Case Study

WaterBridge Resources Leverages MQTT for Complete Visibility into Operations

WaterBridge Resources, a midstream water management company, recently experienced rapid growth. They quickly realized their SCADA and control systems were not able to reliably handle the changes they needed to make to run their operations at maximum efficiency. They aimed to migrate to an updated IIoT platform for flexibility and visibility into operations.

Project Goals and Challenges

Over a period of growth, WaterBridge Operating had reliability and stability issues with their control and SCADA systems, and the cost was escalating rapidly. Maintaining the system was costing $200k per year with several million dollars in additional loss estimated due to equipment failure. They wanted to move away from a closed proprietary system to a new system based on open and industry-accepted enterprise IIoT technologies that would allow them to achieve more insights into their operational data.

More specifically, WaterBridge needed a way to capture manual data entry in the field in addition to machine data collection and share it with key stakeholders. Some of their sites had panels with remote HMIs where employees entered information about remote operations. WaterBridge needed a simple and automated way to capture this data securely and send it to a central system to be unified with other OT data.

WaterBridge wanted a solution that was scalable, low-maintenance and required little expertise or coding for advanced features. They aimed to provide complete data to key stakeholders to give them visibility into operations to enable better data-driven decisions.

Solution Requirements

WaterBridge required a solution based around a SCADA system to maintain, manage and control OT assets, gather data from them, and provide the data to other systems at a high frequency with optimized bandwidth usage. They needed to improve data resolution and quality with the ability to collect over two thousand tags at one second intervals per facility.

They needed a centralized, enterprise-grade system hosted in the Cloud that would allow them to unify all OT data. They sought a solution that could offer local visualization and control HMI, and mobile-first access to the centralized data visualizations.

Implementation

The customer worked with TIGA as the systems integrater and chose the Ignition SCADA platform as the central control system for its edge computing features and to replace the legacy proprietary field equipment they had used previously. They deployed an enterprise Ignition system within Microsoft Azure Cloud hosted infrastructure and the system was architected with MQTT and Sparkplug B at each facility with redundant Cirrus Link Chariot Brokers. WaterBridge optimized bandwidth usage via Cirrus Link's MQTT Ignition Modules and deployed Cirrus Link's MQTT Recorder module to handle the data that was being entered by remote HMI.

MQTT and Sparkplug B

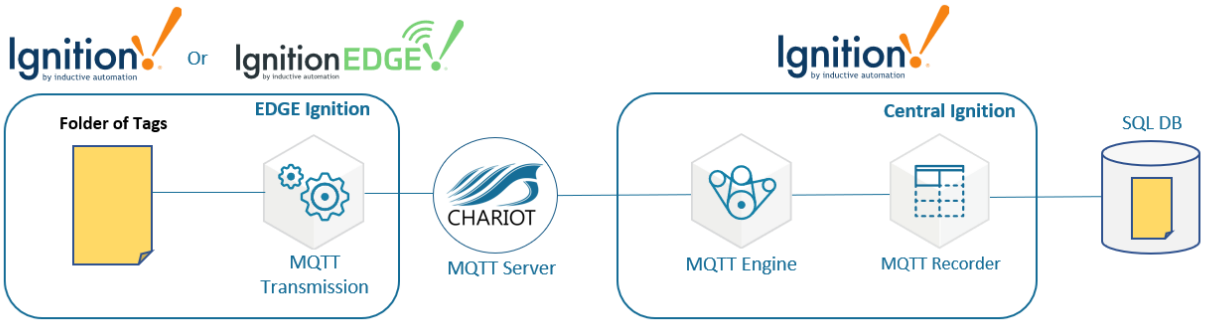
As mentioned, WaterBridge deployed Ignition at each facility with the help of MQTT and Sparkplug B via Cirrus Link's MQTT Ignition Modules. Adding the Cirrus Link MQTT Modules to the Ignition SCADA system platform allowed the customer to move data securely and efficiently from the OT layer upstream to Azure. MQTT (Message Queue Telemetry Transport) is a proven, standard machine-to-machine data transfer protocol that is quickly becoming the leading messaging protocol for Industrial IoT. MQTT was ideal for this use case as a publish/subscribe, extremely simple and lightweight messaging protocol ideal for constrained networks.

Sparkplug B is an open-source software specification that defines how to use MQTT in a mission-critical, real-time environment. The Sparkplug B specification provides the data model needed to define a tag value for use with OT, also providing data to IT, making it 100% self-discoverable and easy to consume.

Cirrus Link MQTT Recorder

One of the primary challenges the customer needed to solve was capturing the manual data being entered through remote HMIs. Historically data

entered via HMI represents a record of information clumsily handled as consecutive blocks of registers which runs the risk of not keeping the data together as a record event. The MQTT Recorder Module publishes those records of data as an immutable record which automatically builds and populates a table within an SQL database.



Setup

- Define Record Configuration in MQTT Transmission
- Arrange Tags in a Folder

Event Flow

- Write True to Boolean Trigger Tag at Edge Ignition
- MQTT Transmission Creates an Atomic Record of tags in folder at Edge
- MQTT Transmission Publishes Atomic Record at the Edge
- MQTT Recorder at Central Ignition receives record, creates SQL table(if does not exist), and inserts data as a row

Results

Ignition Edge is being used for data collection at each of the 100 Saltwater Disposal (SWD) facilities. The system is collecting over two thousand tags at one second intervals per facility through the Ignition and Cirrus Link architecture built on MQTT and Sparkplug B for data transmission.

WaterBridge has realized a substantial increase in data resolution and data quality utilizing the Sparkplug B report by exception and store and forward. The MQTT Recorder Module allows the detailed information they enter via HMI to be published securely as an immutable data object into the central system on the fly with no coding required.

Overall, WaterBridge has been able to maintain control and safety systems at each of their locations while enabling a higher quality of data, better experience for data users, and a manageable and open SCADA system for digital transformation. Operations are more efficient since stakeholders now have access to all the data they need for improved decision making thanks to Ignition, Cirrus Link and MQTT/Sparkplug.

Centralizing the data has helped not only operations but has also enabled a digital transformation. The collection of data is stored in one location and serves over 30 WaterBridge Operating customers with the ability to monitor all aspects of the midstream allocation.