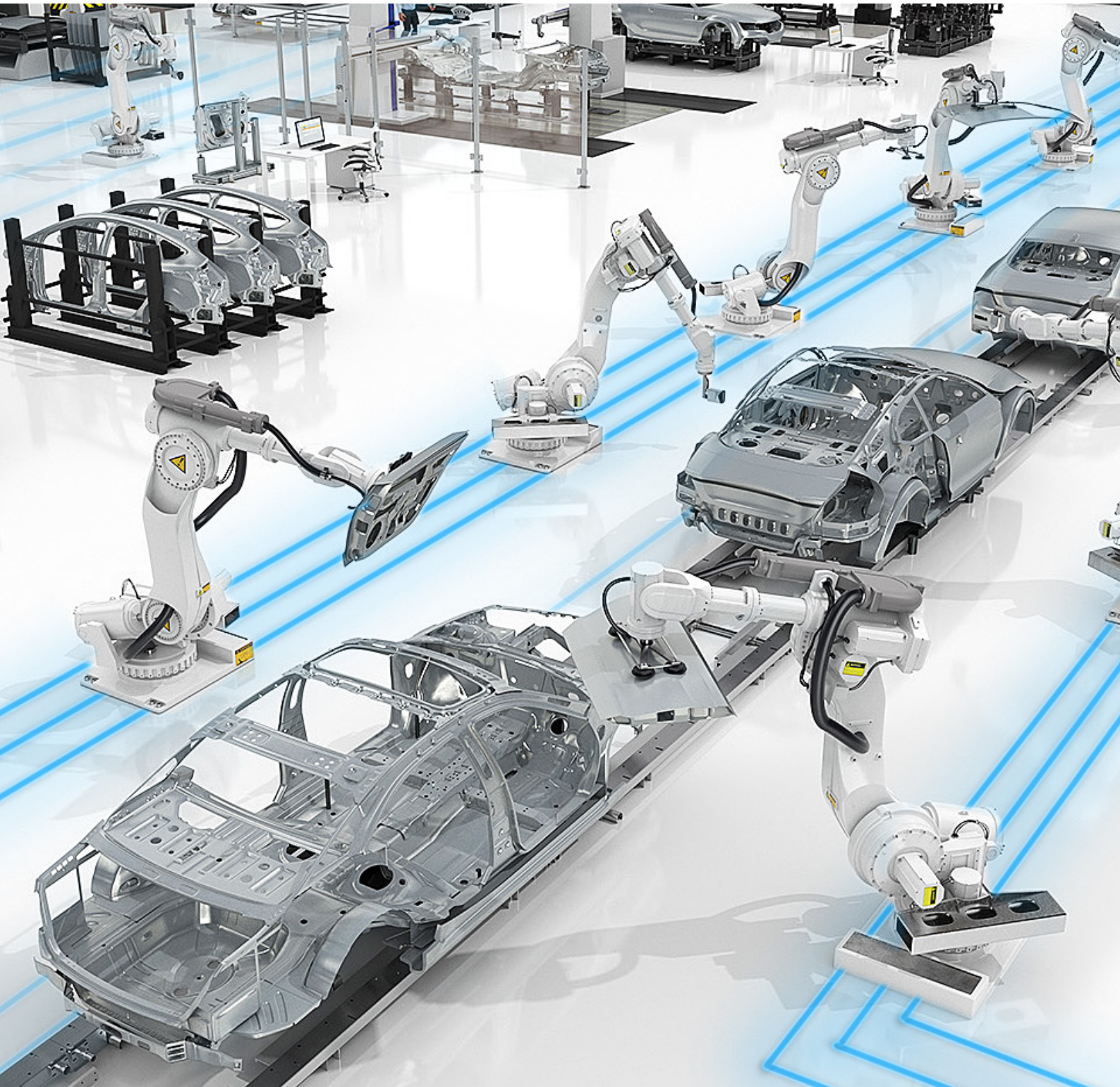
Digital Shop Floor Management

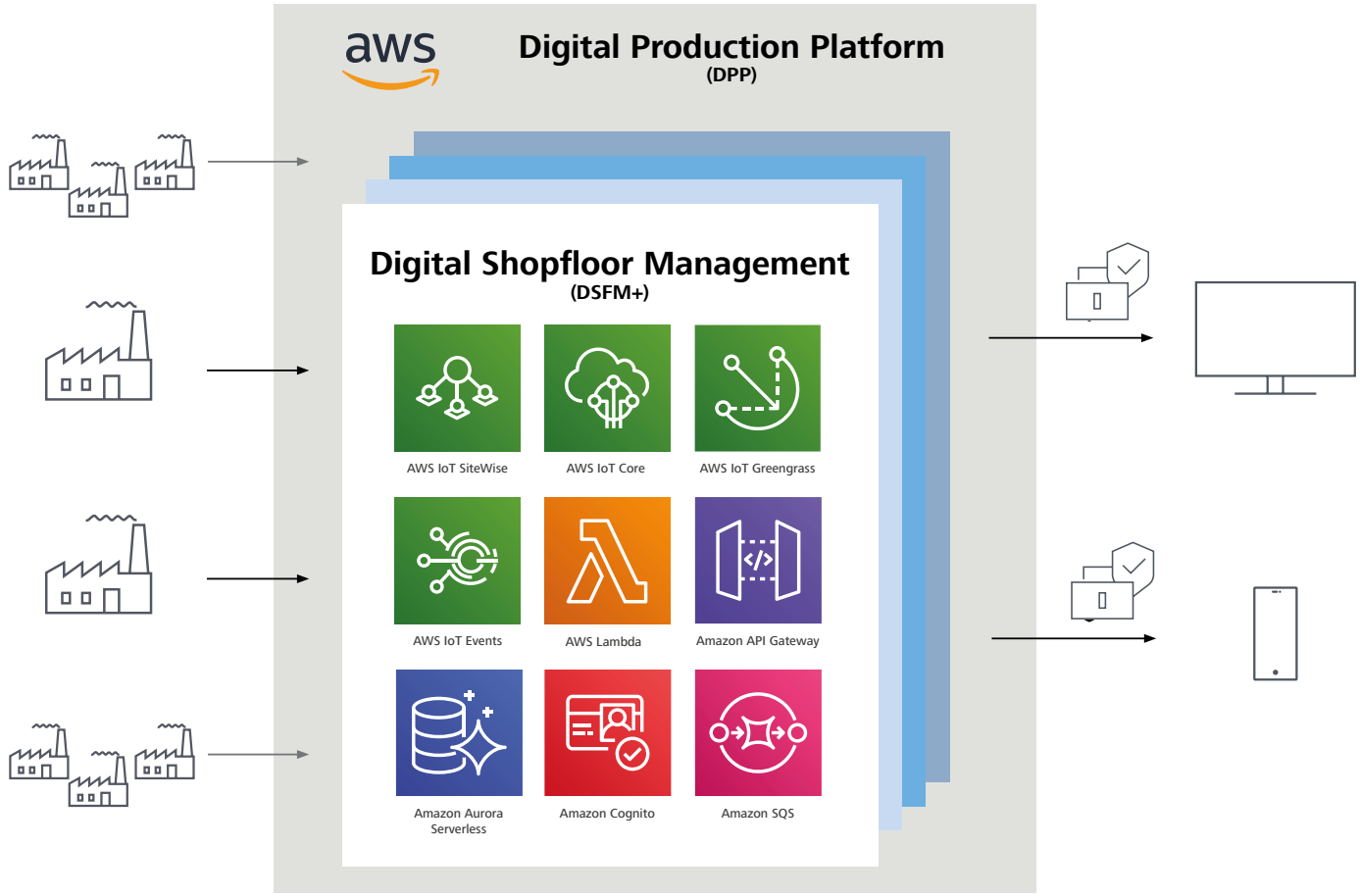
for the Volkswagen AG Production Platform



Higher automation and improved quality

Volkswagen (VW) is establishing a new digital production platform (DPP) for production lines in the Group. It replaces the traditional on-site IT systems with scalable and reusable solutions based on Amazon Web Services. A VW Software Development Center is developing the basic services and architectures for this. The use of cloud technologies, in particular, is expected to increase the reusability of solutions worldwide, in the plants of the VW Group and beyond. The aim of the project is to increase the degree of automation in production lines worldwide in order to improve efficiency and reduce the amount of rework.

