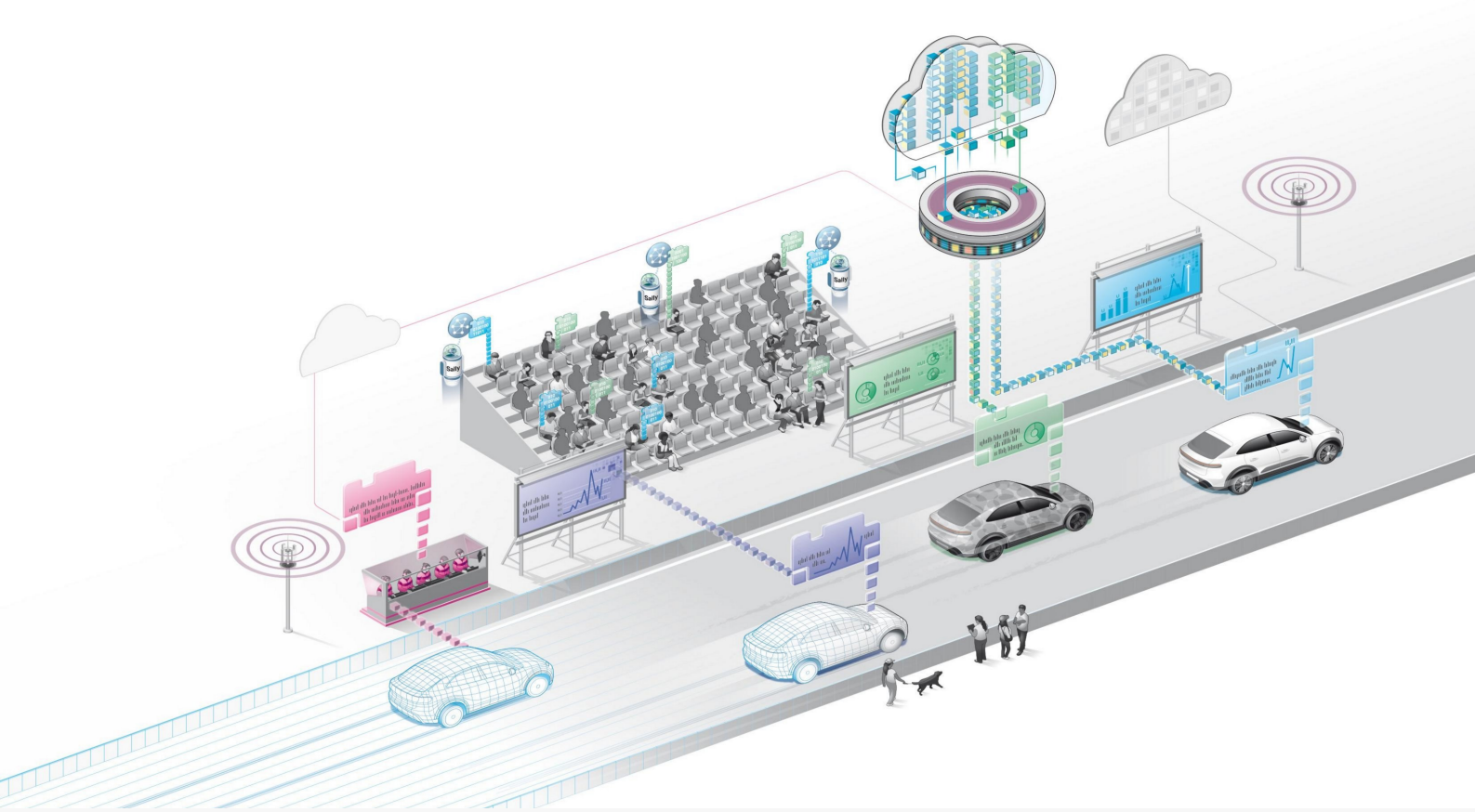

Modular and flexible: The chain of tools for data-driven development can be adapted to the needs of each customer. All modules mesh together and complement each other optimally, thereby ensuring improvements to development processes.

