influxdata®

AN INFLUXDATA CASE STUDY

How to Digitize Industrial Manufacturing with Azure IoT Edge, InfluxDB, and MAJiK

MAJiK SYSTEMS

MAY 2023

MAJiK Systems: How to Digitize Industrial Manufacturing with Azure IoT Edge, InfluxDB, and MAJiK

Company in brief

Founded in 2013, MAJiK Systems is a Canadian company with the goal of helping manufacturers unlock unrealized potential by connecting directly to industrial equipment and capturing real-time operational data to monitor, analyze, and optimize manufacturing processes.

Technologies used:

Azure IoT Edge, InfluxDB

Case overview

PLCs are a rich source of operational process data. Customers wanted to capture PLC data and derive insights using advanced statistical analysis, machine learning (ML), and artificial intelligence (AI), but PLCs don't have internet accessibility and this analysis happens in the cloud. MAJiK Systems bridges the gap between PLCs and the Azure IoT Edge and Hub Cloud. MAJiK Systems uses InfluxDB to power the higher-order analytics needed to contextualize and derive meaningful insight from industrial time series data. The result is a cutting-edge platform that uses real-time data to pinpoint areas for factory optimization and provide the resources needed to implement factory best practices and predictive maintenance.

> **"We've seen customers be able to reduce their downtime by 35 to 45 percent, reduce waste by 7 to 10 percent, all by taking that OEE as a starting point, and then diving into process data and IoT data from using InfluxDB"**

Jared Evans, MAJiK Systems COO

The business challenge

MAJiK Systems is no newcomer when it comes to building factory visualization tools that enhance their customers' Overall Equipment Effectiveness (OEE). With the pressure to perform at a high level while doing

more with less only increasing, MAJiK Systems needed an environment that gave customers the tools to reach their goals. This meant drilling into the process data collected from industrial programmable logic controllers (PLCs). The PLC data, categorized as time series data, came in the form of machine telemetry metrics and traditional manufacturing data. Examples of machine telemetry data are temperature, pressure, vibration, voltage, amperage, and current draw. Parts produced, downtime and faults, and quality yield rates are some of the traditional manufacturing data points. PLC data collection was a necessary first step on the path to closing the OEE gap between preventive and predictive maintenance, and implementing best practices across factories.

Training the advanced analytics models that power predictive maintenance requires data. A lot of data. Just one model can require millions of individual data points. A million is just the bare minimum and, in many cases, more time series is necessary to gain sought-after insights. The requirement for this large amount of data was because contextualization and integration with advanced statistical analysis, machine learning (ML), and artificial intelligence (AI) tools were essential before users could derive actionable insights. For this, MAJiK Systems turned to InfluxDB.

The technical challenge

Industrial connectivity on the plant floor is a big challenge. Sending PLC data safely to the cloud is quite the hurdle because PLCs lack internet connectivity. One key reason for this is that PLCs control vital factory processes and machinery and lack internal security mechanisms, making them a rich target for hackers and bad actors. Another piece of the connectivity puzzle is the lack of standardization between industrial protocols. Industrial protocol diversification is so severe that different model PLCs from the same manufacturer relied on different protocols. To create a full solution that collects data from PLCs, existing SCADA systems, and legacy data historians, MAJiK needed a way to communicate with any or all these protocols at any given time.