ZEISS Digital Innovation tasks



As a partner of the VW Software Development Center, our team is developing VW-specific standard services for production lines. The first step involves a new **Digital Shop Floor Management (DSFM+)** to optimize production-related processes on behalf of VW Group IT Components. The aim is to replace and avoid the manual and heterogeneous acquisition of data in the individual plants. The software solutions developed are already being used productively in the pilot plants. One exemplary application is the so-called **EpiK** Service (bottleneck analysis in car body construction). Here, complex assembly lines can be analyzed live for machine bottlenecks regarding assembly cycle time and optimized with the results displayed graphically. The **DataHub** project was implemented to transport the live data of a plant's production machines from the shop floor to the cloud.
The focus here lies on data transparency and data quality. Thanks to its successful implementation, DataHub currently not only provides the data for the digital shop floor management projects, but

is also used as a standard application for other projects on the DPP and is therefore used in significantly more plants. The **Asset Management** Service is available to map plants and their production flow logically as a digital twin. With a streamlined user interface, production planners can configure the logical combination of machines and production lines. The **Fault and Action Management** project serves to reduce the workload of employees on the shop floor. Among other things, parts and assembly losses are recorded and categorized here. There is a user interface with guided dialogues that can be displayed on a tablet. The previous paperbased reporting has been eliminated completely. At the same time, machine statuses and alarm messages are loaded live from the machines and correlated with the component losses. The next service **KPI** will generate corresponding complex reports, such as OEE analyses (Overall Equipment Effectiveness), Loss Pareto or shift handover reports. It will even be possible to compare two or more plants directly with each other.
This will be an enormous help for the continuous improvement process.
DSFM+ has already been installed in four pilot plants, but can be applied to many other plants and rolled out worldwide. It is planned to introduce the solution in other plants in Europe.