# Data-driven development: The Building Blocks of Success

**16/12/2025** Porsche Engineering is embracing data-driven development—using a full range of modular tools throughout the entire development cycle to do so. The tools can be flexibly adapted to the individual requirements of each project. Industry customers benefit from significantly shorter development cycles, especially when they make maximum use of the range of tools.

Data is the new gold. This much-quoted statement is particularly true when it comes to vehicle development. Data analyses and data-driven development based on them are becoming increasingly important in this field. And that's no wonder, as they allow engineers to obtain faster insights into the current performance of new vehicle functions—and to draw conclusions from early phases, see what works, and identify where there are still issues. "With the help of data-driven development, we are now in a position to optimize new functions much more quickly and expedite their market maturity," reports Leon David Lange, Project Lead ADAS Data Analysis at Porsche Engineering. "Without this acceleration, particularly complex vehicle features could not be realized at all in a reasonable time."

However, the fast feedback loops from the development or testing phase require a tool chain that is as seamless as possible. “The benefits of data-driven development can be fully utilized if you have the necessary tools along the entire development chain,” explains engineer Dr. Hagen Stübing, Senior Manager Software Engineer at Porsche Engineering. “This is why several specialist disciplines at Porsche Engineering have developed an integrated modular set of tools for different development phases. These tools optimize the development process both when used in isolation and as a complete range of tools – from recording and evaluating the data in the vehicle to its transport to the backend, storage, and analysis in the cloud, through to the transfer of new software versions back to the vehicle.”

The tool chain has a modular structure and can therefore be flexibly adapted to the individual requirements of every industry customer. “Some customers only need the tools during development, while others want to use them end-to-end – that is, throughout the entire life cycle of a new vehicle,” says Dr. Heiko Helble, Project Lead for Data Gatherers at Porsche Engineering. “Modularization means that we can adapt to any request. “Porsche Engineering has developed a tool chain in-house that can be used from the initial development steps to endurance testing and series production. This increases the speed with which changes in the market can be responded to—with custom-fit tools at the right time.

## Portfolio of six tools

The Porsche Engineering portfolio currently includes six tools for data-driven development: The Automated Measured Data Evaluation Tool (AMDA V2) has been developed to evaluate measurements automatically, and directly in the vehicle. It is used in the early development phases. When the vehicle is closer to series production, the Porsche Engineering Data Gatherer (PEDG) that is integrated in the vehicle will then be used to collect data. The ComBox app, which runs on a standard Android smartphone, provides support for data provision and validation of test drives (see the detailed Report starting on page 30). The LLM service platform SALLY specializes in use in vehicle development. SALLY is a digital assistant that supports developers. The PE IoT edge platform (PEvIoT) manages devices such as measurement technology via 5G from the cloud. It is integrated into a vehicle-based PC. The PEvIoT platform transfers all recorded data to a data lake in the cloud— the Porsche Engineering Data Hub (PEDH). “Our tools incorporate the experience gained from many years of vehicle development at Porsche Engineering," says Daniel Schumacher, Specialist for Cloud Architecture at Porsche Engineering. “We can advance and adapt the tools and, as a development service provider, put them into use, because they were developed completely in-house.” Porsche Engineering uses the tool chain in development projects, however also offers it to industry customers as “software as a product” via licensing. All tools can be booked on a modular basis, but the benefits offered by the overall package are particularly high.

## Automated Measurement Data Evaluation – AMDA V2

AMDA V2 (Automated Measured Data Evaluation Tool, version 2) is software for evaluating measurement data automatically and directly at the point of origin. It has access to the data buses of

the test vehicle, which means that it can read the full data traffic live and immediately analyze relevant signals while the vehicle is moving. In this way, AMDA V2 is able to detect certain driving scenarios, such as a vehicle in front merging. At the same time, AMDA V2 records the reaction of the vehicle functions—in this example, the reaction of the adaptive cruise control longitudinal controller to the merging road user. Using key performance indicators (KPIs) based on vehicle data, the tool then objectively assesses whether the system has handled the situation well or not sufficiently. Analysis directly in the test vehicle using AMDA V2 means that no large amounts of data need to be transferred to the cloud for evaluation. This not only reduces development costs, but also contributes to more efficient test procedures and increases the objective assessability of a function.

