SEPTEMBER 15, 2022

How RS Industria Harnessed AWS Cloud to Create an End-to-End Modular IIoT Service

By David W. Humphrey

Keywords

RS Industria, AWS, Cloud-based Services, Industry 4.0

Overview

Industry 4.0 is about using technology to gather untapped data, and then turning the data into actionable information. The theory is straightforward, but in practice, the devil is in the details. Industrial processes create treasure troves of raw data, but a combination of proprietary, legacy automation systems and a lack of personnel with relevant IT skills makes it challenging for industrial companies. Most companies today are addressing these challenges by undergoing a digital transformation, and many use external partners to help them on their journey. This ARC View looks at how RS Industria leveraged the AWS cloud platform to create new remote monitoring services for its broad customer base of industry users.

RS Industria is an innovative cloud-based service that helps industrial companies liberate, collect and analyze data from legacy assets in real-time for improved decision making. Users take advantage of digital services to unlock insights that help improve uptime, increase efficiency, and empower their plants.

Customer Value

The value proposition for customers of RS Industria has several aspects. First and foremost, it allows users to quickly add condition monitoring applications to existing equipment without disrupting the process. Instead of hiring personnel with the IT skills needed to create a home-grown solution, the solution provides access to a readymade, modular application for remote monitoring. The pay-as-you-go model allow users to "start simple and grow smart," meaning that they can begin with a simple application to assess its value, and then replicate it across more machines or lines as needed. RS Industria provides the tools that liberate, collect and analyze data from legacy

assets, while the AWS cloud platform provides the infrastructure and connectivity.

From Components to Service Provider

According to its staff, RS Industria felt like a start-up company as it set out to explore new business opportunities and revenue streams. The goal was to create an industrial data service designed to give clients data-driven insights into their manufacturing processes in a fast, affordable and modular way. Recognizing that a practical understanding of industrial OT is critical to successfully developing a practical IIoT platform, RS Industria acquired a company in 2019 that specializes in onsite condition monitoring. The practical experience gained from this service provider was incorporated into the development of the RS Industria data service for industrial production and asset optimization. Later that year, the team selected AWS as its cloud partner. Working closely with AWS Solutions Architects, rapid development led to first beta site deployments in 2020.

The AWS cloud provides RS Industria with a robust, secure and scalable platform. According to the company, using managed and purpose-built IoT services enables the team to bring new capabilities to market quickly rather than having to focus on managing infrastructure. Selecting an innovation-on-cloud approach allowed the company to experiment, fail fast, pivot, then select the right solutions and find the right use cases.

In 2021, the product was launched commercially and now supports several dozen clients. The RS Industria team continues to enhance the platform for customers, taking advantage of the flexibility and modular approach offered by the AWS cloud platform.

More Data, But How?

Accessing and deriving value from raw data in industrial processes involves several steps. The first step is to liberate difficult to reach data that are hidden in legacy automation systems or are only accessible via proprietary networks. The next step is to put the data somewhere where they can be accessed easily and quickly, and then analyzed together with data from other sources and locations. The final step is to turn the information into actionable items that can impact key operating metrics. Implementing these steps is

often beyond the capabilities of small industrial companies, and this is why many are turning to external partners for help.

The resulting solution may be just to set up a loop of data extraction and analysis, or it could be a full-service contract to set up and operate the system. The latter is the approach offered by RS Industria.

Connecting Factories

The RS Industria solution consists of three key processes: Connect, Monitor and Improve.

Connect

The Connect process connects to and consolidates data related to single or multiple assets into one place. This involves the installation of IoT devices such as edge gateways, signal conditioners, data-enabled meters, additional sensors, and security devices. The Edge Gateway enables many different industrial data protocols to be translated in real-time, so that all types of industrial assets can be connected, solving a major barrier that has previously hindered the wide adoption of IIoT. Clients may opt to install these devices themselves, with technical support offered by the RS Industria team.