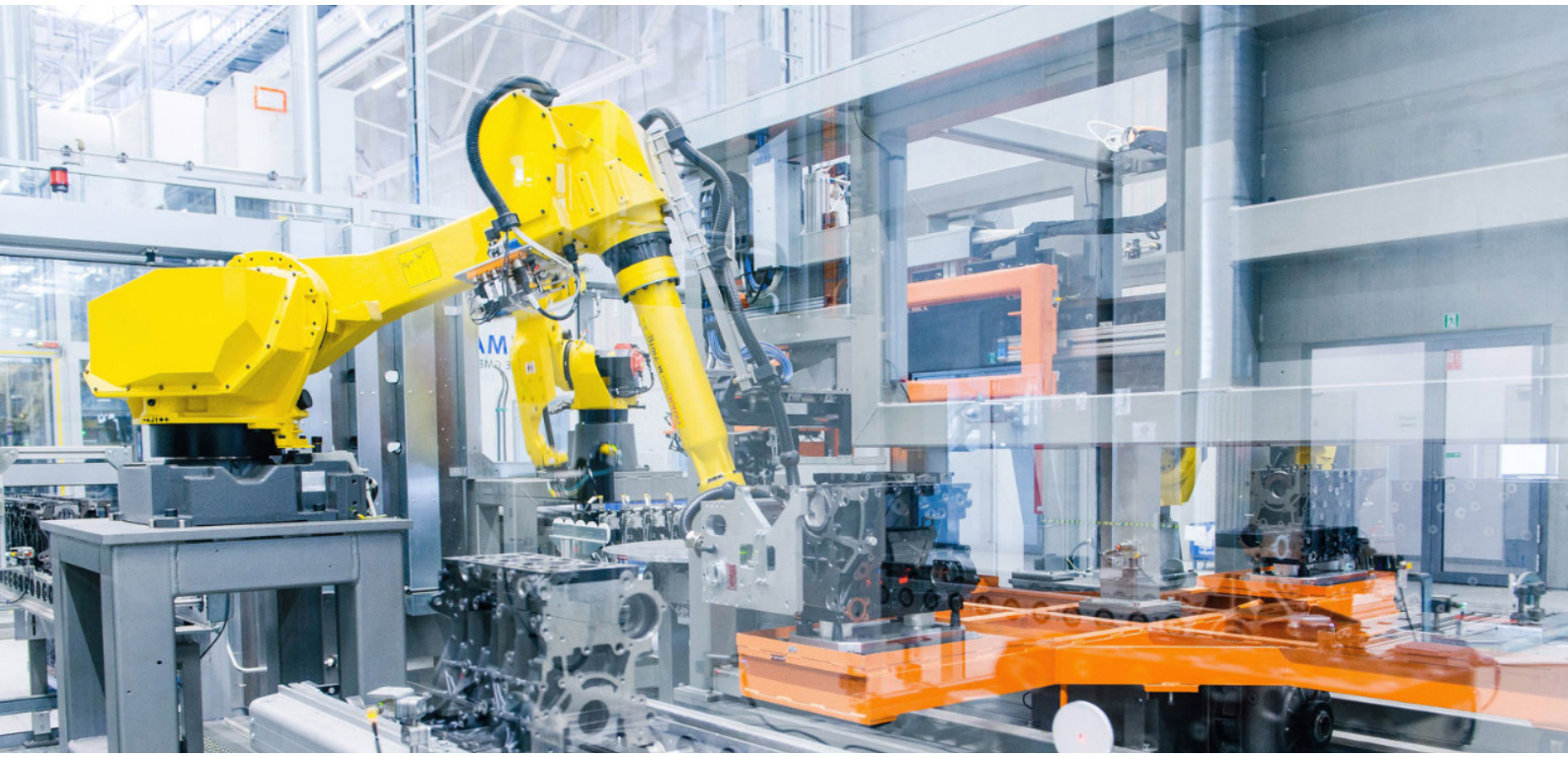
