The Sage Advisor

SCADA, SECURITY & AUTOMATION NEWSLETTER

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A Publication of Sage Designs, Inc.

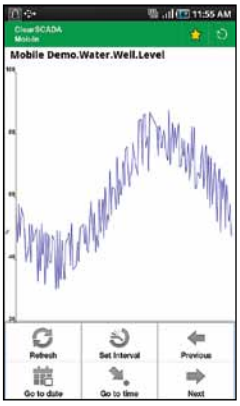
ClearSCADA Goes Mobile!

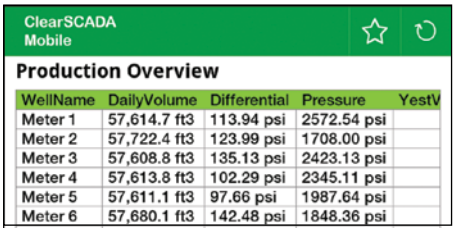
Schneider Electric TRSS is proud to announce, that with the release of StruxureWare SCADA Expert ClearSCADA 2013, we offer ClearSCADA Mobile, an integrated mobile interface focused on operational efficiency of field services.

ClearSCADA Mobile is an extension module to ClearSCADA that provides real-time data and monitoring capability straight to field operation and maintenance teams' mobile device, helping them make quick decisions and be more productive. With support for alarms and alarm management, event lists, database browsing, user favorites, custom queries for reporting and KPIs, historic trends and point controls, ClearSCADA Mobile provides opportunities to quickly assess and resolve alarms providing the convenience of system operation without the need to turn on your laptop.

Enhanced Security and Efficiency

Communication to the phone utilizes SSL to enable appropriate encryption on transmitted data. Security is implemented requiring device registration and application level security via the use of a user pin-code. As the system has been designed from the ground up as a mobile platform, display and data retrieval is achieved in seconds, even for complicated trends or large event journal queries.





Custom Queries

Users can get access to tabular data, providing easy analysis and comparison. Overall system KPIs for management, production summaries, system water flows, reservoir levels, etc. can all be easily added and made available to users.

Workflow Assistance

Users are notified of new alarm conditions relevant to their area of responsibility, and can action those alarms using the built-in alarm and event lists. The database browser provides detailed status information related to any database object to allow for more in-depth system performance. Trends provide users with the ability to review historic data to make the right operational decisions for the future and user favorites allow users to store commonly used views on their phone for easy retrieval.

Mobile Displays

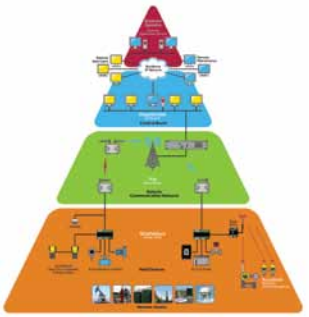
ClearSCADA Mobile also provides summary data displays for "at a glance" understanding of system performance and operation, bringing together important information from a single site, or even presenting summary information from multiple sites. These displays can also provide navigation to other features within ClearSCADA Mobile for a specific object within the database (e.g. trend display, event list for a group, or another mobile display).

Try It Out Today

Download the AndroidTM client from the Google Play Store and access our online ClearSCADA Mobile Demonstration System today; see more details here: http://tinyurl.com/azsej3b. We're also working on an iOS client for iPhone and iPad which should be available within the Apple Store soon!

Schneider Electric TRSS Update

In January 2013, Control Microsystems made their full transition to Schneider Electric. Sage Designs is still the California/Western Nevada region representative for this product line, which can be now be found under Schneider Electric's Industry Business | Telemetry & Remote SCADA Systems division. Look for the TRSS "triangle" under the products section of the www.Schneider-Electric.com Global site. There are still some website updates in progress which will fully integrate the products into the US & other geographically-based Schneider Electric websites. The US Training Class schedules are currently found by visiting the Schneider Electric Customer Learning Center at http://www.schneider-electric.us/sites/us/en/training/training.page. California & Nevada classes can also be found on the Training & Events pages at www.sagedesignsinc.com & www.scadawise.com sites.



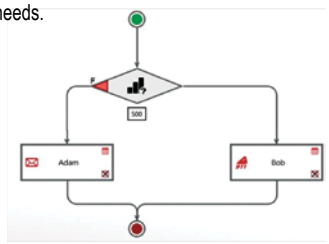
The Next Gen WIN-911®

WIN-911 Version 8 represents a total rethinking of WIN-911 designed for tomorrow's technologies. The new modern codebase is built upon Microsoft's latest version of the .NET platform. This architecture insures that the next generation product will have unprecedented reliability, security, flexibility, and performance. WIN-911 Version 8 will allow users to create or make configuration changes at runtime using powerful new escalation tools called Strategies and Tactics. WIN-911 Version 8 will store project information in the database of their choice.

