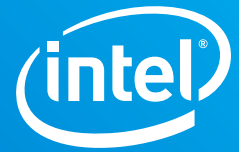


CASE STUDY

Intel® Architecture-Based IoT Gateways
relayr Smart Manufacturing Solution



Manufacturer Increases Uptime Using IoT Solutions to Improve Machine Visibility

relayr's data visualization tools helped a machinery manufacturer achieve an overall 11 percent performance improvement

“Intel® architecture-based IoT gateways provide diverse and expandable input/output connections for connecting to sensors and machines.”

Rick Caylor

Channel director North America, relayr

relayr.

A major European manufacturer of bottling machinery also offers service contracts to help its customers maintain overall equipment effectiveness (OEE). One of the manufacturer's customers operates a facility with older equipment, which began to negatively impact operating margins. With more than three hundred 20-year-old machines, an entirely new approach was needed to improve their OEE metrics, such as uptime, product quality, line performance, and maintenance cost.

The machinery manufacturer decided to implement Internet of Things (IoT) solutions from relayr, a technology company offering expert consulting, enterprise IoT middleware platforms, IoT gateways based on Intel® technologies, and easy-to-use data tools.

Challenges

Improve equipment availability. Unplanned downtime cost \$35,000 per hour.

Increase productivity. No additional spending on current machinery was allowed.

Address connectivity issues. Data and communications protocols were used inconsistently among the wide mix of equipment manufacturers.

Solutions

relayr 5-4-3 Innovation Acceleration Process. Helps determine the scope of a smart manufacturing project.

relayr Vertex IoT gateway. Uses Intel® processors to capture and compress data, and control machinery.

relayr retrofit kit. Connects to outdated machines or programmable logic controllers (PLCs) whose data was previously unavailable because of the use of proprietary protocols.

Fog architecture. Sends aggregated OEE values to the cloud in real time for monitoring and dashboarding.

Impact

Reduction in maintenance costs: 30 percent

Increase in machine uptime: 20 percent

Increase in operating profit margin: 2 percent

In only three months of data gathering and analytics, the customer was able to achieve significant business benefits.

Packaging technology and more

Consumers have a wider choice of beverages and foods than ever before, thanks in part to advancements in bottling and packaging machines. A leading European manufacturer of bottling machinery offers filling, labelling, and packing solutions for liquids and viscous foods, like milk in plastic bottles, mustard in glass bottles, or tomato sauce in cans. The manufacturer also offers maintenance service contracts covering its own machines and those from other manufacturers.

Line performance optimization

One of the service contract customers of the bottling machinery manufacturer operates a bottling plant that produces 1.2 million bottles per day per production line. Much of the plant's equipment is decades old and showing its age, as seen by escalating unplanned downtime. The plant managers were under pressure to increase productivity of the current machinery at little or no cost.

The bottling machinery manufacturer sought help from relayr to gain a better understanding of how the machinery was performing and what steps could be taken to reduce downtime. The first step was to use relayr's unique 5-4-3 process to identify the operations responsible for 90 percent of the plant's downtime, which were labeling, packaging, and palletizing.

Next, it was necessary to collect information from machinery built by a wide range of manufacturers who used different data and communications protocols. Bridging diverse protocols, a relayr Vertex IoT gateway made it easier to connect to and communicate with the large variety of machines.

Using relayr's data visualization tools, depicted in Figure 1, the customer was able to locate points in the plant where unnecessary buffering significantly decreased production line performance. The tools also drew attention to a packaging unit with a quality value that fell below acceptable thresholds. Addressing these issues resulted in an overall 11 percent performance improvement for the plant and an 8 percent quality improvement.¹