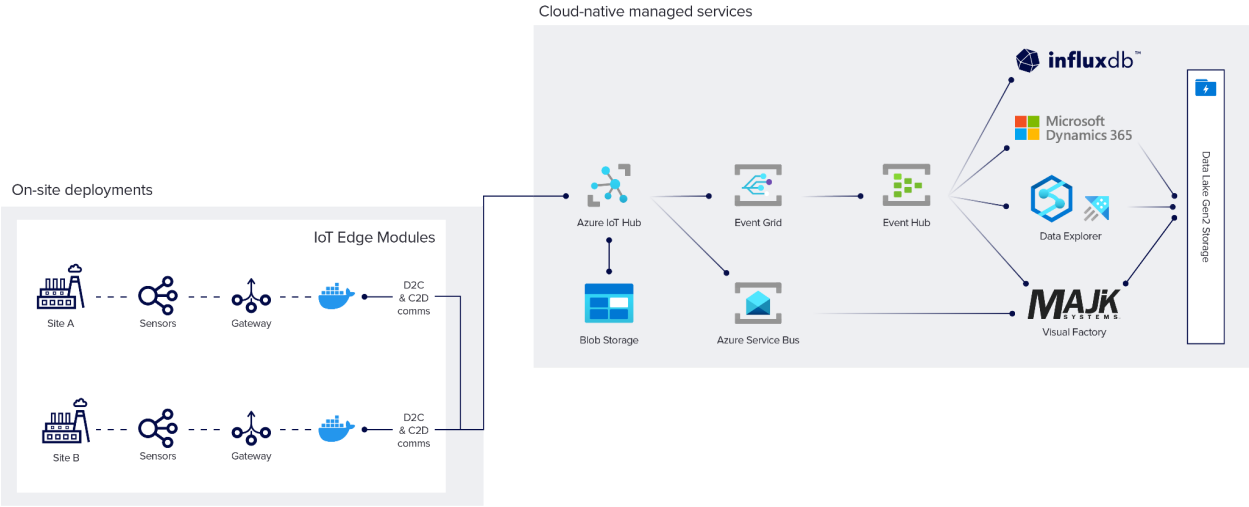
Time series data created another technical challenge. The data-heavy workloads MAJiK worked with stored event data such as downtimes or quality issues. Reaching higher OEEs meant relying more on process data and working toward the goal of avoiding downtime and quality issues. Time series data floods in at lightning-fast ingest speeds and huge volumes. PLCs collected the data but MAJiK didn't have a database partner that could capture data from a PLC in 50 millisecond intervals then use real-time analytics, machine learning models, or artificial intelligence tools to work with the data in a meaningful way.

The solution

MAJiK Systems enhanced their Visual Factory Software to work with time series data in a meaningful way.

Every Visual Factory System now includes an instance of InfluxDB and added support for third party, cloud-based systems such as enterprise resource planning (ERP) systems, business intelligence tools, and maintenance systems.

It all starts with data collection. MAJiK Systems created a flexible edge-to-cloud gateway that consists of a hardware/software solution to address the business and technical challenges. The hardware solution is an industrial PC where the software solution, IIoT Connect, runs. IIoT Connect functions as the intermediary between PLCs and the cloud. The industrial PC resides inside the plant, on the same subnet, and has the internal security mechanisms required for internet connectivity. IIoT Connect has out-of-the-box connectivity with 95% of controls and sensors on the market. It connects directly to PLCs or existing systems such as supervisory control and data acquisition (SCADA), human machine interfaces (HMIs), or legacy data historians.



