

Autonomous driving simulation and validation

Deliver ADAS/AD innovation faster with the Dell Autonomous Drive Ecosystem and dSPACE's data driven development solutions

dSPACE and Dell Technologies are at the forefront of the ADAS/AD revolution, providing the differentiating technologies that make tomorrow's automobiles possible today. OEMs and Tier-1s face a multitude of complex choices throughout their journey to bring autonomous vehicles to the market successfully. They must choose the right partners for the right job, including data logging, data management, and open- as well as closed-loop testing.

For ADAS / AD development, those partners include dSPACE and Dell Technologies. Our partnership is built on the philosophy of offering flexibility and variety of choices, which enables informed decision making across our extensive portfolios. Whether you're looking for industry experts, such as AI data scientists, software and hardware architects, and validation engineers, or you are looking for infrastructure for data centers with the corresponding efficient tools for simulation and validation, we have the right solution for you and can help you make the right choice for your requirements.

Comprehensive open- and closed-loop test solutions

In order to test ADAS/AD ECUs, data recorded during test drives needs to be replayed in the laboratory. It must be ensured that the recorded heterogeneous data streams are reproduced time-coherently in the test environment. In an open-loop/data replay test setup, dSPACE RTMaps (Real-time Multi-sensor Applications) in conjunction with the dSPACE SCALEXIO platform ensure realistic real-time stimulation of the device under test via a time-correlated and jitter-free transmission of video and vehicle bus data.

Besides data replay, real-time closed loop simulation often comes into play. Here, the dSPACE SCALEXIO is also the right system of choice. The SCALEXIO product family provides high-performance processor technology that is capable of handling the most demanding real-time requirements including fast I/O capabilities, comprehensive bus and network interfaces, and challenging rest bus simulations of CAN, LIN, FlexRay and Automotive Ethernet networks.

Equipped with the dSPACE Environment Sensor Interface Unit, the dSPACE SCALEXIO perfectly combines classical HIL testing with ADAS/AD data replay and simulation tests in a best-in-class accuracy and fidelity.

dSPACE Benefits

- **Accelerate time-to-market** and **cut costs** with dSPACE open and **scalable end-to-end solutions**
- Rely on **dSPACE automotive expertise** for AI, data-driven development, simulation and validation
- Profit from our **local footprint** and the dSPACE **partner ecosystem**

Dell Technologies Benefits

- Automotive thought leader providing Automotive-specific products and solutions including the Dell Autonomous Drive Ecosystem
- Proven ADAS storage solutions with approximately 70% of leading Tier-1 ADAS suppliers using PowerScale Storage today.
- High performance CPU and GPU-compute solutions for AI/ML/DL
- World-wide support and services tailored to meet needs ranging from start-ups to global enterprises

High-end vehicle data logging

Reliable 360-degree environment detection, required for safe autonomous driving, is performed with a variety of environmental sensors, such as cameras, radars and lidars. Every second, these sensors generate vast volumes of data, which must be stored accurately during a test drive. The dSPACE AUTERA system is the ideal system for recording and processing large volumes of data from various sensors, automotive buses and networks, during test drives. All data sources are time-correlated and recorded accurately with their timestamps directly at the data-input location so that recorded data can be replayed with correct timing. High-performance computing as well as high network bandwidth are critical in this scenario, given the number of high-resolution sensors that are recorded simultaneously. dSPACE AUTERA is capable of continuously streaming up to 50 gigabits per second to compact, ruggedized, hot-swappable solid-state disks (SSDs). For even higher bandwidth demands, multiple AUTERA systems can be combined.

