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Industrial Internet of Things Puts New Pressure on Traditional Control Systems

Drawing from the Industrial Internet of Things, a water utility can tie data from sensors and other equipment into its existing control network to economically combine information into one system. **BY SCOTT DUHAIME**

REBECCA JOHANSEN (name changed by request) has a dilemma. The large municipality she works for has used a human machine interface/supervisory control and data acquisition (HMI/SCADA) system to control water distribution for decades. However, the system is being eyed by other departments that require noncontrol data to manage initiatives such as leak detection, asset maintenance, and equipment efficiency. But like with all municipalities, every dollar spent is scrutinized and security is paramount.

"The business would like to see information made available in a browser, but our chief security officer says the control side can't send anything to the cloud," says Johansen.

She isn't alone. Most cities and towns struggle with trying to solve both sides of the dilemma. At odds are two technology streams—one mature and one emerging. HMI/SCADA has been in vogue since the dawn of personal computers and disk operating systems, providing operators with alarms, messages, and operating conditions.

Such server-based systems collect and acquire process control data to provide automatic or manual control along with networked workstations that provide users with graphical interfaces to interact with the data and information. Because of its nature, HMI/SCADA tends to be deployed on several redundant servers to support high availability behind a series of firewalls in a secure and separate network, with many highly secure workstations made available only to the operators who must respond to critical alarms and events.

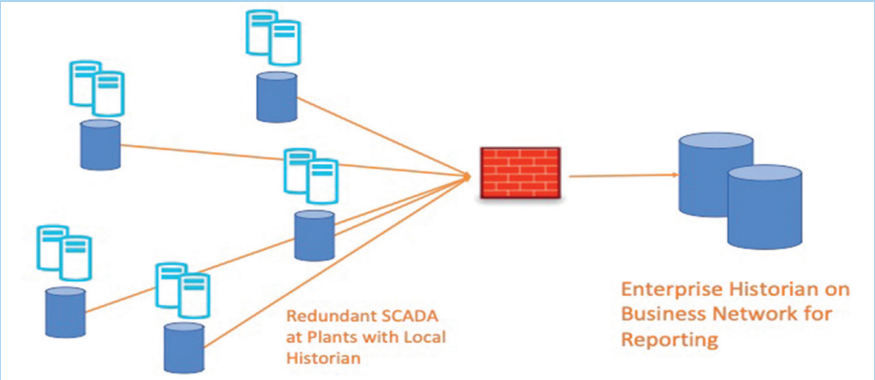
But an emerging concept is the Industrial Internet of Things (IIoT), a network of internet-connected sensors, instruments, and other industrial equipment that provides myriad data that aren't necessarily required for control but for information. IIoT solutions in a municipal water system could yield information about things such as production data, turbidity and chlorine levels, spills, metering and flow, leak detection, energy management, public dashboards, regulatory compliance, river level analysis, and more.

Marrying the two types of networks can be problematic because of security, according to Mark Fusick, a manufacturer's representative with CB Engineering in the Pacific Northwest.

"You have to crawl before you can run," he says. "You have to build a base, and OPC Unified Architecture [OPC UA] represents the foundation to build on."

Common Deployment Scenario

OPC UA servers facilitate efficient HMI/SCADA and IIoT management.



HMI/SCADA and IIoT integration delivers faster insights for operators and other data users. The key is to deliver those insights in a secure system.

PHOTOGRAPH: ZSTOCK, STOCK.ADOBE.COM, FIGURE: GE DIGITAL

A STANDARD FOR THE FUTURE

OPC UA is an open standard machine communication protocol developed by OPC Foundation (www.opcfoundation.org) that is helping water utilities remove barriers between the two systems in several ways, including relatively easy configuration; operating system independence; support for data, alarms, and events; and a robust security model that requires trust between client and server through digital certificate exchange, which is critical for the client/server architecture inherent in SCADA. Part of the problem with integrating the two types of networks is the sheer volume of data required for IIoT-type applications.

"The SCADA system only brings about 10 percent of the data required for IIoT to the operations team," says Johansen. "Operators are only concerned about the data required to operate the system in real time."

With more departments asking for operational data, applications requiring 10 times the data needed to operate a plant, and nearly prohibitive costs to implement acceptable security measures in a proprietary SCADA control network, the pressure is on SCADA vendors to assist their customers.

Writes Eric Bindler, digital water research director at Bluefield Research, "The SCADA software market is a key gateway into higher-value IIoT software sales for industrial majors in the fragmented, low-tech US municipal water industry."

According to Bindler, US water and wastewater utilities have budgeted roughly $2.6 billion in capital expenditures (CapEx) on automation and control hardware and software over the next decade, a figure that represents approximately 16 percent of the total projected CapEx budget for IT/hardware.

SYSTEM INTEGRATION

How can water utilities bridge the gap between the two needs? One way is to push all equipment data into a historian across a "demilitarized zone" to a separate secure business network for reporting and analytics. Another way is to standardize an approach to collect and share data in an open and secure way, and OPC UA offers a potential solution.

"OPC UA becomes critical to SCADA," says Aaron Knight of GrayMatter Systems, a North American–based software representative in the SCADA market. He cites a Canadian municipality putting in flow meters with no need for control; it just collects data.

"IIoT means no control," relates Knight. "It's forcing us to be more creative in deploying a less-expensive SCADA-type network. OPC UA is critical in moving away from proprietary systems into a highly secure, easy-to-configure open standard."

Greg Hazel of TMMI, a manufacturer's representative in Colorado, agrees. "IIoT means connecting SCADA to third-party and cloud-based applications like energy management, alarm analysis, and customer-facing dashboards," he says. "OPC UA is critical to success."

Meanwhile, the pressure on municipalities to deliver IIoT information with low-cost, highly secure solutions will continue to increase. According to Johansen, she thinks about the need to monitor her utility's ultraviolet disinfection beds with hundreds of lamps each or about the pumps she has to manage across thousands of miles of pipes and nearly 100 pump stations. If she can find ways to install inexpensive yet secure data collection devices and leverage what's already installed instead of building new networks, it will help the city keep costs down and reduce water loss.