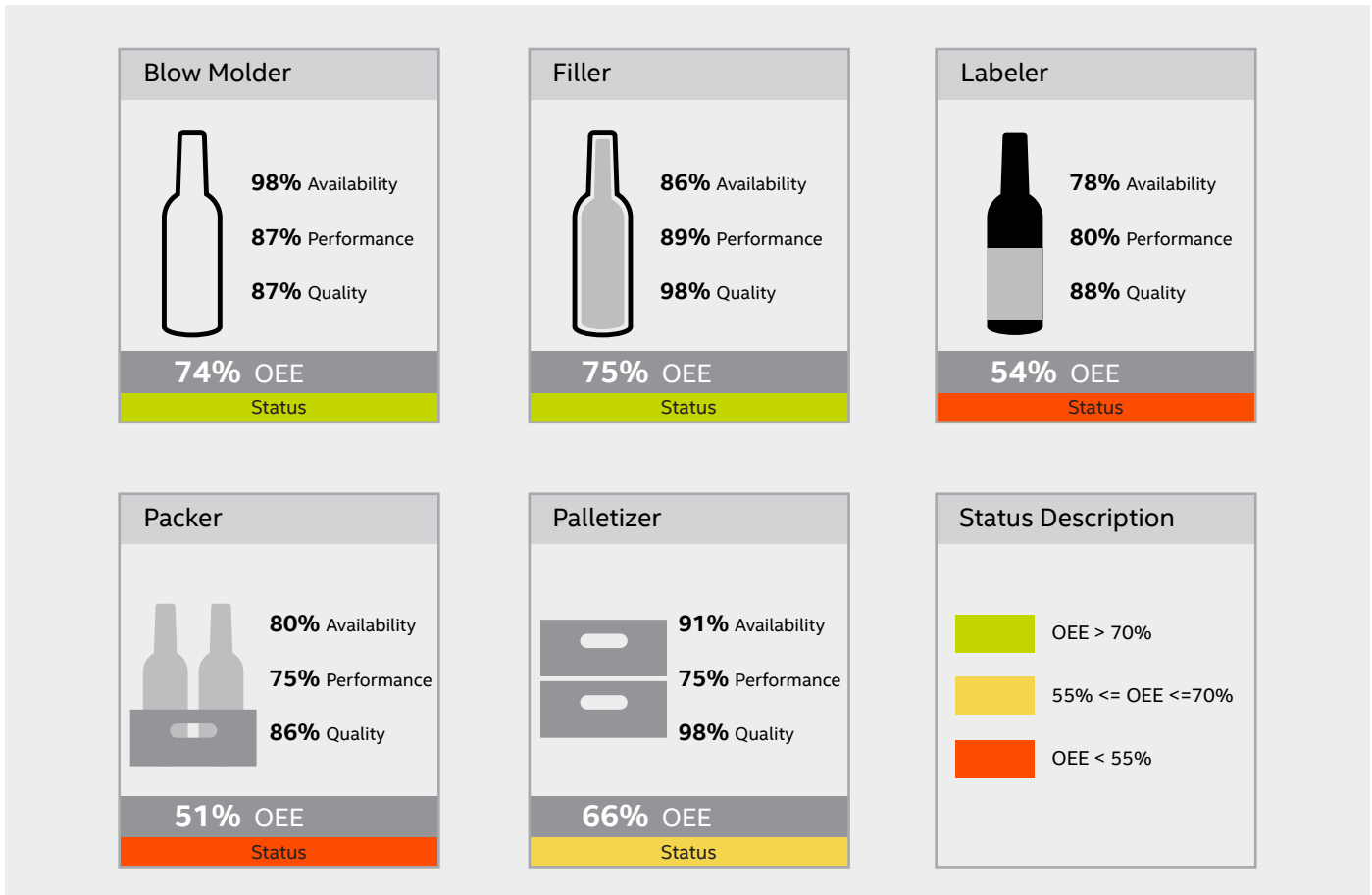


Figure 1. Overall equipment effectiveness (OEE) metrics for different machines and overall plant

relay's smart manufacturing solution allows users at different levels in the organization to visualize how each machine connected to the relay Cloud* is performing.

Solution overview

Machine visibility is vital to understanding plant performance and ultimately increasing efficiency and lowering operations costs. IoT solutions help increase visibility by making it easier to collect, analyze, and visualize data used to find new ways to optimize production. The following describes how relay helped its bottling machinery customer use its IoT solutions to improve production line performance.

