

Case Study

Energy Company Maximizing MQTT for Control and Efficient Image Data Transfer



A multinational energy corporation sought a modern solution to efficiently monitor and collect OT data, including images, at more than 150 pipeline facilities. They needed an OT-first solution to maintain, manage and control their assets along with a way to unify and make OT data available to both operators and cloud systems for company-wide visibility into site and machine behavior.

Project Goals and Challenges

At the highest level the energy corporation was focused on digital transformation to continuously improve efficiency across the company's operations. They aimed to provide the right data to the right people at the right time to enable better decisions from data and remote imagery for better management and process controls.

Specifically, the customer needed to improve the monitoring of their field assets. Legacy SCADA systems couldn't provide the granular asset visibility to achieve the goals they set out. With the remote locations suffering from unreliable networks, they needed to access the latest in IoT technology to overcome bandwidth challenges.

The customer identified various use cases for the new project, including improved maintenance. Pipelines are susceptible to structural failures such as corrosion, cracks, and leakages. The customer hoped to reduce the time required for on-site maintenance by capturing images at each location to gain insight into events or failures. The resulting image data would allow them to improve safety and operational efficiency by cutting man hours and providing alerts to events at pipeline facilities in real-time.

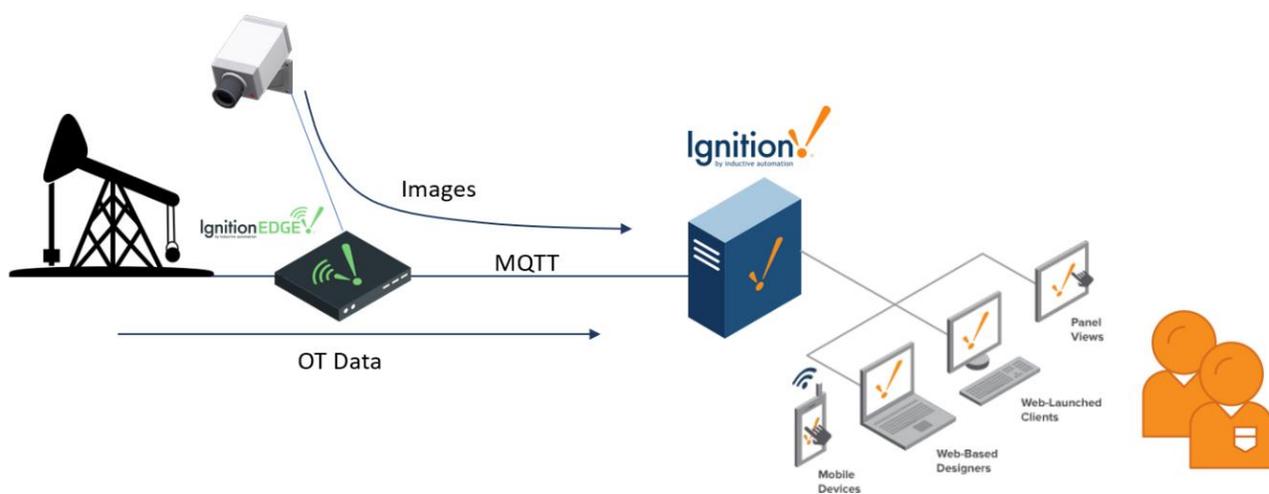
Solution Requirements

The customer required a SCADA system to maintain, manage and control OT assets and gather data from them, providing the data to technicians, cloud systems and applications. They needed a solution that could collect data at remote sites and share it to a central system extremely efficiently to overcome intermittent network and bandwidth issues.

Due to the remote, distributed nature of the pipeline facilities, they also wanted a solution that could be deployed within Azure IoT. The solution also needed to be able to handle image data transfer, packaging images in a small footprint. They needed to be able to deploy and scale the solution quickly and easily across all 150+ pipeline locations.

Implementation

The customer chose the Ignition SCADA platform as the central control system for its high-availability and robust toolset for data acquisition, real-time status and process controls, optimized HMIs, alarms, and analytics. They appreciated the ability to customize the modular solution and powerful visualization tools were also part of the decision. Ignition offered the capability to be deployed as a Dockerized solution within Azure IoT Edge.



Cirrus Link Solutions designed MQTT Modules for Ignition to integrate, or push, data from OT to IT. 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.

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 was ideal for this use case as a publish/subscribe, extremely simple and lightweight messaging protocol ideal for constrained networks. MQTT is designed for intermittent connection with a queuing system baked in and remedies for unexpected disconnects. Due to its pub/sub nature, MQTT can broadcast very efficiently and only sends a message when the value of a signal changes – or report by exception.

Another key feature of the Cirrus Link modules is the ability to provide a file transfer mechanism to send files from the remote assets over the same MQTT channel efficiently. Utilizing this feature, the client installed remote cameras alongside the standard OT data connectivity at all 150+ sites to capture images as needed, with some sites having multiple cameras. MQTT could handle images from on-site cameras up to a rate of 2000 images of 600k file size per minute using the same secure transport method as real-time OT data. The images can be sent at a set time interval or

triggered by an alarm or event to provide crucial information as it happens.

Results

The solution has been extremely successful for the image data transfer use case. MQTT packets and validates the image data using much less bandwidth than would typically be needed to send an image. One to three images are being captured and shared at every site and the customer now has a more accurate picture of what is going on at all the remote facilities.

The solution will lead to operational cost savings for the customer by reducing the need for technicians to visit the site in-person. Previously if an event happened at a site, a technician was automatically dispatched. Now when an event occurs a picture is captured at the same time and the technician can pull out his phone or laptop and see an image from the site in real-time.

One of the operators commented, “This is the first-time new technology has been brought in that will actually help me do my job rather than messing something up.” The solution is very helpful to operators and over time the historical image will also help management determine how the remote facilities are operating and allow them to make changes as needed. As for the future the Customer is looking at using this image delivery solution for “[Custom Vision](#)” from Microsoft Azure for advanced self-learning artificial intelligence to optimize processes and driver further ROI.