

# Industry 4.0 Pioneer in Machine Tool Manufacturing Leverages AWS for Seamless Operations



## Summary

In a mammoth project, Schwäbische Werkzeugmaschinen GmbH (SW) migrated its digital services platform to AWS. The switch was successfully and seamlessly completed within the deadline. In the process, they are benefiting from an optimization towards serverless applications and Infrastructure as a Service. The tool manufacturer continues to lead the industry with data-based value-added services, for predictive maintenance, optimized machine availability and reduced setup time.

### About Schwäbische Werkzeugmaschinen

Schwäbische Werkzeugmaschinen (SW) is a machine tool manufacturer, headquartered in Waldmössingen, in the south of Germany. SW is a world market leader in the field of multi-spindle machining centers for cutting all types of materials. As a system supplier, SW creates entire manufacturing systems for automobile, construction, and agricultural machinery. SW products are also used by manufacturers of components for fuel cells, medical technology and aerospace. The company focuses on providing software solutions and predictive maintenance for end-to-end analysis, assembly, and optimization of plant data across process flows. Their solution is designed to provide accurate estimation of costs before production begins. The machine tool builder champions the cause of "comprehensive digitization". SW's industrial data platform is one of the backbones of the German "Industrie 4.0", enabling their customers to make smarter data-based decisions.

### The Business Need

SW operates with a digitization portfolio where data from the machine is collected via an IoT gateway (industrial PC) and transferred to downstream systems via this gateway. This component is particularly complex as it handles both data acquisition, processing, and forwarding. The downstream systems include the SW CloudPlatform (SWCP). However, the captured data can also be transferred to customers' existing systems or to the local customer solution also developed by IDS - the SW ScadaPlatform (SWSP). It is important for automotive suppliers for the SWSP to trace and acquire parts on a line basis. "The digital products are developed by IDS based on its many years of experience and in consultation with customers and, if necessary, individually adapted or expanded," explains Sandra Schuster, Product Owner IoT Gateway. The goal of all solutions is always to enable high process reliability and stability.

## High Data Expertise is the Key

SW was one of the first machine builders to begin using cloud solutions by adopting it as early as 2002. The aim was to learn more from the data generated while operating at the customer's site and also in its own assembly line. Initially, this was executed via an external platform, which is now also hosted in-house. In 2016, the firm decided to scale to an independently developed PaaS solution and gradually replace the existing system. In 2018, the first version of the new SW CloudPlatform system was released.

## Feasibility Studies for IoT Gateway and Cloud

In 2021 the platform provider announced that it was discontinuing its service. The experts at SW faced the challenge of creating a new platform for their digital services in a comparatively short time (by the end of 2022). Since the firm had already initiated contact with AWS in 2020, the decision was made to migrate the system to the AWS cloud together with AllCloud as a partner.

The joint collaboration began by developing two proofs of concepts (PoC). The first was to analyze and determine if managing the IoT gateways would seamlessly align with AWS services and components. Since SW had global customers, software updates and upgrades needed to be possible from anywhere at any time to bypass on-site activities. To test this, the existing solution was replicated based on AWS Greengrass – an open-source edge runtime and cloud service that enables the deployment of smart device software. The second PoC was a feasibility study to demonstrate that the entire SW CloudPlatform (SWCP) and its services could run on AWS.

## Complicated Data Collection at the Controller

SW builds machine tools with brands like Siemens, Bosch and Fanuc, the biggest challenge was communicating with different interfaces for each tool. "Very specific knowledge is required to collect the data. For example, it must be clear whether the parameter is to be fetched on the PLC or NC side and whether further calculations may be required in the control system. It's a plus that we have mechanical engineering development and design in-house," says Schuster.

Another roadblock is to understand the use cases and how to implement them. He explains that for data analytics providers outside the industry, it is harder to define which scenarios work and what exact data is needed to execute them. But because SW has been consistently collecting and analyzing data for twenty years, it has a significantly large head start.

