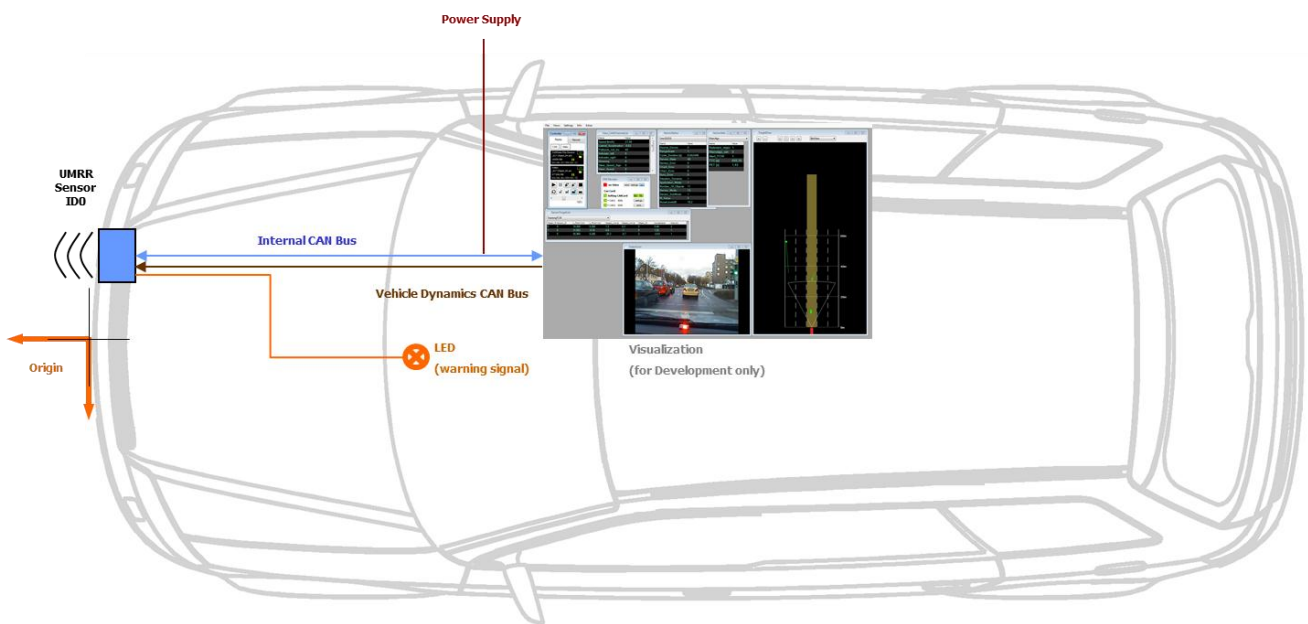


### 1.1.2 Single Sensor Setup with Central ECU / Control Box (ACC or FCW)

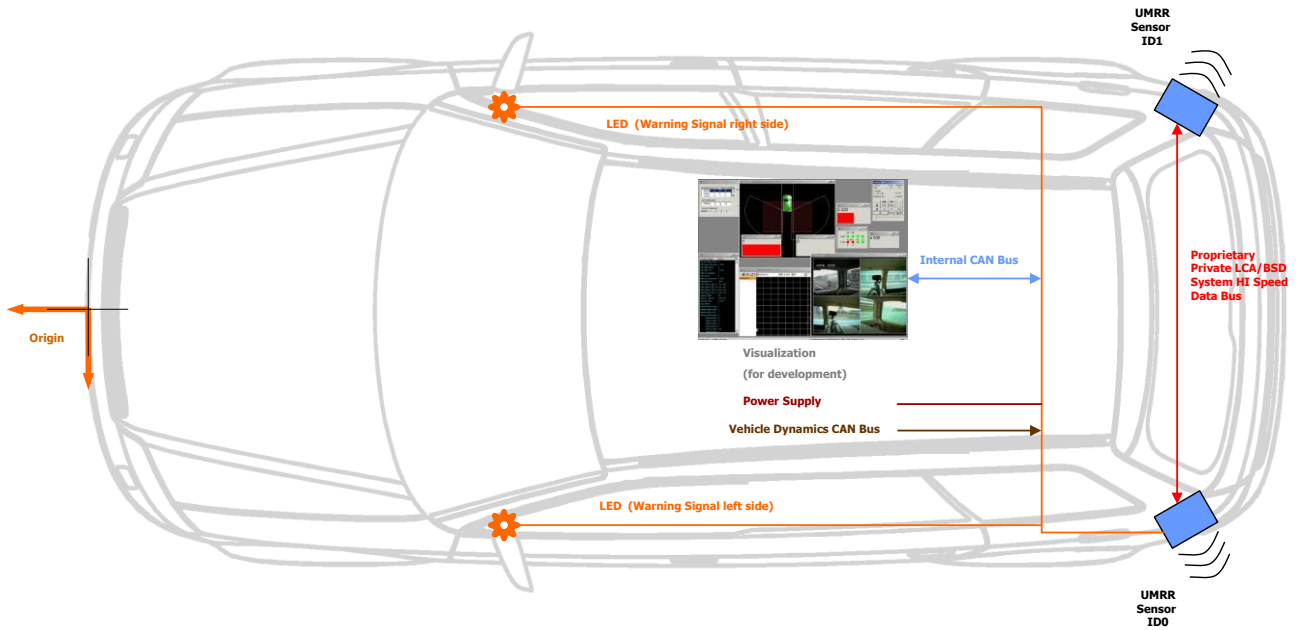
The central ECU / control box may integrate:

- tracking software
- execution of the fusion of vehicle dynamics data and the radar data
- path prediction
- object to lane mapping
- selection of most relevant object in lane ahead
- Calculation of a warning algorithm.

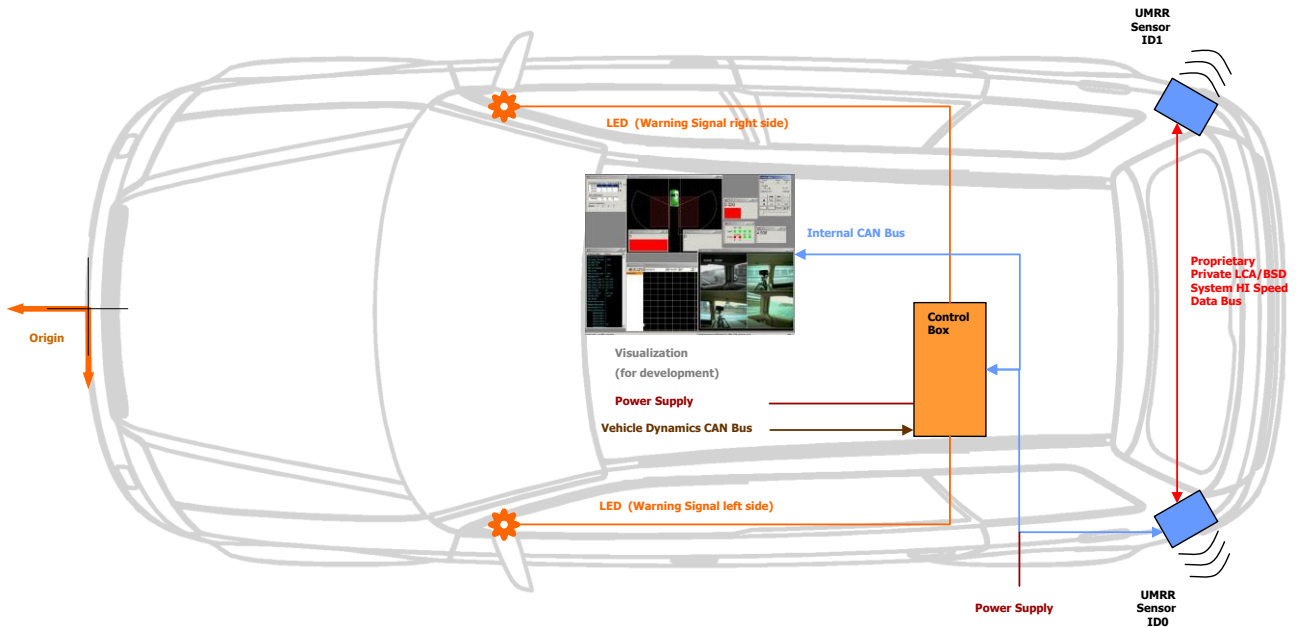
The tasks of the control boy may also be reduced to the creation of the warning signal only (human machine interface). In that case all other algorithms can be run on the sensor.



1.1.3 Dual Sensor Setup Example (Lane Change Assist with Blind Spot Detection or Blind Spot Detection only) without Control Box (Master-Slave Setup)