In addition, WIN-911 Version 8 will utilize Windows Communication Foundation (WCF) for inter-module communications allowing the WIN-911 system to be self-organizing, distributable and redundant with no user configuration required.

WIN-911 Version 8 will offer many other features and enhancements including robust voice, rich text email and support for Mobile-911 along with scheduled reports and much more.

For more information about this unique way of delivering critical information about your process watch our website www.specterinstruments.com. Please contact Sage Designs for more information regarding the WIN-911 software that will meet your needs.



Inside This Issue

Cucamonga SCADA Upgrade

With a mission of *providing high quality, safe and reliable water and wastewater service, while practicing good stewardship of natural and financial resources,* the Cucamonga Valley Water District (CVWD) is constantly looking to improve service to our customers. Together with Sage Designs Inc., FireTide Radios, Southern California Edison, Honeywell Utility Solutions, and EnerNOC, CVWD recently completed a communications upgrade consisting of 76 Programmable Logic Controllers (PLCs), 51 radios, 71 antennas, and 6 permanent towers. This upgrade provided a high performance communication infrastructure enabling the District to participate in automated Demand Response, as well as provide the foundation for scalable future upgrades.

Background

CVWD serves a population of over 185,000 customers, consisting of 49,000 water connections within a 47 square mile area. With an average demand of 50 MGD, CVWD operates 20 pump stations, 64 booster pumps, 29 wells, and three potable water treatment plants. This operated equipment results in 56 electrical service accounts, with an annual cost of $5,250,000 from 42,947942 KWh annually.

In order to offset annual electrical costs, CVWD initially enrolled five sites into a Demand Response program, allowing operator-initiated electrical service interruptions during peak electrical demands. With sound past experience in demand response, CVWD partnered with Sage Designs Inc., FireTide Radios, Southern California Edison, Honeywell Utility Solutions, and EnerNOC to create a migration path toward Automated Demand Response (ADR). This path included the enrollment of 22 additional electrical service accounts, PLC hardware upgrades, and a wireless radio network upgrade.

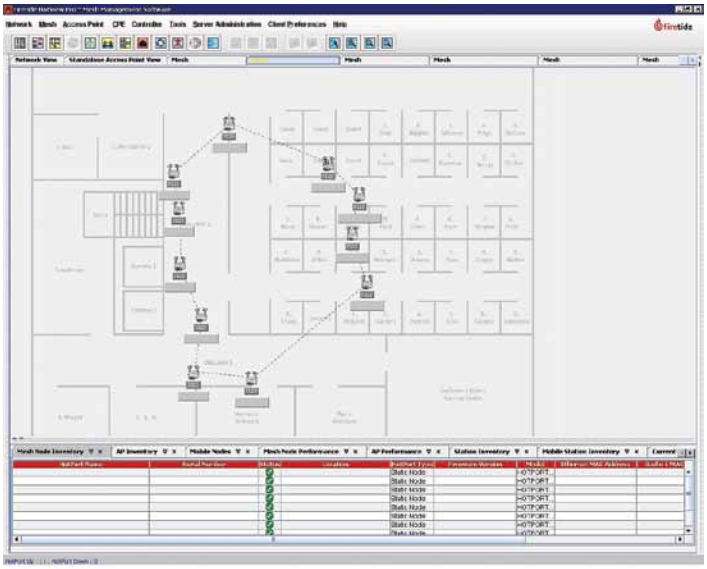
Automated demand response consists of the following steps:

- Receipt of event notification
- Stage necessary ADR set point changes
- Event trigger
- Transmission of ADR set points
- Equipment shutdown
- Completion of event - equipment startup

Project

The purpose of the project was to create an infrastructure capable of transmitting a signal from a central location to a distribution system, allowing for an automatic shutdown of field equipment along with status confirmation and KWh values from the electrical accounts. The goal was to replace an existing 900 MHz Spread Spectrum Frequency Hopping radio network with an upgraded 900 MHz solution. The existing network could be characterized as a self-healing mesh with low throughput.

Initially, CVWD was offered several radio solutions to conduct field tests. The FireTide solution, chosen by CVWD, was by far the most intuitive, highest performing, most scalable and versatile solution available.