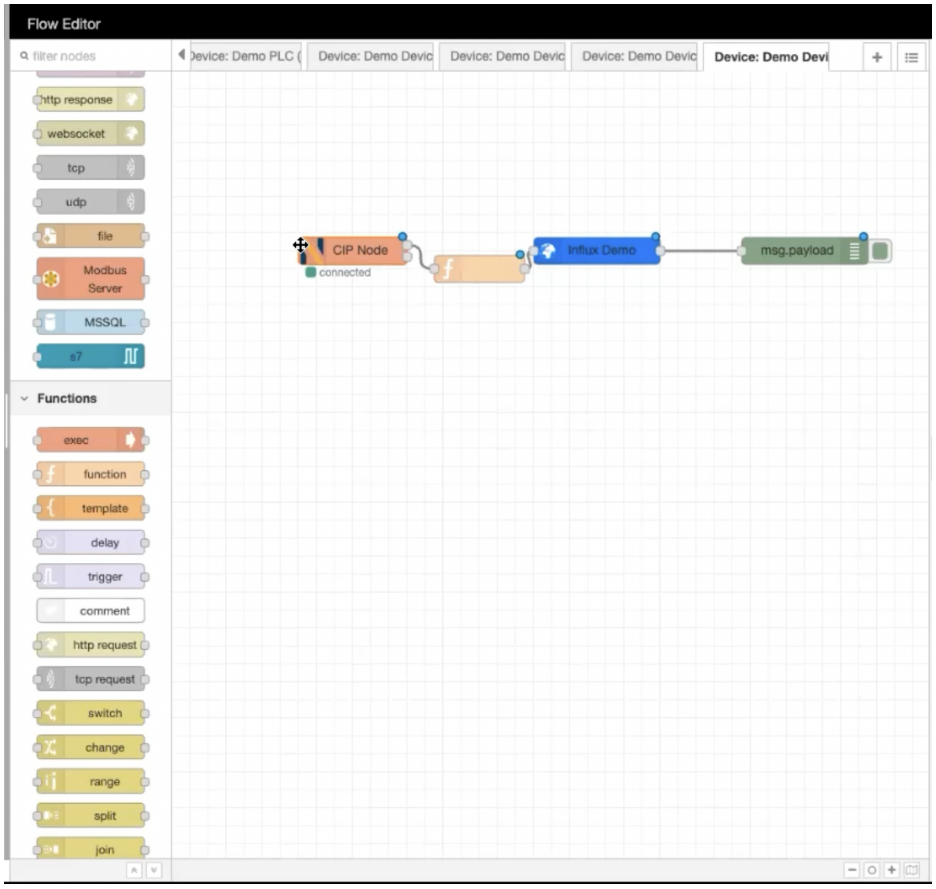
The above diagram details the journey from the plant floor to various cloud endpoints. IIoT Connect connects to the PLCs to extract data points such as air pressure, temperature, and electrical current in real-time. IIoT Connect transforms, manipulates, and cleans the data before sending it to the cloud. MAJiK Systems relies on the data transport capabilities of Azure IoT Edge and Azure IoT Hub throughout this process. Azure IoT Edge sends data from the edge to the Azure IoT Hub in the cloud via an encrypted connection. The Event Grid, Event Hub, and Service Bus services handle different data transport duties once the data reaches the cloud. Terraform deploy scripts spin up MAJiK Visual Factory and InfluxDB.

InfluxDB plays an integral role in observability and machine learning model training. Because machine learning models require such a high volume of data to train, their training takes place in the cloud. After successfully training a model, MAJiK's system sends it back down to the edge, where it works against the real-time data in the plant. These models are sent through the Azure ecosystem as containerized applications.