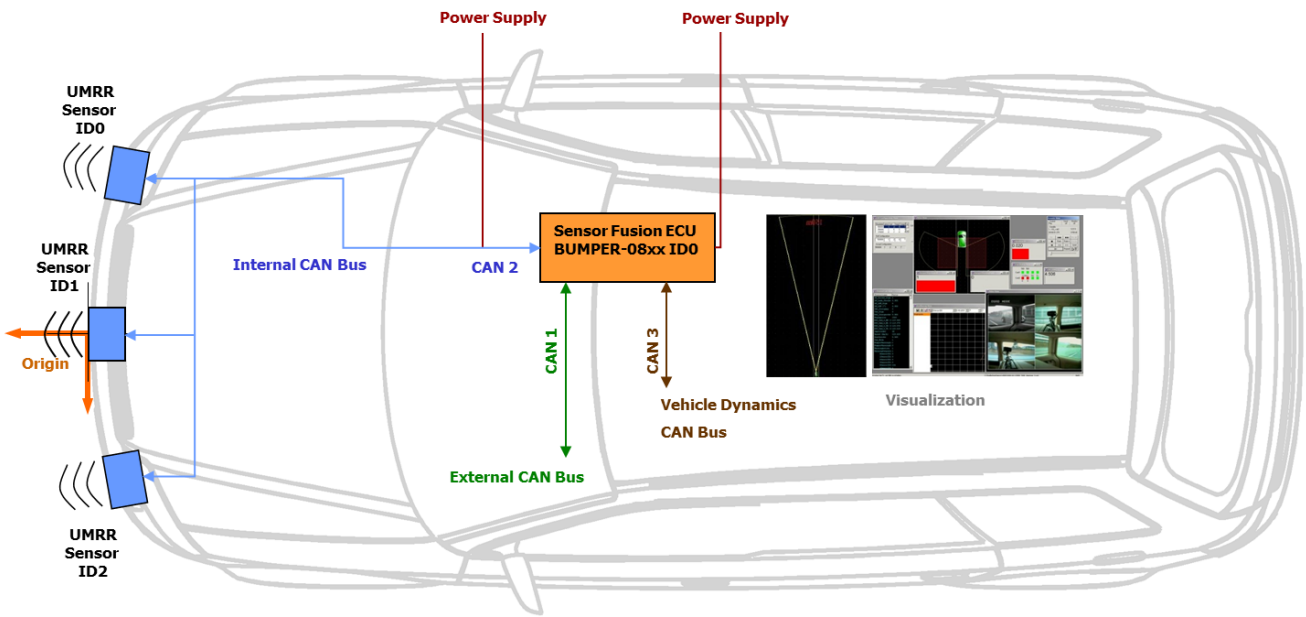
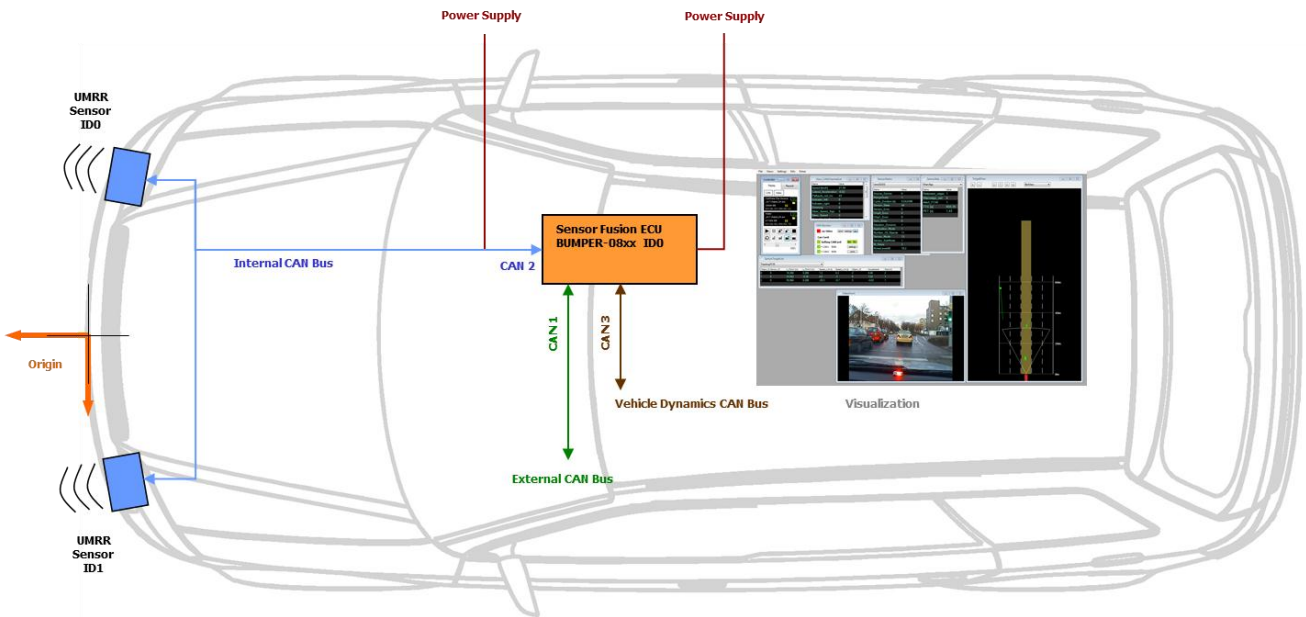
1.1.4 Dual Sensor Setup Example (Lane Change Assist with Blind Spot Detection or Blind Spot Detection only) with Control Box



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### 1.1.5 Multi Sensor Setups with Central ECU Examples



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### 1.1.6 Multi Sensor Setups in Master-Slave Configuration Example

The sensor system may consist of a number of individual sensors (Slaves) while one of them works as central processing unit (Master). The latter controls the whole system, interprets the sensor data and communicates with the vehicle.