Monitor

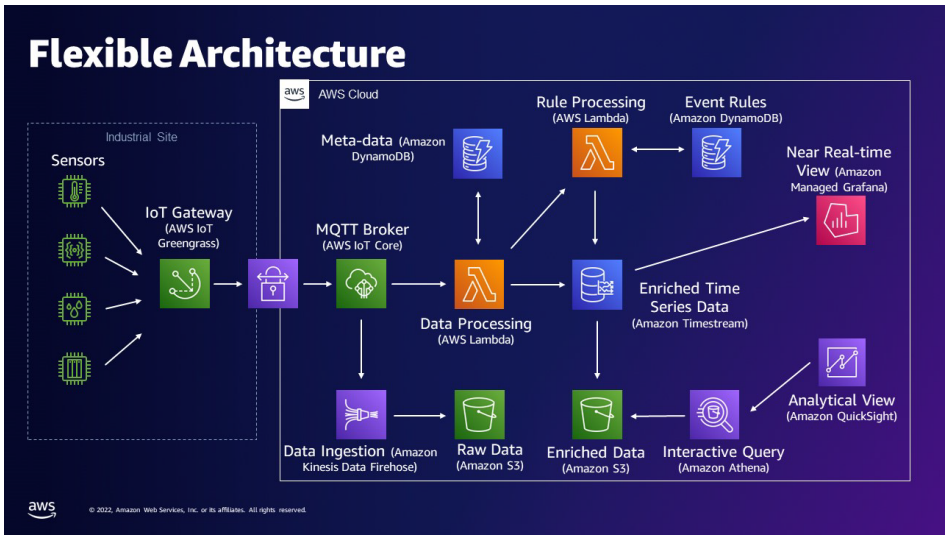
The monitor process creates dashboards for PCs, tablets and smartphones that are tailored to the individual needs of relevant plant personnel. All share a single accurate source of asset data and operational insight. Asset dashboards can provide a view of overall performance at the line, location or site level. Individual dashboards consolidate KPIs and critical asset operating data onto a single page for an at-a-glance understanding of assets' condition and performance, whether in an office or on the shopfloor.

IoT Greengrass is an IoT open-source edge runtime and cloud service that helps users build, deploy, and manage device software.

Information might include trends of key operational parameters and energy consumption, as well as urgent condition-monitoring alerts. Users can quickly use this information to identify which assets in a process currently have problems or are at risk of some form of failure in the future. With the Data Studio feature, users can create custom charts and graphs to display and compare information across multiple assets.

Improve

With the Improve process, RS Industria actively supports clients' continuous improvement goals, based on accurate information and insights. The Predictive Maintenance service uses machine learning and predictive analytics to forecast an asset's condition in the near future, specifying the likely failure-modes. This service is powered by Senseye, a cloud-based predictive analytics service. To help clients get started, RS Industria's predictive analytics team includes data scientists and specialists in machine learning.



RS Industria Relies on AWS to Provide a Secure Cloud Connection to Client Sites

Based on the condition-monitoring data generated, RS Industria's experienced reliability engineers can also offer expert advice on reliability improvement. Each has significant hands-on experience in reliability across several different industries. Support is available either remotely or onsite.

As an open industrial data platform, RS Industria was designed to integrate easily with other solutions. The company soon plans to offer APIs to connect third-party systems such as asset management, wireless monitoring, and CMMS.

Capitalizing on Growth in IIoT and Demand for Services

RS Industria is a trading brand of RS Group PLC, a UK-based distributor of industrial and electronics products best known for its RS Components brand. The company began exploring new revenue streams several years ago by creating a cloud-based asset monitoring service augmented by the

experience of a field service company it acquired that specializes in condition-monitoring and reliability services. For the underlying cloud infrastructure, RS Industria selected AWS Cloud. The focus on using higher-level managed services offered by AWS helped enhance RS Industria's ability to quickly experiment, reduce development time, and so increase their speed to market.

Use Case: Anomaly Detection on Automated Conveyors

Conveyor systems are widely used in manufacturing logistics to move products around a plant at high speeds. Simple electrical or mechanical failures can bring entire production lines to a sudden stop, so manufacturers have a keen interest in identifying and solving problems before they occur, if possible. Traditional vibration analysis is an obvious technology to use to spot impending problems, but this solution is usually too expensive to deploy over large numbers of low-value replaceable items like AC drives and gearboxes. RS Industria has found another way to address this problem without the need for additional sensors, significantly reducing deployment costs.