FireTide offers an extremely intuitive interface, allowing the user to configure and manage networks. The Graphical User Interface (GUI) is scalable to all of the radios used by CVWD. Licensing, security, and configurations are loaded to each individual radio via the GUI. Tools including spectrum analyzers, antenna alignment, and iPerf are built into the individual radios. Initially a spectrum analysis was completed to determine channel saturation/availability with the use of a third party spectrum analyzer. Once the permanent FireTide equipment was installed, another round of spectrum analysis was completed which gave precise values of saturation/availability with the specific equipment used. This second round of analysis offered a larger amount of channel selection.

CVWD decided to install radios and antennas and enable radio options to meet the needs of today with the ability to expand radio options to meet the needs of tomorrow. FireTide radios have the ability of running in a Multiple Input Multiple Output (MIMO) mode, which allows wireless throughput to exceed 100Mbs, or to run non MIMO with a consistent throughput of over 10 Mbs. The difference between MIMO and non MIMO is simply a license key to unlock the ability of the radio, and a replacement of the antenna horn. The mesh technology allows for radio paths to be either specifically determined or automatically routed via the radio network. Another feature allowing optimal performance are the dual processors. Unlike other radios, FireTide incorporates dual processors to limit the overhead of security. One processor handles the communications while the other handles security and encryption.

FireTide radios are versatile, able to go where other radios were not. The choice was to use an outdoor radio in order to use a shorter cable from the radio to antenna. The specification of the radio allows for the radio to mount in any location where power is present. The radio also acts as a switch allowing multiple device connectivity. However, the most relevant characteristic of the radio is the ability to run frequencies in the 902-928 MHz, 2.4 GHz, 4.9 GHz, and 5.4 – 5.8 GHz spectrum. This alone, excluding the GUI, security, and performance, would have set the FireTide radio above its competitors for this project.

Result

After the completion of the ADR project, CVWD was granted $462,300 from Southern California Edison to produce a system able to shed electrical load automatically. This amount covered the purchase of all necessary hardware (excluding six towers) to produce a system capable of much more than Automated Demand Response. All design, engineering, installation, commissioning, and maintenance was done inhouse, consisting of 1,860 man-hours.

— CVWD Production and Controls Team, Cucamonga Valley Water District

SAGE DESIGNS, INC.
SCADA & Security Products

Earn Contact Hours

Schneider Electric

SCADAWise™ Training Classes

ClearSCADA

SCADAPack

ClearSCADA Level 1 Training Course

May 6-9, 2013 — Mill Valley, CA
Aug 19-21, 2013 — Reno, NV
Nov 4-7, 2013 — Mill Valley, CA

Day 1 (8AM– 4PM)	Installing ClearSCADA, Introduction to ClearSCADA, Components, Using ViewX, Using WebX, ClearSCADA Help
Day 2 (8AM - 4PM)	Configuring using ViewX, Database Organization, Basic Telemetry Configuration, Creating Mimics, Creating Trends
Day 3 (8AM - 4PM)	Configuring using ViewX, Templates & Instances, Logic Languages, Security, Communications Diagnostics
Day 4 (8AM - 4PM)	Reports, System Configuration, System Architecture, Questions

Cost: ClearSCADA Training Course $2,200

This course has been certified by the California Department of Public Health as courses qualifying for contact hour credit for Water Operator Certification for Drinking Water Treatment or Distribution in the State of CA.

(28 Contact Hours)

Telepace Studio Training Course

April 30 - May 2, 2013 — Mill Valley, CA
Sept 16-19, 2013 — Reno, NV
Oct 29-31, 2013 — Mill Valley, CA

Day 1 (8AM - 4PM)	SCADAPack controller operation, Series 5000 I/O, Telepace Studio introduction
Day 2 (8AM - 4PM)	Telepace Studio advanced programming techniques and advanced functions
Day 3 (8AM - 2PM)	Controller communications, Modbus Master/Slave protocol, Diagnostics, Modems

Cost: SCADAPack Telepace Studio Course $1,650*

* You must have a licensed copy of Telepace Studio installed on your computer for this course. Course price for Telepace Studio: $510 + applicable CA sales taxes

This course has been certified by the California Department of Public Health as courses qualifying for contact hour credit for Water Operator Certification for Drinking Water Treatment or Distribution in the State of CA.

