Simple, Scalable and Secure Well-Head Monitoring and Control

Temblor Petroleum implements secure cloud-based data sharing solution that provides historical, real-time and trending data analysis for well-site operators.

SUMMARY

Customer requirement: Control and monitor well heads remotely; provide operators with timely access to production data; scale up quickly.

Bedrock/Tyrion Solution: Bedrock® Open Secure Automation platform that controls plant devices and exchanges data securely across the cloud in integration with Tyrion Nucleus IIoT gateway and OPC UA.

Result: Site operates virtually unmanned and operators can enjoy ready access to production data. Integration of Bedrock Open Secure Automation and Tyrion Nucleus cloud gateway saved more than $50,000 over alternative technology and implementation costs.

The efficiency with which petroleum producers monitor and control remote well operations can have a significant impact on profitability. Temblor Petroleum, a California oil and gas company, is deploying a unique cloud-based control and monitoring solution that not only reduces the need for onsite operators but also gives an up-to-date view of site production.

The project involves open and secure control, power management, and engineering software supplied by Bedrock Automation and a cloud-based data-sharing technology and implementation provided by Bakersfield, California systems integration firm Tyrion Integration.
“We were excited about our new field and really wanted to optimize technology to impact our operations, field surveillance and have real-time data. This system has allowed us to achieve that from any location, office or field with access to the internet,” said Temblor President Mike Thorsen.

Meeting these requirements presented Tyrion with both control and communications challenges. On the control end, they had to build an infrastructure that would initially automate operation of two well heads but would also scale to operate more wells in the future. On the communications side, they needed to be able to provide secure access for operators, but to protect profit margins they had to do so using standard technology.

**The control solution**

To meet the control challenges, Tyrion chose Bedrock® Open Secure Automation (OSA®), which has Bedrock’s industry-leading Cybershield technology built-in to all components. The OSA system controls tank levels, pumps, compressors, separators, duct valves and other devices, turning them on and off automatically as production demands. Bedrock® OSA also automates operation of an underground transmission pipeline that delivers product to market, automating throttling of
pressure and gas volume based on various operating conditions, shutting the operation down if the pressure changes to outside the preset setpoints and reopening it when safe operating setpoints are achieved.

The secure Bedrock hardware consists of a compact ten-slot rack containing a high-performance control processor, two analog inputs, two discrete inputs, and universal I/O that can be soft-selected for most mainstream protocols. Powering the system is a standalone secure power supply (SPS) backed by a secure uninterruptible power supply (UPS), which Tyrion found to have an unexpected safety benefit for the electrical maintenance as well.

“Remote PLCs are typically housed in a high voltage – 120 volt – enclosure, which means that only a licensed electrician can access them. But the hardened electromechanical design built into the Bedrock power supplies enabled us to mount them outside of the enclosure and run only 24 volts into the PLC cabinet, enabling operators...
to maintain the PLCs safely,” said Mark Goehring, owner of Tyrion Integration.

Adding other protection to the controls is the fact that all modules are encased in metal enclosures, which are tamper-proof and resistant to weather, corrosive gases, and extreme environmental conditions such as electromagnetic radiation.

**The communications solution**

Tyrion built the communications around the Nucleus communication gateway, a product they developed. Nucleus enables operators to monitor trending, alarming, and analysis in the cloud as often as they want. It receives operating data from the Bedrock OPC UA server via Ethernet and communicates it to a cloud-based infrastructure via cellular and message queuing telemetry transport (MQTT), a publish-subscribe-based messaging protocol that works on top of the TCP/IP protocol to enable transmission of huge amounts of data with minimal packet sizes. Users interact with data via protected browsers on a phone, tablet, or laptop. There are no local HMIs anywhere.

“We browse field operating data through OPC UA and then expose it to the cloud. The Bedrock IEC 61131-compliant Integrated Development Environment (IDE) enables us to take advantage of the advanced encryption and authentication options of OPC UA. We use the secure Bedrock IDE to set data tags to read-only or read-write, controlling access with encryption and authentication handshakes so seamlessly that users don’t even realize that they are engaging in such deep cyber security protection,” said Goehring.

Goehring said also that the ability to use open source code is an advantage. In addition to the fact that the open engineering software comes free with the Bedrock system, they were able to save costs by basing configuration functions from open 61131 libraries.

Real-time gas, oil and water volumes comparable with previous day are accessible on the cloud, any time, and from anywhere.
50-percent cost savings

“Integrating Bedrock Open Secure Automation with our Nucleus cloud reduced hardware and implementation costs by about half over any alternative approach, while also setting Temblor up for continued life cycle cost savings, operational effectiveness, and improved service to clients,” said Goehring. “We could not have done this project as economically and effectively as we have without Bedrock. The need to secure the PLC to cloud communications alone pretty much ruled out any other controls vendor.”

Goehring cited many facets of the integration contributing to such benefits, including the use of pre-engineered universal enclosures, which reduced panel building costs and field wiring; eliminating SCADA development and licensing costs by using a secure browser-based cloud architecture; the free engineering software for unlimited users; and an ability to scale I/O easily and inexpensively.

Scaling up

A Bedrock backplane handles 10 or 20 I/O slots making it very easy to scale from less than ten to thousands of I/O. Also, Tyrion is now considering using Bedrock Automation’s new OSA Remote controller as I/O for the next Temblor expansion. The OSA Remote has all of the security and performance capability of the main Bedrock system, but delivers it in an even smaller footprint, making it easy to expand the domain of control without necessarily adding backplanes.

Going forward, Goehring expects to mirror this control and communications set up, using the scalable and secure design intrinsic to Bedrock.

Now it is all systems go on the first couple wells. The combination of the Bedrock and Tyrion capabilities has set up Temblor to gain maximum ROI and security of their remote operation.