## Data Gatherers in Series Production Cars – PEDG

The Porsche Engineering Data Gatherer (PEDG) is a data collector designed for series use. In contrast to AMDA V2, the tool does not run on separate hardware (a PC in the vehicle or notebook), but can be embedded in an existing series control unit. This is why the PEDG is only used in later development phases and after the start of series production. The PEDG can be set remotely using mobile technology (over-the-air) to automatically detect certain processes—for example, switching on a vehicle system or emergency handling of a situation. In this case, the tool automatically records all relevant signals and automatically returns them to a back end, where further analyses can then be carried out. The great advantage of the PEDG is that it is possible to record data in series-produced fleets without the need for physical access to the vehicles, for example by visiting a workshop.

## LLM Service Platform for Development – SALLY

SALLY is a platform in the cloud that software developers can access via their computers and that aids them in their work by acting as a digital assistant. Users can, for example, access information about the current status of tickets for specific events and receive support when working on new software functions via a prompt in natural language. In contrast to well-known large language model (LLM) platforms such as ChatGPT or Deep Seek, SALLY has access to domain knowledge from the development of advanced driver assistance systems (ADAS); further domain knowledge is dockable. This allows SALLY to be used in areas such as developing ACC functions—on the one hand, to efficiently retrieve knowledge from the requirements and, on the other hand, to provide direct support during software development. For example, the tool can create code snippets, correct code, and create documentation from existing code.

This allows new software functions to be created, analyzed and tested more quickly. In particular, the time required for troubleshooting and subsequent installation on test vehicles is significantly reduced. This makes SALLY a development accelerator in the area of new ADAS functions. The SALLY platform has an application programming interface (API) through which further AI applications can be set up and existing services integrated.

## Digital Assistant for Test Drives – COMBOX APP

The ComBox app is a software that runs on a smartphone and serves as a digital assistant for the test driver. During test drives, it accesses the vehicle data from the data logger automatically or after a manual trigger; the data is then transferred to the cloud via the mobile network—and in some cases is pre-processed using AI. Currently, the ComBox app offers six different modes: Basic service, traffic sign recognition, scene recognition, acoustic complaints, infotainment recording as well as automated shift and test reports.

## Data Lake in the Cloud – PEDH

The Porsche Engineering Data Hub (PEDH) is another cloud platform from Porsche Engineering that can log all recorded data from the test vehicles in a data lake and store it in a folder structure—comparable to the file explorer on a PC, only scalable to an entire fleet of development vehicles.

Developers in the Porsche network can access it, while indexing the metadata for the uploaded files allows for efficient filtering and searching. This makes it possible to immediately see information such as which vehicle uploaded the data, which tools have been used for recording it, and which software version was installed on the control units.

## Connected to the Cloud – PEVIOT

The PE IoT edge platform (PEvIoT) connects devices to the cloud, such as the measurement technology in the vehicle or the PCs on HiL (hardware-in-the-loop) test benches. It runs on a vehicle-based PC that is connected to the Internet (via 5G, for example). PEvIoT can be used not only to transmit measurements, but also to install or update other tools such as AMDA V2 in the vehicle—easily and fully automatically. Docker containers are used to dispatch the tools; these package software together with all dependencies such as operating system libraries, software frameworks or databases. This ensures smooth operation in a wide range of computer environments. PEvIoT enables the use of different tools in the vehicle and significantly reduces the time required for commissioning them. At the same time, updates can be distributed flexibly and entire vehicle fleets can be managed conveniently from a remote location.

## Info

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Text: Christian Buck
Illustrations: Andrew Timmins

## MEDIA ENQUIRIES

**Sandro Kälin**

Head of Communications Porsche Schweiz AG
+41 41 487 91 16
sandro.kaelin@porsche.ch

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**Dr. Ing. h.c. F. Porsche Aktiengesellschaft**
Porscheplatz 1
70435 Stuttgart