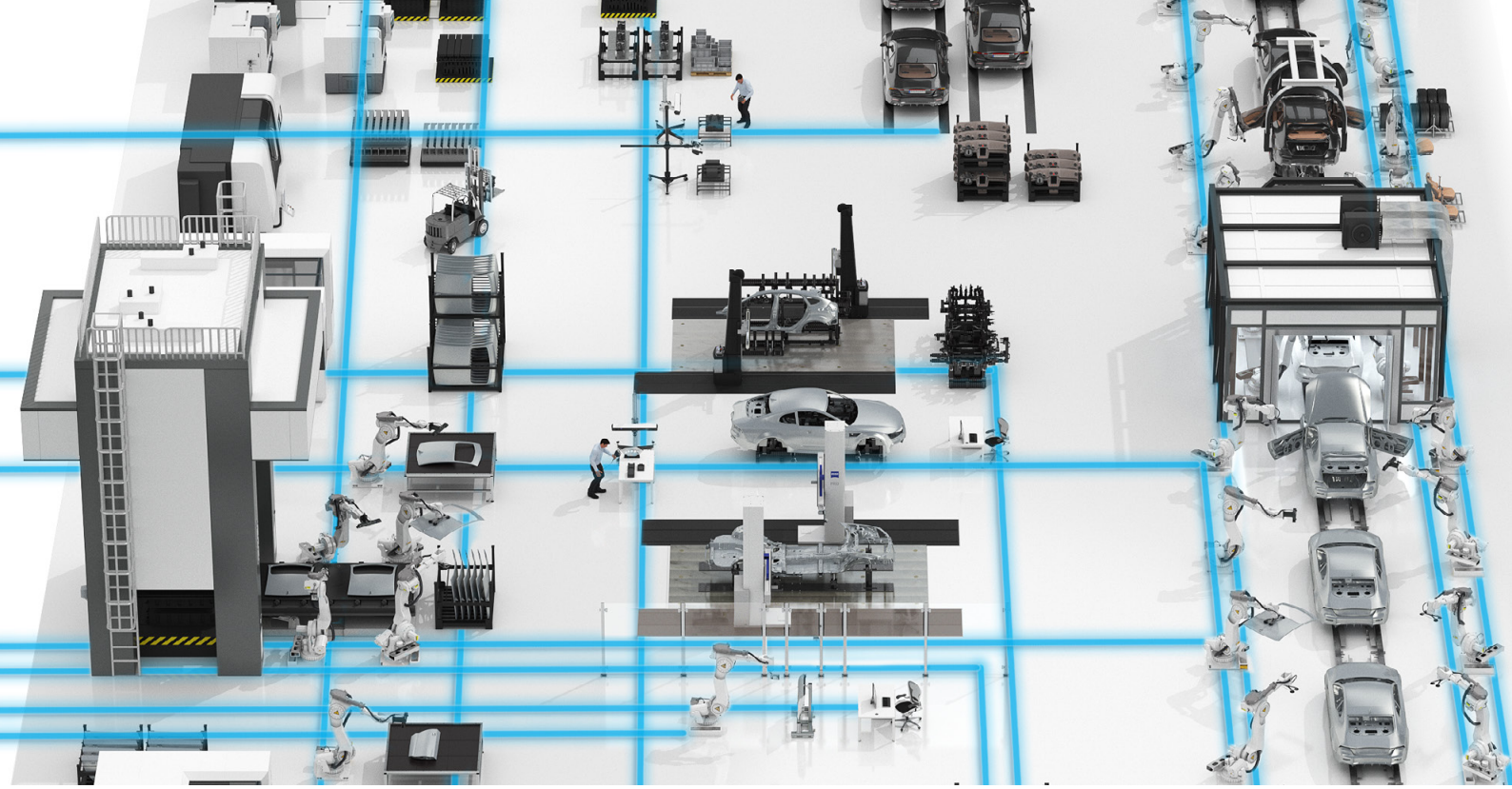


