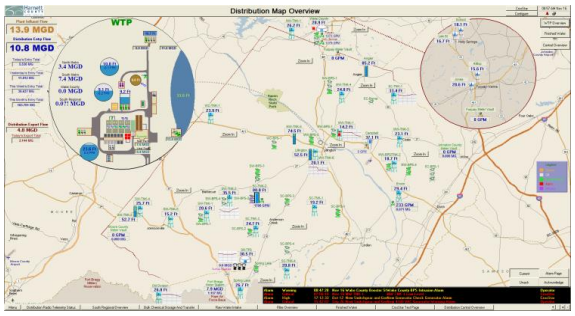
VTScada
Software for Monitoring & Control

Good SCADA Makes Good Neighbors

NC utility monitors their own remote sites and those of utilities that buy their water; including Fort Bragg.

By Bryan Byrd, Devin Carroll, David Riemenschneider and Christopher Little



Display for a water treatment plant and remote monitoring sites

In addition to serving its own 75,000 residents, the Harnett County Department of Public Utilities provides water and wastewater treatment services to seven nearby utilities. In 2009, they partnered with the Fayetteville Public Works Commission to provide water service for the Fort Bragg Military Base. Harnett will also treat Fort Bragg's wastewater when the base retires its onsite facilities. In 2009, the utility commissioned integrator Custom Controls Unlimited (CCU) to develop a new Supervisory Control and Data Acquisition (SCADA) system to help meet the challenge of monitoring and controlling their diverse and widely-distributed infrastructure. In this article, Bryan Byrd of Harnett County and integrators Devin Carroll and David Riemenschneider of CCU describe how they used VTScada Human Machine Interface (HMI) software to create an intuitive system that could encompass Harnett County's existing water treatment and distribution infrastructure while allowing them to share information more easily with their internal and external customers. Harnett County also commissioned CCU to create a wastewater SCADA system to be described in a future article.

Harnett County Department of Public Utilities, NC

Based in the Town of Lillington, North Carolina; the Harnett County Department of Public Utilities operates a water distribution system made up of Harnett County Regional Water Treatment Plant as well as 36 remote monitoring and control sites. These sites include water towers, pumping stations, underground valves and flow rate meters.

Serving External Water and Wastewater Customers

Senior SCADA tech Bryan Byrd has worked with Harnett County for over nine years. "We have data coming in from other entities that partner with us or buy our water," says Byrd. "Some of them are across county lines." The county currently sells water to the cities of Lillington, Fuquay-Varina, Holly Springs, Spring Lake as well as Johnston and Moore Counties and Campbell University. In 2010, Harnett County and the Fayetteville Public Works Commission completed a shared infrastructure project that allows them to jointly provide wholesale water to the nearby Fort Bragg Military Reservation. For this reason, Harnett maintains many of its own monitoring and control devices at customer sites outside the county. "Generally, we do not rely on anyone else's equipment because if we did it would be out of our control to maintain."

A New SCADA System

To better monitor and control this dispersed infrastructure, the utility contracted Raleigh-based integrator Custom Controls Unlimited to design and install a new SCADA application for their water treatment and distribution system. CCU vice-president Devin Carroll led the integration team. "The County deserves allot of credit for the development of this system," says Carroll. "Their administration and managers had the vision to implement a state of the art system and allow their staff, including plant operators and SCADA techs, to have input into the design. Many of the front end graphics and controls were built onsite with the staff's input. From an integrator's position, this 'design onsite' method often takes longer and usually costs more up front. However, you end up with a better system when it is designed, in part, by those who are going to use it every day."

The rest of the team included project engineer Kevin Monk, control systems engineer Nate Powell and SCADA integrator David Riemenschneider. With the help of Harnett County staff, the team completed the new water system in the fall of 2010. "We took about two months for the initial equipment installation and HMI development," says Riemenschneider. "It took another three to integrate the remote water telemetry system, create the graphic screens, build reports and fine tune the process." Supervisory control and data acquisition (SCADA) systems typically include three primary components: remote monitoring and control devices, human machine interface (HMI) software to allow users to view process data and perform system control and finally a communication network to connect the two.

Monitoring & Control Equipment

One challenge for the new system was the diverse range of monitoring and control devices being used. "We have some really old stuff out there," says Byrd. "There are eleven Remote Telemetry Units (RTUs) at the treatment plant itself which monitor and control pumps, valves and instrumentation." The system also monitors process control hardware such as the clarifier and filter control panels (Allen-Bradley CompactLogix and SLC-500), Calgon Carbon Ultraviolet Disinfection System Control Panels (Allen-Bradley Contrologix), Cummins Generator & Switch Gear (Modicon) and the Polymer Preparation System (Allen-Bradley SLC-5/04). "We are still running thirty-six remote sites with Healy Ruff 015 and 023 RTUs," says Byrd. "Some of those devices were made in the 1980s. At the same time, side by side, we're running Allen-Bradley and Automation Direct Programmable Logic Controllers (PLCs). [For the new system] we ended up putting in all Allen-Bradley RTUs because some of the equipment already had Allen-Bradley. We used Allen-Bradley CompactLogix throughout."