Establish clear goals

Manufacturers just starting to use IoT solutions have many considerations, such as deciding which operations to tackle and in what order. The customer and relay defined the scope of the IoT solution with help from the relay 5-4-3 process,

which is designed to deliver real business results by converting ideas into a functioning prototype in three months.

Collect machine data

Machines using proprietary protocols for communications complicate the task of collecting and sending their data to the cloud for analysis. In the bottling plant shown in Figure 2, analog machine data, such as runtime error information, was collected using relay's retrofit kits that integrate the Intel® Edison sensor kit. The kits send data to the relay Vertex IoT gateway, which also communicates with the numerous on-site PLC systems, translating the various protocols used by the PLCs.

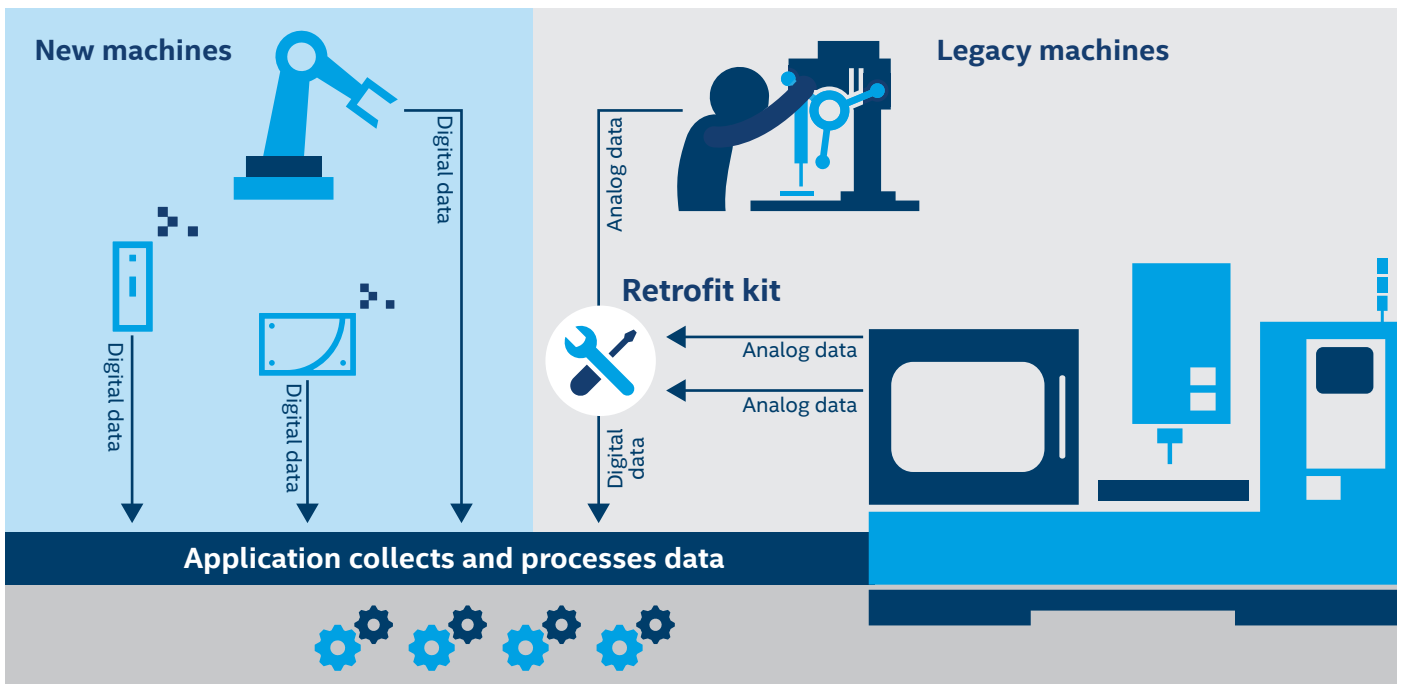


Figure 2. Analog and digital information is collected and analyzed

The relay Vertex IoT gateway is based on the Intel® IoT Gateway running the Wind River Linux* operating system. Compared to other gateway designs relay worked with in the past, the Intel IoT Gateway offers superior performance, computing headroom, and a choice of Intel processors, thereby future-proofing their design. Another major factor was the ease of porting relay Vertex software to the gateway due to its high level of Intel support and appropriate communications interfaces.