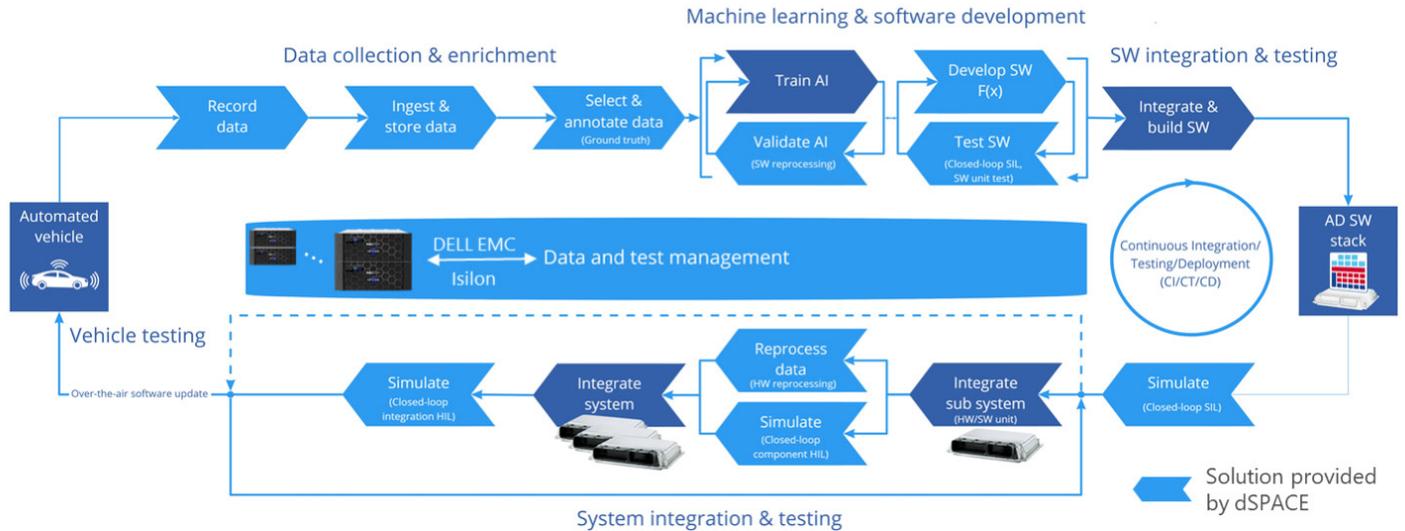


Fig. 1: The dSPACE ADAS/AD offering with Dell EMC PowerScale

dSPACE and Dell Technologies: Efficient, accurate data replay validation

SAE-level 3 projects already require hundreds of petabytes of storage, and this is constantly growing. As the industry approaches SAE-level 5, projects will be measured in exabytes. Staying ahead of this exponential data growth is one of the key challenges for any ADAS/AD project. Planning for this data growth must be fully accounted for at the beginning of the project, addressing project needs, maximizing the extracted value out of the underlying resources, and implementing best practices. Over 40 leading OEMs and Tier-1 automotive suppliers worldwide already rely on Dell EMC Isilon scale-out NAS storage, now part of the PowerScale storage portfolio, to safeguard their valuable sensor data. Dell Technologies and dSPACE bring their industry experience together to provide proven ADAS solutions built with industry-leading hardware, and software expertise. These solutions make it easy to overcome these challenges and empower IT teams, data scientists and engineers to spend less time worrying about data and more time on strategic value-add projects.

Though the dSPACE data replay solutions are designed to be infrastructure agnostic platforms for flexible integration across private, public and hybrid cloud infrastructure, dSPACE has collaborated with Dell Technologies to assure our mutual customers have the best experience and ease of use. In the figure below, for example, we show a co-developed reference architecture featuring the Dell EMC PowerScale NAS storage. With this solution, you are assured that you can test smart sensors & ADAS/AD controllers with a modular system architecture that efficiently scales in a very cost-effective manner. The dSPACE validation systems support all sensor interfaces and bus networks incl. security features and they guarantee highest replay accuracy and minimal jitter with the proven SCALEXIO real-time technology. Moreover, they are multi-role systems so that a single test station can be used for data replay tests as well as closed loop high fidelity simulation tests.

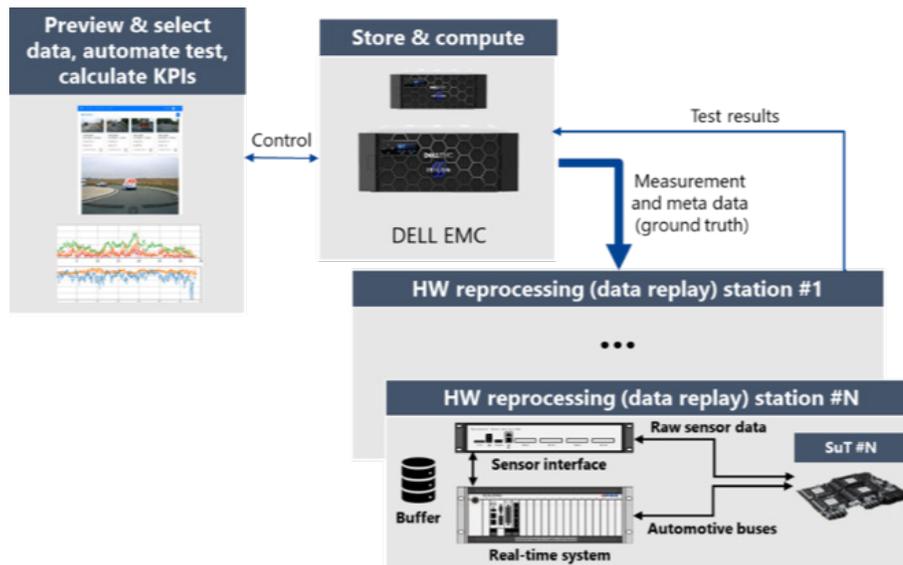


Fig. 2: dSPACE SCALEXIO and Environment Sensor Interface (ESI) used for data replay with the Intempora Validation Suite (IVS) data management software and the DELL EMC ISILON data storage hardware

About Dell Technologies

Dell Technologies helps automotive companies pursue new data-driven business opportunities in the software-defined era with future-proof infrastructure built on massively scalable, high performance storage systems, intelligent servers, access to your choice of public cloud services, a streaming data platform, and a well-vetted ecosystem of software partners. We can support both traditional workflows and data-intensive, emerging AI workflows. Dell Technologies solutions offer simplified data management and predictable performance all at the massive scale required for ADAS and AD development and testing. Learn more about [Dell Technologies storage solutions for Automotive Applications](#).

About dSPACE

dSPACE is a leading provider of solutions for developing connected, autonomous, and electrically powered vehicles. Particularly automotive manufacturers and their suppliers use the company’s end-to-end solution range to test the software and hardware components of their new vehicles long before a new model is allowed on the road. dSPACE is not only a sought-after development partner in vehicle development. Engineers also rely on our dSPACE know-how in aerospace and industrial automation. Our portfolio ranges from end-to-end solutions for simulation and validation to engineering and consulting services as well as training and support. With approximately 1,800 employees worldwide, dSPACE is headquartered in Paderborn, Germany; has three project centers in Germany; and serves customers through regional dSPACE companies in the USA, the UK, France, Japan, China, and Croatia. Learn more about [dSPACE autonomous driving solutions](#).

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