Multiple Communication Networks

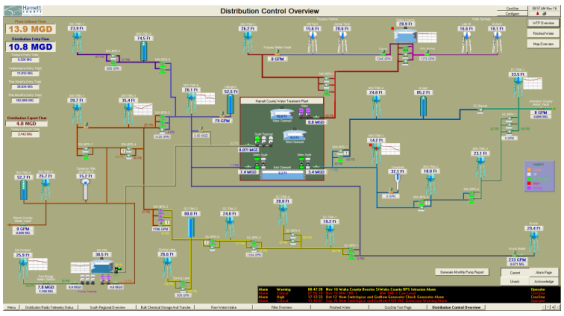
"We use multiple paths to get data back to display and allow us to perform control," says Byrd. "We are doing a lot of controls. Our water system is all about controls. We are using a fiber network at the water treatment plant. It runs on one port via a fiber switch. I love the speed and reliability that fiber gives us. I never have to worry about whether we are having problems with atmosphere or if it's stormy or if the foliage grows too high or any of the other things you have to deal with a wireless network." Due to the large area being covered, fiber was not practical for the whole system. "Outside of the plants we needed to use wireless radios," says Byrd. "We have five watt licensed frequencies as well as spread spectrum radios. We are using a little bit of everything." The new water SCADA system would need to accommodate this.

Harnett County, NC

VTScada
Software for Monitoring & Control

VTScada HMI Software from Trihedral

HMI software applications are responsible for logging process data and providing operators with an interface to remotely control equipment such as pumps, motors, gates and valves. For this project the HMI product needed to be able to communicate with all of the county's different brands of PLCs and RTUs over fiber and radio communication networks. Devin Carroll selected VTScada software from Trihedral. "Devin was familiar with VTScada and liked it," says Byrd. "We started using it for the water system. Then we started using it everywhere. It already included everything that we needed." VTScada is also being used by nearby municipalities including Pittsboro, Fuquay-Varina, Selma, Smithfield and Pinehurst; many of whom purchase water from Harnett County. Their partner Fayetteville Public Works also uses the software.



Overview with Fort Bragg Meter Station and Old Division Tank

Integrated Device Driver Library

VTScada includes a large library of direct drivers that allow it to communicate with all commonly used monitoring and control devices. "We haven't had any issues with [VTScada's] drivers," says Byrd. "They work with about anything we need them to. It also supports multiple forms of communication. It's just got so many things it can do."

Built-in Trending and Reporting

"The trending and reports we have now are marvelous," says Byrd. "They tell us what we need to know on a day-to-day and month-to-month basis. It just does everything. VTScada has 'pump discrepancy' reports that tell us if there is anything wrong at any of our remote stations. We also use the long run times to figure out when we need to pull a pump to see if its impellers are worn. We are using this more and more to help decide where we need to work. We use it as a troubleshooting and a preventative maintenance tool." In some cases, reports are delivered directly to Byrd's inbox. "Every day, VTScada emails us a daily flow summary report. This consists of raw water and plant influent flow values as well as distribution entry flow and distribution export flow values. We are also hopping to have a weekly pump runtime report very soon."

Sharing Data with Partners and Customers

Most of their municipal water customers draw process data directly from Harnett's RTUs. "We share with them analog and digital data," says Byrd. "They take it and use it however they like." Riemenschneider designed many of the reports for the new system. "If a whole-sale water customer requests information on water flow totals, demand peaks, or other collected datum, they can generate reports using the VTScada report generator and send them as Excel workbooks or printed reports." In some cases the new water system shares information with the new wastewater SCADA system. "We have several different communication networks," says Carroll. "From some locations, it made more sense to bring back water parameters over the wastewater radio network. Then, once we had the information in the wastewater VTScada application we could port it to the water application over the wide area network using the Modbus protocol."

Redundancy

Since so many are depending on this information, uptime is critical. "We can't get by very long at all without this system," says Byrd. "That's why we have a hot standby [server] running right now. Thank goodness we don't get to use it much. Our system is so large that we can't afford not to invest in primary and secondary servers. We also duplicated our master telemetry units so that we can have another unit up and running right away." In addition to supporting an unlimited number of redundant servers, VTScada also supports redundant Internet servers and communication links.

Fort Bragg

Harnett County maintains monitoring and control devices at two sites within the Fort Bragg Military Reservation.

- The Fort Bragg Meter Station is located at the base's Wastewater Treatment Plant. This RTU monitors the combined water flow to the base from Harnett County and Fayetteville. In addition, it logs system pressure, pH, water temperature Monochloramine, Chlorine and Ammonia levels. Both Fayetteville and Fort Bragg draw information directly from this RTU.
- The Old Division Tank is found near the middle of the base. In addition to returning the tank's level, this is the main control tank for the Pump Control Automation. It also acts as a data portal for the interface between Harnett County, Fayetteville and the base. Harnett County, Fayetteville and Fort Bragg all have radio telemetry remotes at this location. They are interconnected to share information between the three different SCADA systems including tank levels, pump run status, flow values.

Technical Support

Harnett County relies on CCU for ongoing support and system expansion. "We have been very pleased with the support we get," says Byrd. "I have never asked them for something that I haven't received." On occasion, Byrd receives software support directly from VTScada developer Trihedral. "I was on the phone with Doug Spurrell while he helped us troubleshoot a problem that had really locked up our system. He stayed on the line for six hours. He tried everything he could to help us resolve the problem."

Conclusion

"I am most proud of the reliability of this system," says Byrd. "We are so dependent on it. I don't have enough personnel to go around and do what it does. Now, it is the least of my worries. I can focus on other things without having to worry about managing the system." Harnett County and CCU are currently working on a parallel VTScada-based application for the wastewater system which is scheduled for completion in 2012.

Images used with the kind permission of Harnett County Department of Public Utilities. VTScada is a trademark of Trihedral Engineering Limited