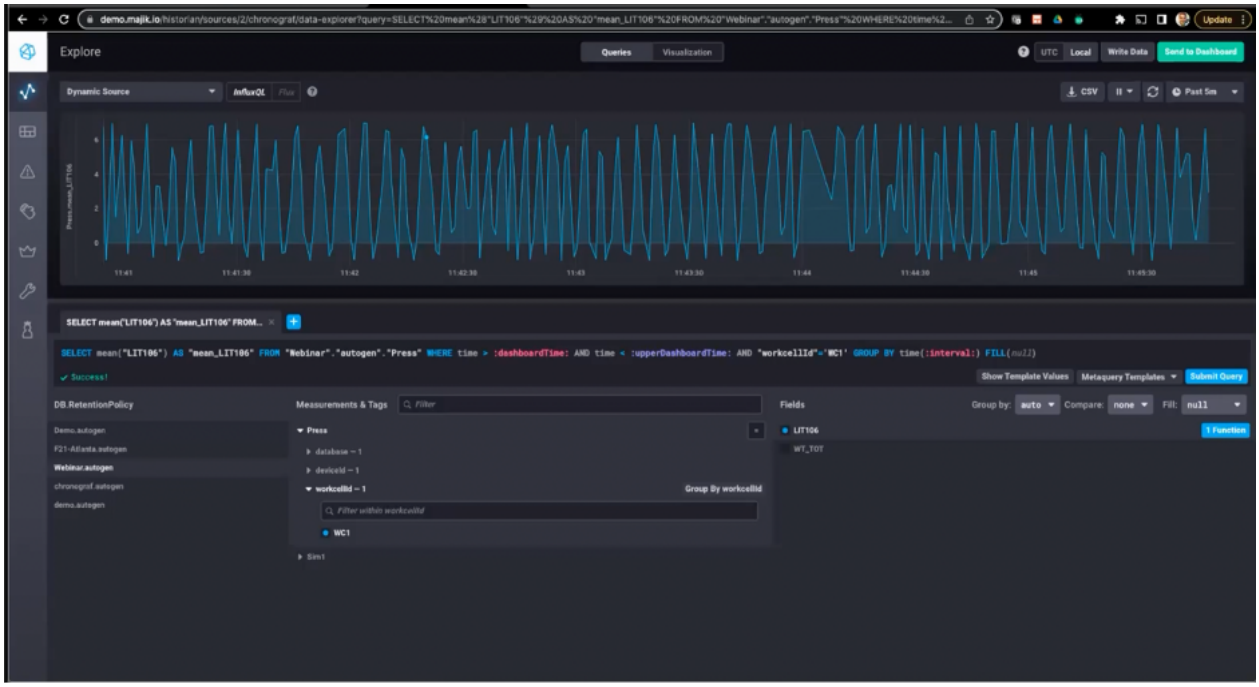
Building the workflow

IIoT Connect handles the heavy lifting of connecting to virtually any PLC or factory system. Configuring IIoT Connect for a new data source involves an easy-to-follow, four-step process. Adding a device is the first step. Users create a device name, select the device brand and model from a drop-down menu, add an IP address, and then ping the IP address. The second step, device connection creation, includes protocol selection from a drop-down menu, naming the connection, and the port recommendation. The user adds metadata to the newly added device as the last step before entering the drag-and-drop UI. IIoT Connect provides tag options for more modern PLCs based on the PLC's inputs and outputs. Older PLCs only have a memory address, requiring a bit of a heavier lift for the user at this point in the setup process. It's also important to add an additional attribute called "WorkCellID" because that sets up part of the key-value pairing for InfluxDB.

Building the connections between the PLCs and Azure IoT Edge and Hub in the drag-and-drop UI is the final set-up stage. The UI is built on top of open-source Node-RED and includes MAJiK Systems proprietary nodes and Node-RED nodes. Pre-built MAJiK Systems modules include various PLC and cloud application provider nodes (such as ERP systems and BI tools). The Node-RED modules provide general-purpose functionality, such as debug nodes and nodes that add JavaScript data functions to transform data along the transport path from the PLC to the Azure IoT Edge node. This may include processing like changing time zones or converting temperature from Celsius to Fahrenheit.



IIoT Connect extracts data from PLCs and transports it safely to the cloud where decision-makers have real-time visibility and access to the data-driven insights needed to make impactful changes on the plant floor.