Fig.: Production of MDB (Modularer Dieselbaukasten - Modular Diesel kit) cylinder crankcases at the plant in Polkowice. Photo: VW

Our services

- Support in recording and analyzing requirements
- Design and implementation of the solution architecture in the AWS Cloud
- Design and implementation of the on-site architecture
- Implementation of the cloud solution
- Implementation of web clients
- Quality assurance incl. extensive test automation
- Documentation
- DevOps

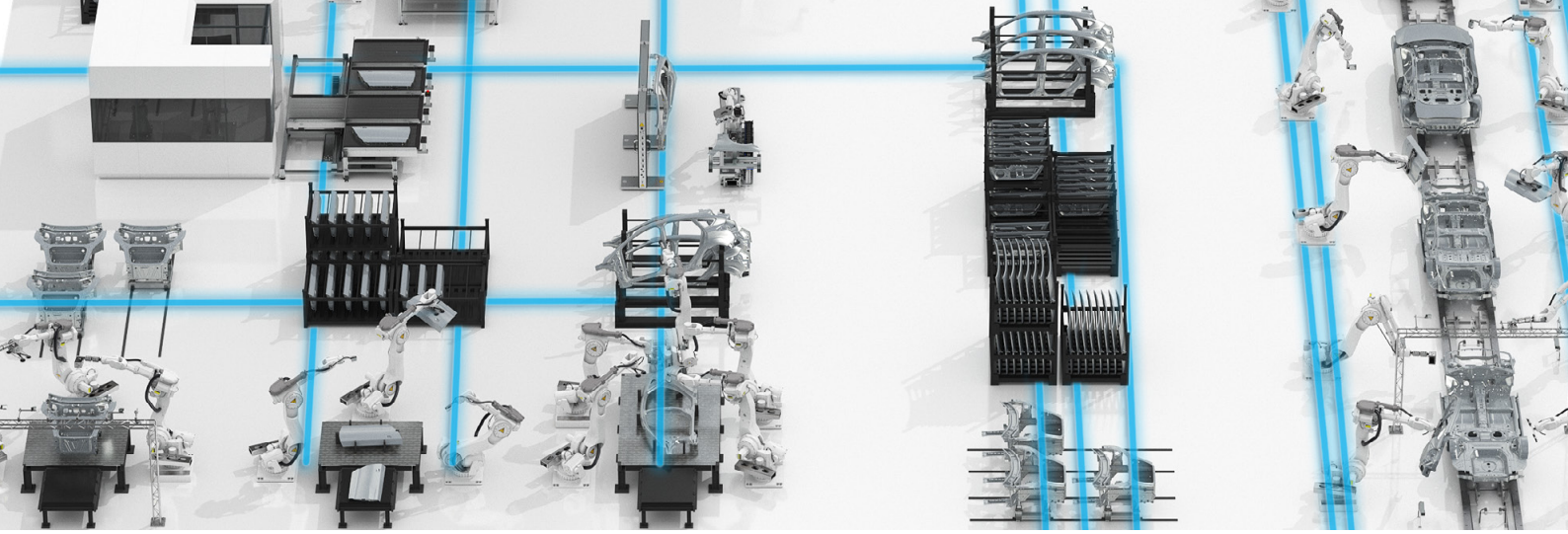


Challenges and specifics

The first step was to review and assess an existing system and evaluate options for further development. In this context, ZEISS Digital Innovation carried out a health check of the system components already implemented and the existing solution architecture. An initial functional system (MVP 1) had to be presented within just three months. In addition to extensive new functionalities, the findings of the health check were an important component for the development of MVP 1. Thanks to the very good and cooperative partnership between VW and the ZEISS Digital Innovation team as well as the agile approach in the project, the requirements were implemented within five sprints. The system delivered at the required time met with a positive response from the customer and within the plants. As the project progressed, one major challenge that remained was to connect the individual plants with their individual solutions they had used to date. The aim here was to reduce manual data collection, filter data streams correctly and obtain missing information from the machines. A simple, robust and scalable architecture must be found that is also flexible enough to be used on as large a scale as possible and worldwide. Good communication with the individual IT units at the plants is also essential. The experience of ZEISS Digital Innovation in distributed agile collaboration is a great advantage in the development and for the VW teams. The general communication between all those involved should be emphasized in particular. For example, the product owners were supported by business analysts from ZEISS Digital Innovation. Working together with the team led to faster success and helped to overcome the challenges.

Technical environment

AWS (AWS Lambda, Amazon API Gateway, AWS IoT SiteWise, AWS IoT Core, AWS IoT Events, AWS IoT Greengrass, Amazon Cognito, Amazon SQS, Amazon Aurora Serverless, AWS CloudFormation, AWS CodeCommit, AWS CodeBuild, AWS CodePipeline), Angular, Redux, TypeScript



About our customer

The Volkswagen Group, based in Wolfsburg, is one of the world's leading car manufacturers and the largest car manufacturer in Europe. Twelve brands from seven European countries belong to the Group. The Group operates 125 production plants in 20 European countries and in 11 countries in America, Asia and Africa. More than 670,000 employees around the world produce vehicles, provide vehicle-related services or work in other business areas. The Volkswagen Group sells its vehicles in 153 countries.

The cooperation along the digital production platform is primarily carried out in collaboration with Volkswagen AG's Software Development Centre Dresden. This collaboration is characterized by agility, partnership-based cooperation and a clear solution-oriented approach throughout the entire duration of the project. In such complex projects, this is the key to efficient and goal-orientated product development.

Customer benefits at a glance

+ Increased production efficiency
+ Increased automation in the production lines
+ Less manual data entry
+ Direct line comparison of two or more plants
+ Greater data transparency
+ Reduced workload for employees on the shop floor
+ Reduced rework
+ Reusability of solutions in VW plants worldwide

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