Analyze data

The next step is to transmit the data from the IoT gateways to the cloud. To simplify this task, data is transmitted directly to the relay Cloud* via an LTE wireless network, which bypasses the manufacturer's corporate network. Once the data is in the cloud, relay's data analytics and machine learning capabilities help gather key insights and identify new optimization opportunities.

Fog computing combines the very best of cloud and on-site computing.

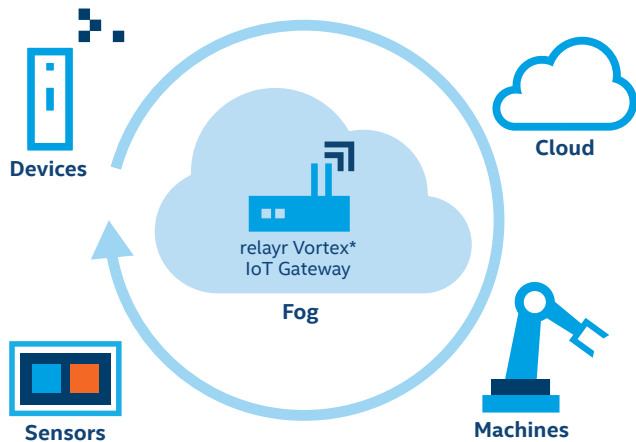


Figure 3. Simplified fog computing architecture

Control machines locally

The insights gleaned from data analysis are now put into action, sometimes requiring changes to the way machines are controlled. When deterministic, real-time control is needed, it is important to evaluate whether the cloud can respond fast enough. Addressing concerns over cloud latency is an increasingly popular technique called fog computing, depicted in Figure 3.

The relayr Vertex IoT gateway is a fog computing device that provides local, autonomous control under rules granted from the cloud platform. For example, decisions to switch a pump on or off, depending on the value received from a temperature sensor, can be made locally within the gateway. The gateway's proximity to the factory floor allows it to respond faster than the cloud in most cases.

Vertex software is configured to locally store all data collected from the plant machinery and send it nightly to the relayr Cloud in compressed batches, thereby consuming less network bandwidth.

Visualize data

To maximize the value of data collected on the plant floor, it should be presented in easy-to-use formats to different organizations across the company. The customer accomplished this using relayr Cloud, which has built-in capabilities for data monitoring and dashboarding.

Machine visibility creates opportunity

Real-time machine visibility allows manufacturers to understand what is happening on the factory floor, as seen in this case study of a major European manufacturer of bottling machinery. Information collected from existing machines is used to significantly reduce unplanned machine downtime, increase the life of the asset, and streamline the flow of raw materials, making the supply chain operate much smoother. Applying analytics to sensor data also helps predict an imminent equipment failure.

The overall impact is substantial, including a 30 percent reduction in maintenance costs, a 20 percent increase in machine uptime, and a 2 percent increase in operating profit margin. When businesses grow, relayr's solution using scalable Intel processors enables manufacturers to add licenses and machinery to their existing infrastructure, eliminating concerns about costs and complexity.

Learn more

For more information about Intel® solutions for industrial automation, visit intel.com/loT/industrial.

Learn more about relayr solutions for smart manufacturing at relayr.io.



1. Source: relayr.

Results achieved in the scenario described are intended as an example of an Industrial IoT deployment performed in a specific client's environment, implemented in October 2016 in Germany, and provided to you for informational purposes only. Any differences in your system hardware, software, or configuration will determine your actual performance.

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