Leading Oil & Gas Company Increases Operational Efficiency with Real-time Oil Well Monitoring

At a glance

What do they do?

- Global Oil & Gas exploration and production

Challenges

- Modernizing upstream Oil & Gas operations
- Remote oil wells with limited bandwidth
- Slow data collection every 5 to 10 minutes led to slow issue response time

Solution

- HiveMQ MQTT Platform with enterprise-grade features to monitor remote sites
- MQTT for more efficient data transmission

Results

- Near real-time data collection for immediate maintenance action
- Increased operational efficiency by reducing bandwidth by 90%
- Cost savings for data movement

Remote Monitoring Poses Challenges for the Oil & Gas Industry

A prominent upstream oil and gas exploration and production company faced challenges with near real-time data collection and monitoring of remote oil fields. With operations spanning the United States, Egypt, and the United Kingdom North Sea, the company needed a robust solution to optimize the efficiency of its wells and ensure compliance with government regulations.

Operating in different locations worldwide, the company grapples with the remoteness of its many well sites as secluded areas with bandwidth limitations and unreliable connectivity. The ability to effectively monitor these sites, especially considering the need for continuous on-site human presence, proved difficult. However, to remain compliant with the Environmental Protection Agency (EPA), the company needed a way to effectively monitor the sites to address potential failures promptly.

Key challenges included:

Data collection and monitoring: The vast geographical spread of operations made it difficult to collect near real-time data efficiently.

Remote site connectivity: Many sites were in remote areas where bandwidth is limited and connectivity is unreliable, hindering the ability to respond to issues promptly.

Regulatory compliance: Ensuring compliance with strict regulations such as the EPA requires continuous and reliable monitoring of operations.

Scalability and cost: The legacy communication infrastructure based on Modbus was not scalable, and the cost was increasingly prohibitive.

The existing systems which enabled communication between the remote oil wells to the company's central CygNet SCADA system relied on the Modbus protocol, but the energy leader recognized the need for a more advanced and scalable solution to collect data from oil fields and send it to its SCADA system more frequently while optimizing the limited bandwidth available.

Due to the costs and scalability of its current system, the company only received messages **once every five to 10 minutes**. This critical delay was a big challenge as issues at well sites need immediate attention, and waiting several minutes for information to act could have catastrophic results. The company needed a technology that could handle the diverse communication challenges and scale with the company.

Choosing a Reliable MQTT Platform

After a review of the challenges and available technologies, the oil and gas company identified MQTT as the underlying technology suited to replace Modbus for its use case. MQTT is designed for environments with limited bandwidth, making it ideal for remote monitoring of oil fields. It supports near real-time data transmission and can scale to accommodate an increasing number of sites and data points without significant additional costs.

The team chose the leading enterprise MQTT platform for deployment, HiveMQ. The business-critical nature of compliance meant the company needed high availability. HiveMQ's clustering capabilities ensure uninterrupted operations, even in the face of hardware failures, network issues, or bandwidth issues. HiveMQ could also maintain a continuous data flow and prevent disruptions in critical operations to ensure zero downtime.

The company's IT department approved the HiveMQ Platform due to the following enterprise-grade features that aligned with requirements:

High availability and reliability: HiveMQ's clustering capabilities ensure high availability and reliability, essential for business-critical operations and compliance.

Scalability: HiveMQ can effortlessly scale to meet growing needs and expanding sites.

Security: Given the sensitive nature of the data and compliance requirements, HiveMQ's enterprise-grade security features provide the robust protection needed.

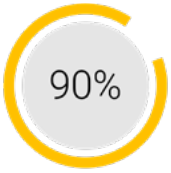
HiveMQ's ability to bring in real-time and quality data to support remote monitoring provided the company with valuable insights into its operations, enabling it to address potential issues proactively and enhance operational efficiency.

HiveMQ's clustering capabilities ensure uninterrupted operations, even in the face of hardware failures, network issues, or bandwidth issues.

Increasing Operational Efficiency with HiveMQ

Transitioning to MQTT with HiveMQ allowed the company to dramatically reduce the time to send data to their SCADA system, moving from a **5 to 10 minute delay to near real-time**. This capability is crucial for immediate issue resolution and optimization of oil well performance. The company monitors metrics on oil wells like pressure levels, vibration rates, and heat rates to aid in efficient maintenance scheduling and ensure efficient operation. These metrics help identify potential issues and allow the company to act immediately.

In addition, by replacing Modbus with the lightweight and efficient MQTT via HiveMQ, the team achieved a 90% improvement in their bandwidth efficiencies, significantly reducing operational costs.



Improvement
in bandwidth efficiencies

The project's initial goals — to optimize well efficiency, comply with regulations, and ensure the timely collection and transmission of data to the central SCADA system — were achieved. As the company continues to collect and act upon its data, it plans to use the data for more advanced use cases including machine learning and predictive maintenance. By enabling real-time data analysis and enhancing operational efficiency, HiveMQ plays an important role in the company's digital transformation, illustrating the power of IIoT solutions in overcoming sector-specific challenges.