Results

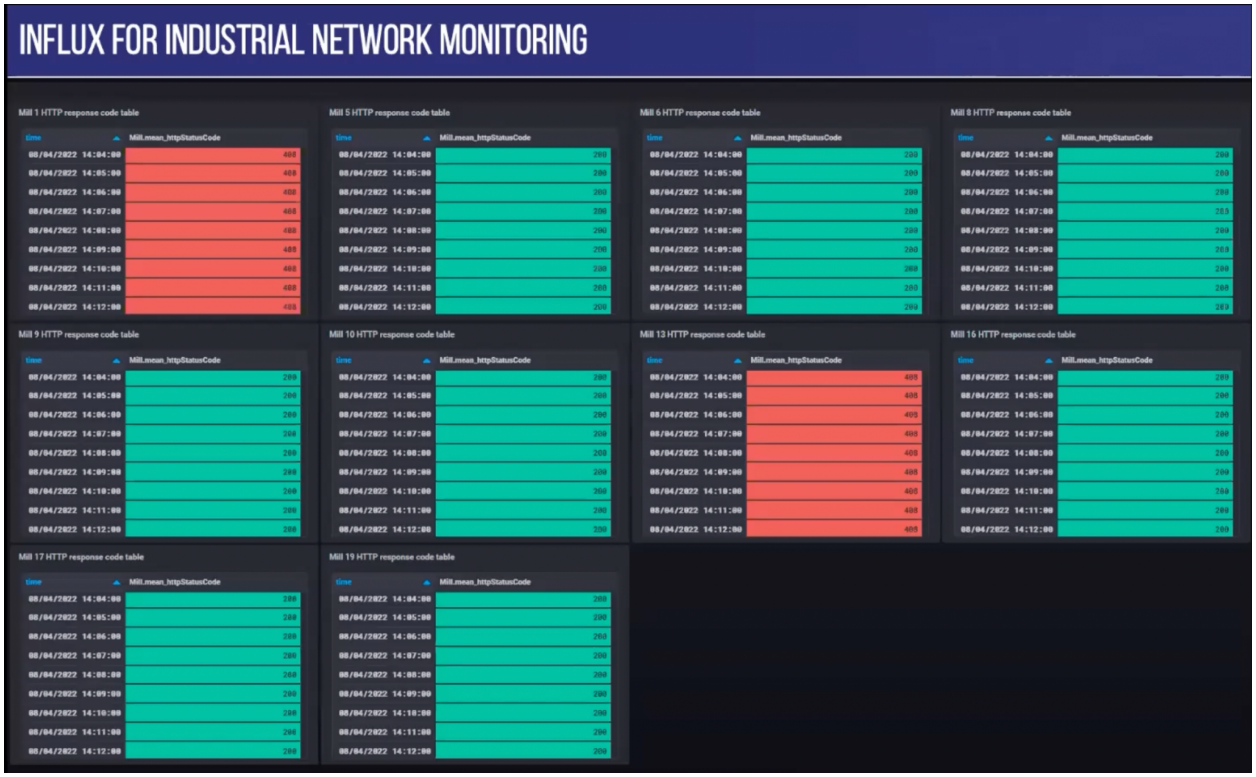
Adding InfluxDB to the MAJiK Systems ecosystem delivered a key component for MAJiK's AI-driven platform that uses contextualized data from IIoT sources to continuously build models around normal operation performance with the goal of optimizing OEE and industrial operations. These tools deliver actionable insights on using today's performance to make the future plans and forecasts, suggest predictive maintenance actions, and identify best practices based on the time series process data. Customers can make a change on the plant floor and have direct insight into how that change affects the bottom line.

The ability to drill into process data provides customers with the new opportunity to shift targets and determine the financial impact of specific optimizations made on the factory floor. Overall, MAJiK customers see a 35 – 45% reduction in downtime and a 7 – 10% reduction in waste.

Monitoring network health

Benefits of time series data aren't bound to machinery alone. Industrial networks are notoriously unstable, largely because of the amount of electromagnetic interference that exists on the plant floor. With InfluxDB added to MAJiK Visual Factory, users can create a custom network monitoring database. InfluxDB takes on the role of monitoring network health by acting as a network monitoring database and uses time series data to monitor device connections. When a data point comes in showing an inactive connection, a series

of alerting protocols are carried out.



MAJiK Systems aims to optimize energy costs by drilling into their customers' energy usage of specific equipment as one of their next projects.

InfluxDB documentation, downloads & guides

Get InfluxDB

Try InfluxDB Cloud for Free

Get documentation

Additional tech papers

Join the InfluxDB community

influxdata®

Try InfluxDB

Get InfluxDB

Contact us for a personalized demo influxdata.com/get-influxdb/