(20 Contact Hours)

ClearSCADA Level 2 Training Course

Fall 2013 - TBA

Day 1 (8AM– 4PM)	Installation, Understanding the Architecture of ClearSCADA, Application Design Considerations, Server Automation Interface, ClearSCADA Logic Engine, Using ODBC and SQL with ClearSCADA
Day 2 (8AM - 4PM)	Advanced Mimic Design and Techniques, Data Grids and Data Tables.
Day 3 (8AM - 1PM)	Accessing Historical Data, Ad Hoc trends, Archiving

Prerequisite: ClearSCADA Level 1 Training Course

Cost: ClearSCADA Level 2 Training Course $1,650

Instructor: Schneider Electric Telemetry & Remote SCADA Solutions factory trainer.
On-line Registration: https://www.clearscada.com/forms/training/advanced-training-registration/

Instructors: ClearSCADA Level 1 & Telepace classes will be taught by Tony Sannellla, Sage Designs, a Factory-Certified Instructor. The ClearSCADA Level 2 class will be taught by a SEUSA training instruction. The ClearSCADA Test drives will be conducted by Sage Designs or a factory representative.

Location: See individual course registration form. Those requiring overnight accommodations should call the hotel directly for reservations.

What should I bring? Laptop computer with minimum requirements as shown on the specific course registration forms, plus necessary permissions to install software on your computer.

***You must have a licensed copy of Telepace Studio to take the Telepace course. We offer a course price for a license or you may purchase through your local Schneider Electric TRSS representative.**

What is provided? Course manual, daily continental breakfast, lunch & beverages.

Schedule Your Own

ClearSCADA Test Drive

Free Hands-On Test Drive
Call to Schedule a Test Drive
Call 1-888-ASK-SAGE
email: info@sagedesignsinc.com

SAGE DESIGNS, INC.
SCADA & Security Products

Download the Registration form at: http://www.sagedesignsinc.com/events/index.htm

*** * * Registration Deadline: 3 weeks before 1st day of course * * ***

All registrations are subject to cancellation fees. A confirmation notice will be sent to all registrants on or before the deadline date.

SCADA Expert ClearSCADA 2013 R1 – What's New

Remote SCADA Software Enhancement

SCADA Expert ClearSCADA software platform, now part of the StruxureWare software applications and suites, has recently incorporated new features and product enhancements to more efficiently manage and optimise the operation of plant and remote assets.

Improved Mimic Drawing Performance

The re-drawing times on mimics containing lines and polylines has been markedly improved (>75%) for ease of use and enriched operation.

Enhanced Historian Scalability

SCADA Expert ClearSCADA 2013 R1 provides significant reductions in start-up time for historic data and the event journal (97% and 94% reductions respectively). Records using 8 TB of storage space will now start up in under 16 minutes. There is also reduced memory required by the historian when storing data online for long periods with improvements over previous revision of up to 90%. Together these improvements considerably increase the scalability and sustainability of the historian allowing much more historic data to be kept online for longer periods.

Wastewater Starter Application Project

This new example project will provide a foundation for the development of real-world wastewater lift stations. The example leverages the close integration of SCADAPack E RTUs and other Schneider Electric equipment like Altivar VSDs and PowerLogic energy meters.

User-friendly Trending

When a trace is selected on a trend it is no longer difficult to determine which Y-Axis relates to which trace, for attributes relating to the trace become clearly visible. In addition, trends are now highly configurable and many visual attributes can have a specific colour defined by the user.

ClearSCADA Mobile

ClearSCADA Mobile is an Android™ based mobile client and server system for SCADA Expert ClearSCADA. It brings mobility to SCADA operations, allowing technical staff and managers alike to obtain real-time information on the performance of the system, even while working in remote locations.

Updated Symbol Library

The SCADA Expert ClearSCADA symbol library has been updated to include 51 new symbols for the Telemetry & Remote SCADA Solutions (TRSS) range of products.

Integrated Database Backup

The new database Backup object enables users to perform backups of the database automatically using a scheduler. While the backup is in progress, the database will continue to operate; processing values, storing updates in memory and synchronizing updates to the standby.