## Migration Under High Pressure

"AllCloud's performance was top notch despite the high pressure. During the critical phase, the collaboration with them was very intensive through daily sync-ups, spontaneous meetings and workshops. The project managers and architects delivered meticulously and were always available for us, even late at night," praises Clara Thiesen, Product Owner SWCP. The collaboration was very trusting, she says, and was also fun despite the time pressure. "It was important to us that our cloud partner understood that we have been working with cloud-native applications for four years and that it was not simply a matter of migration. In addition, the AllCloud experts were keen to understand the requirements for SW CloudPlatform in the mechanical engineering environment," says Konrad Grüner, Software Architect Industrial Data Services.

"The project was successfully completed in just under 1.5 years. To benefit from AllCloud's know-how beyond that, AllCloud Engage Professional was booked.", reports Sandra Schuster.

## Accelerated Innovation Under Tight Deadlines

"We redeveloped a large part of the applications originally created in Java in Python. To do this, the application was converted from a microservice-based to a serverless architecture. Terraform was used to orchestrate the infrastructure and the functionality was implemented using AWS Lambdas (Cloud Functions)," explains Konrad Grüner. AWS Lambda is a service that executes serverless and event-driven automated code and manages the associated compute resources. The open-source Terraform tool is used to automate the management of IT resources.

Given the tight deadline, AllCloud's team had a laser focus on providing innovation by eliminating the previously used container technology. "By automatically scaling serverless technologies, we were able to optimize our resources.. Serverless instances are significantly more scalable than containers, making administrative setup and operations much simpler," he continues. Lambdas are used in virtually all services, including time series for data analysis (with Amazon Timestream) and master data management, such as user management and asset management.

## Increased Scope and Lowered Costs with New Platform

The enhanced solution was more powerful, but that also meant a greater time commitment initially, says Sandra Schuster. It was also a good decision to participate in AWS's Migration Acceleration Program, she says. "We now have even more possibilities with AWS than we did with our old platform. The collaboration was constructive and on an equal footing; we can bring requirements to AWS that also add value to AWS services like Greengrass. As we continue to develop, we can also create good, marketable solutions for other industries," emphasizes Konrad Grüner.

Within the first two months of going live, it became apparent that people are moving faster and cheaper on the new platform. "I assume that we will also have great savings potential in the future, because we can make the new functions even more efficient," says Clara Thiesen. "AllCloud also offers support and tools for optimizing services that reduce cost," she adds. The company sees the fact that AWS offers different server locations - in the U.S. and also in Frankfurt, as particularly positive. Since the SW group of companies has production sites in the U.S., Germany and China, it is important to be able to offer a European server. The machine tool builder has consistent support from the AllCloud team. "The personal contact is excellent, the colleagues know us and our requirements, and respond directly to our concerns without delays," praises Schuster.

## Expansion and Focus on Digitization

The platform is designed to be continuously developed on AWS into a fully-fledged Industrial Data Platform and completely replace the existing solution over the course of the next few years. There is going to be a growing need to depend on data and analytics to increase efficiency within the supply chain towards growing OEMs. With the new platform running on AWS, SW is now equipped to master the ever-increasing challenges, bringing OT and IT closer together and even making it possible to connect the shop floor with the cloud thanks to AllCloud's own OT Landing Zone.

For greater process reliability for customers, the SW CloudPlatform offers availability calculations to quickly identify bottlenecks. Sprouting maintenance issues are also projected to be addressed in a more targeted manner.

SW's digital services have also become increasingly sophisticated over time. Time series analyses of axle tests, which can be used to identify mechanical wear, are particularly important. Digital services can also make an important contribution in the future to address the shortage of skilled workers which may arise due to an aging workforce and shortage of experts. SW is therefore trying to use digital services to put specialized domain knowledge into formats that can be used by all relevant groups at an early stage.

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*Clara Thiesen, Product Owner Industrial Data Services at Schwäbische Werkzeugmaschinen GmbH*