AC drives generate a lot of useful data such as fault codes that can provide valuable insight into their condition, but these parameters typically are not used by the supervisory control system. In addition, analog signals such as voltage and current can show when operating limits have been reached: for example, a sudden increase in current draw may indicate a jam in the conveyor. While vibration analysis requires sensors to be mounted physically on the mechanics, drive parameters can be easily read via an existing industrial network.

RS Industria's solution is to use its machine-learning resources to assess these parameters to determine when an individual drive is operating outside of its normal conditions, triggering maintenance staff to investigate the fault. When these data are first connected to the RS Industria cloud platform, machine-learning algorithms analyze the parameters from multiple devices to learn what 'normal' operations look like, a process that can take several weeks. Once a picture of normal operating limits has been learned, any parameter values occurring outside of these limits are considered anomalies. Depending on the number and scale of the deviations, the system automatically generates alerts, enabling maintenance crews to focus on fixing impending problems rather than looking for them.

Use Case: Energy Monitoring

While soaring energy costs are a headache for households, they pose a serious threat to the business of industrial companies that can't always pass on the additional costs to their customers. Even before the current spate of inflation and high oil prices, manufacturers have sought ways to monitor energy consumption intelligently, identify areas of energy waste, and optimize energy usage through process improvement. One barrier has always been accessing energy usage information, which may only be available at one metering point, such as the site's mains supply. Even when multiple metering points exist, collating all the readings, often manually collected, takes time and effort.

Vision: "RS Industria is an open industrial data platform and service that enables our customers to make data-led decisions in the management of their assets and their MRO supply chain – securely backed by a market-leading, resilient and enduring FTSE 100 business."

To solve this problem, RS Industria installs on-premise edge gateways that connect a variety of OT networks (both Ethernet-based and legacy) to collect the large amount of data embedded in PLCs, AC drives, sensors, and data-enabled utility meters. This process brings together asset energy usage data and places them in the context of running production processes. Asset-level metering allows the user to measure energy consumption at the process cell or even the unit level. When combined with other data from the control system, the user can calculate the energy consumption of each stage of the manufacturing process, rather than only at the end of the line.

Intelligently monitoring energy consumption down to the process cell or unit level offers enormous cost savings potential. For example, idling AC drives are said to consume as much as 90 percent of the power they use when actually running. Depending on the processes and duty cycle, powering them down when not required can result in large energy savings. As with the automated conveyor use case above, users can derive power-factor data by accessing the many parameters available in AC drives, most of which are not normally used by the control system.

Another potential for cost savings is to monitor for unequal loading on a three-phase circuit. The resulting phase imbalance can damage motors and equipment by causing increased current in the motor windings, raising their temperature, and the phase imbalance lowers the designed torque output, creating mechanical stresses in motors and connected equipment that can

lead to premature failure. According to RS Industria, its solution can identify phase imbalances at the asset level, enabling corrective action to be taken to protect the motor from further damage.

Finally, the power factor for a site can be reduced if inductive load assets (induction motors, fluorescent lighting air conditioning systems) cause the current and voltage to fall out of phase. This means paying for electricity that is not usefully used and possibly even incurring electrical supply contract penalties if the PF is too low. In short, improved power factor management can lead directly to a reduction in energy bills.

Future Plans for RS Industria

RS Industria is pleased with its initial product launch and plans to grow the business with aggressive customer acquisition including outside the UK. Ongoing product development will be based on feedback from user insights, and the company plans to scale up staff and support infrastructure accordingly.

Recommendations

With the RS Industria solution, the RS Group has demonstrated how industrial suppliers can harness the power of IIoT and grow their portfolios in completely new business areas, thanks in part to the availability of industry-focused cloud-based solutions such as AWS Cloud. With this in mind, ARC makes the following recommendations:

- Cloud platforms such as AWS Cloud offer readymade capabilities for digital services, allowing solution developers to focus all their resources on developing their specific solution. Industry players large and small are taking advantage of this, creating a healthy field of competition.

- The most attractive digital services solution for industrial end users is one that straddles the IO gap by combing the domain know-how and experience of vendors from the industrial community with the IoT underpinnings from IT providers. While factors such as the availability of development and admin tools are important, the absolute top criterion is the availability of cybersecurity that considers the needs and requirements of industry users. Platforms like AWS provide security capabilities

that can work at the required scale for IIoT solutions, and which are continually assessed and updated to meet new threats.

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