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Simcenter SCAPTOR for capturing raw ADAS data

Solution brief

Siemens Digital Industries Software

To accelerate the development of multi-sensor autonomous driving and advanced driver assistance systems (ADAS), manufacturers of highly automated vehicles need to embrace a closed-loop development process. This process captures, analyzes and diagnoses raw sensor data. From there, it helps you intelligently explore design variants across multiple scenarios. It also is used to verify and validate scenarios throughout massive virtual validation cycles that provide insights into safety performance, then loops back to data collection. In this development process, the recording, storage, analysis and replay of terabytes of raw sensor and in-vehicle electronic control

Figure 1. The Simcenter SCAPTOR system fits in a trunk.

Challenges

- Capture raw ADAS sensor data to reproduce all possible driving situations
- Record terabytes of data at ultra-high bandwidth
- Synchronize multiple sensor types

Solutions

- Provide synchronous raw data recording from multiple sensors
- Use a flexible unit configuration that adjusts to requirements
- Leverage streamlined toolchain for data recording, replay and visualization

Results

- Capture terabytes of data in a single storage unit
- Provide a more durable unit compared to custom solutions
- Deliver easy data copy and transfer for replay and visualization

Solution focus

unit (ECU) data play a crucial role in ensuring safe and smooth vehicle operation.

The essential role of high-speed ADAS data recording

The ADAS data collection solution accelerates the development of multi-sensor autonomous driving and advanced driver assistance systems. It is based on Simcenter™ SCAPTOR™ hardware and software, which provides a complete toolchain for the recording, visualization and replay of raw data captured by test vehicles on the road. Simcenter SCAPTOR enables engineers to reliably record raw radar, lidar, high-resolution cameras and vehicle bus data.

Simcenter SCAPTOR, which is part of Xcelerator, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, is used to record, store, analyze and replay vast amounts of raw data. It can be used to assist with sensor benchmarking and prototyping. It enables the generation of real-world test scenarios and provides the data to train vision and detection algorithms.

Figure 2. Simcenter SCAPTOR software helps monitor the recording of raw sensor data.

It helps validate preproduction series vehicles for thousands of driving hours and millions of kilometers. The high-speed in-vehicle data recorder captures a continuous, genuine and uncompressed flow of data. The time-synchronous raw data replay helps develop the computer vision and machine learning models that power autonomous vehicles.

The challenges of in-vehicle recording

As part of the autonomous vehicle development process, large fleets of test vehicles drive millions of miles every year while recording the data that will help validate driving scenarios that consider all possible road hazards and contingencies. Fleet data recording comes with a number of challenges: Each vehicle is fitted with an abundance of sensors and multiple interfaces. Data streaming from these interfaces need to be recorded at ultra-high speed and synchronized and stored safely in a central unit. Fleet vehicles operate in harsh conditions driving on desert roads and icy tracks. The recording systems need to be compact enough to fit in a vehicle trunk, robust enough to withstand extreme heat and cold and reliable enough to operate continuously while preventing data loss. Lastly, they need to write gigabytes (GB) of raw data every second to provide the real-world information needed to train neural networks and verify and validate driving scenarios.

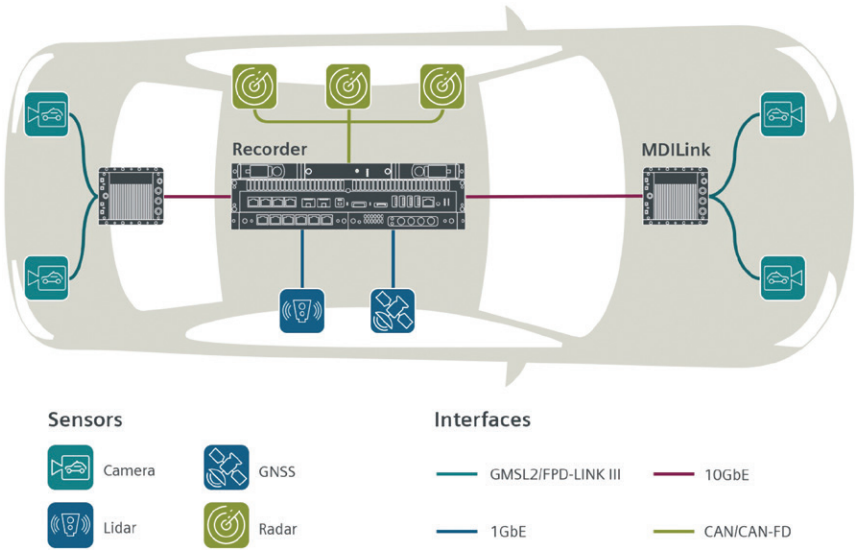

Figure 3. A typical setup for a level 2 autonomous vehicle.

Uncompressed, high-fidelity data collection

The Simcenter SCAPTOR solution records a continuous, genuine and uncompressed flow of data from radar, lidar, high-resolution cameras, automotive-standard buses, networks and more. The solution is optimized to reliably record every bit of raw data, stream this data at high bandwidth at the lowest latency and to handle terabytes of data efficiently.

It offers an acquisition speed of 16 gigabits (G) per second and a logging storage of up to 32 terabytes (TB). With its compact rack setup, it is optimized to fit in a small space and minimize wiring efforts. The solution is scalable to adapt

to growing bandwidth and storage requirements. Finally, it is sufficiently robust and can operate continuously in extreme conditions without downtime or data loss.

Robust, reliable and flexible

Simcenter SCAPTOR includes a robust, off-the-shelf raw sensor data recorder that is easy to install inside the vehicle. It is compact enough to fit in the trunk of a passenger car. It withstands operating temperatures of -25 Celsius (°C) up to 70 °C. In its standard configuration, it can operate and record continuously for a full day of testing. It offers additional functionalities such as optional storage expansion or optional uninterruptible power supply (UPS) against power disruption. The included visualization software helps monitor the recording while driving or in the office. All functionalities serve the purpose of continuous, reliable recording of raw sensor data, constantly avoiding data corruption or loss.

The flexible system configuration allows you to connect sensors using all common types of interfaces: high-speed serial flat panel display link 3 (FPD-LINK3), gigabit multimedia serial link 2 (GMSL2) or camera serial interface (CSI), standard or automotive ethernet, FlexRay, controller area network flexible data-rate (CAN-FD) or CAN-bus vehicle busses. The system is future-proof, adjusting to innovative sensor technologies and novel types of interfaces.

Record, visualize and ingest raw data at a high speed

The Simcenter SCAPTOR interface is user-friendly for comfortable and secure operation. The visualization tool permits a graphic monitoring of the bit-accurate, fully synchronized high-speed data recording. Data ingestion by a cloud or on-premises server is just as efficient. The system is conceived to prevent downtimes, avoiding disruption in data capture.

Simcenter SCAPTOR is one of the most fit-for-purpose systems for the capture of accurate ADAS raw data. It is part of the Simcenter portfolio of testing and simulation solutions for ADAS and autonomous vehicle development and constitutes a forward-looking system that supports the development of level 2 automation in vehicles as well as the implementation of future levels of automation in the transportation industry.

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