White Paper

Optimizing oilfield communication cabinets with the TropOS 2410

In oil and gas operations, the best lessons are learned in the field. Recently, ABB was on site in south Texas, designing a wireless network for a major oil and gas producer. To explain one of their pain points, the producer's infrastructure manager led an ABB wireless engineer to a communications equipment cabinet installed near a pumpjack. Inside the cabinet was an expensive problem: a jumbled mix of single-purpose communication devices, all manufactured by different vendors. On the cabinet's shelves and DIN rails was a power supply for a backhaul radio, a serial-to-IP protocol converter, an Ethernet switch, a Wi-Fi access point, and a 900 MHz master radio for local instrument communications.

The infrastructure manager said to the ABB engineer: "My problem is that in order to deliver reliable SCADA communications and mobile access to production applications, I need to install this same cabinet at every well pad in the field. It would be great to simplify it, downsize it, and not lose any functionality." The ABB engineer replied, "I get it. Why use five boxes when one will do?" The customer nodded his head and together they drew up the concept, then sent it to ABB Wireless product managers in Silicon Valley.

Challenges

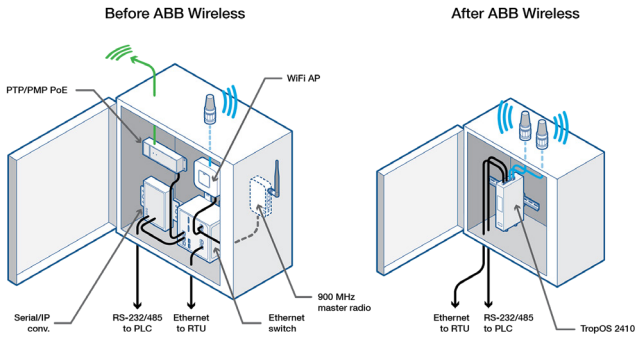
For the field communications cabinet, operators struggle to rationalize installing multiple products from different vendors and having to maintain relationships with each of those vendors. Most of the time, this is out of pure necessity because each product is fit for purpose. In some situations, actually, a multi-vendor solution is truly the best of breed. However, even if a local service company provides field support for all equipment inside the cabinet, they ultimately pass along the cost of maintaining multiple vendor programs to the end user. With multiple vendors comes different software and variations in network management capabilities. Some devices found in the south Texas cabinet supported standard communication protocols with web-based configurations, and others required proprietary software that must be installed on operator PCs. Even if all of the devices' management mechanisms provided all of the functionality desired by the operator, there is still the problem of managing individual devices rather than the entire system. A more reliable, cost-effective solution is a single device capable of all required communication functions, managed together with all other devices, over the air on the same field network. Managing the entire system enables operator visibility into and control over the interactions between devices as well as the devices themselves.

Another issue in the cabinet is cabling. Not only must each of the five devices in the cabinet be powered, they must be connected together with copper wires and various terminators. Cutting cables to the correct length and attaching the appropriate terminators takes time, especially in the field. Multiply one cabinet by 500, and the cost of labor and materials becomes a significant piece of the communications budget. Overall reliability of the multiple box cabinet solution is yet another problem, as cables have been known to fail and equipment with different failure rates will lead to some incompatibility as components get replaced. The more elegant solution is to install a single product that combines the related functions of multiple other products, optimized specifically for well pad applications.

Power consumption is yet another problem in the cabinet. How much power does each component in the cabinet consume, on average, and how much autonomy is required when the sun does not shine and the wind is calm? Together, the various single-purpose communications devices consume enough power to signficantly affect the sizing of the solar panels and batteries used in the system. With fewer devices in the load, the solar power plant for each cabinet can be optimized and cost-saving design changes can be implemented across the field.

The industrial Ethernet switch is an essential cabinet component because most devices at the well pad now expect Ethernet communications. With multiple devices needing connection to the network, an Ethernet switch provides the interfaces, but does it have to be a standalone unit? Could there be hundreds of dollars saved in physical space, power consumption and equipment cost by eliminating the standalone industrial Ethernet switch? Absolutely. The TropOS 2410 features an integrated four-port managed Ethernet switch, allowing operators to connect several devices such as PLCs, flow Computers and video cameras into a common network while maintaining full data separation and security.

Finally, there is the serial-to-IP protocol converter. Vendors are now including standard support for Ethernet communications in their equipment, which drives the need for multiple ports. However, there are still thousands of RTUs, PLCs and meters in the field with interfaces only for serial protocols like Modbus. Assuming these devices are still functioning properly, operators will struggle to justify the cost of a field-wide upgrade to Ethernet-equipped measurement and automation equipment. Instead, the field network should be able to interface with both serial and Ethernet devices, performing protocol conversion without the need for a dedicated box. ABB has designed the TropOS 2410 to help operators simplify the communications cabinet by integrating the essential functions of multiple devices into a single wireless mesh router.



Next level operations

Operators now have the ability to monitor the voltage on the battery system, with status updates transmitted over the wireless network. If daily charging is reduced due to weather, or the battery life is coming to an end, the TropOS 2410 can detect falling voltage according to a user-determined threshold. When that threshold is exceeded, the router sends an alert message to SuprOS, the comprehensive network management system from ABB. Instead of waiting for the equipment to go offline when the battery fails, the operator can proactively replace the battery and maintain maximum equipment uptime at the well pad.

The days of the single purpose field radio system are over, and this is actually great news for upstream companies. As producers begin to realize the economic advantages of integrated operating models and remote visibility to every asset, they are demanding more from their field networks: more bandwidth, more reliability and more flexibility. These demands have driven ABB to develop a modern network architecture that combines radio technologies and maximizes the strengths of multiple frequency bands to strike the elusive balance between cost and performance. A network built according to this architecture allows companies to operate by exception and reduce costs through continuous, data-driven production optimization. With SCADA, HMI, video, work order processing and other mobile applications available throughout the field, the network infrastructure becomes a vital utility for achieving the company's daily production targets. The ability to troubleshoot and resolve issues remotely will greatly increase equipment uptime and maximize the productivity of every operator in the field. Operators can use the network as a force multiplier, enabling them to accomplish more each day with the ability to instantly view the condition of any asset from anywhere in the field.

Advantages:

- Integrated networking functions (mesh backhaul, 802.11, Ethernet switch, serial)
- Voltage monitoring for batteries
- Dry contact for monitoring cabinet open/close
- Low voltage input (7-32 VDC) with two-wire DC leads

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