BENEFITS AT A GLANCE

- Improved operational efficiency through increased system performance
- Improved engineering efficiency through simplicity and productivity
- Real-time operational data
- Tailored trending display aesthetics for greater ease-of-use
- Strategic enhancements to drive value in oil & gas and water & wastewater applications

ADDITIONAL ENHANCEMENTS

- Take advantage of improvements in operating system technologies with the addition of support for Microsoft Windows 8 and Server 2012
- Improved automatic trace colour selection
- Dynacard data export capability allows further data analysis by third party productivity tools such as XSPOC software
- New practical design guide providing 'best practice' guidelines for SCADA Expert ClearSCADA deployments

Telemetry & Remote SCADA Solutions

Schneider Electric

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DNP in Wind Turbine Generator Application

Funding a wind turbine project depends on government subsidies and incentives offered by the local utility provider. In the state of Nevada, NV Energy's WindGenerations program requires that the power curve be certified to the IEC standard (61400-12). The incentives paid are directly proportional to the power produced at a wind speed of 11 meters per second. The underlying requirement for the IEC certification is the collection of data be at 1 Hz or greater. That is, data sampling at once per second or faster. But how do you achieve this when you have an existing PLC control package that was designed to control the wind turbine start-up and synchronization, not to emphasize the "DA" in "SCADA?"

Hearing the echo of Tony Sannella's voice, touting the virtues of time stamping data in the controller with DNP3, it was a pretty easy decision to build a weather station around a SCADAPack and ClearSCADA. With that in mind, we developed our own weather station using calibrated transmitters for wind speed, wind direction, relative humidity, temperature and pressure. Putting the weather station together and setting up the controller to scale and report the data was the easy part. The challenge was putting the weather station at wind turbine hub height, which happens to be 100 feet in the air. Most instrumentation projects don't require a crane and it took almost as long to get the crane to the Reese River Valley, near Austin, Nevada, as it did to set the tower and guy lines. All in all, the weather station has performed flawlessly.

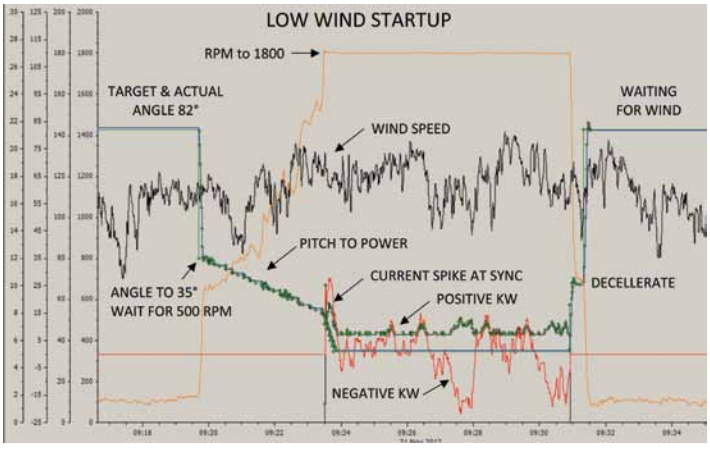
With ClearSCADA running on a laptop - hidden in the turbine control cabinet - and a direct Ethernet link to the SCADAPack 330 and 5506 card, how fast was the Data Acquisition? There were many instances where the wind speed changed by 0.1 miles per hour, 10 times in one second. In fact, the controller was initially set up with ladder logic to only take data once per second. That is, Telepace has a program block to Generate DNP Event. Ultimately, the programming was abandoned in favor of letting the system take its natural course on data scanning throughput with 10X performance.

Once the data was in ClearSCADA, it was imperative that it be downloaded from the database for the IEC method of "Bins." The standard requires that the data be grouped in 1 minute long data sets with Min, Max, Mean and Standard Deviation. Then, the data was to be grouped into 10 minute data blocks of wind speed data in "Bins" of 0.5 meter per second. You know, some things are best left to Microsoft Excel. ClearSCADA allowed us to visually scan plots for specific times when the units were on-line, then pull historical data by specific times and simply copy and paste the results. A bit keyboard intensive, but it worked.

Now what is a guy to do about getting data quickly from four different wind turbines on a scanning radio scenario? And why in the world does Schneider offer a SCADAPack with no I/O? Well, not technically true, the SCADAPack 330 offers counter inputs, but not much else. However, it does have an integrated radio and communications ports. The package made for a very small foot print to piggy-back into an existing cabinet to do data acquisition on the main controller.

Fortunately, when we designed the control system for the Matrix Wind Solution MWS100 wind turbines, we included a power quality meter to monitor individual phase currents and voltages with real time power calculation. Further, we had an existing Modbus serial connection between the PLC and the power quality meter. This was the bottle neck, but we were getting about three samples every two seconds and well under the 1 Hz specification. A reasonable margin, but we needed to insure the performance passed through.

Now queue Tony's voice once again regarding DNP. To get there, we connected the SCADAPack 330 with a radio and antenna on four of the nine individual turbine control cabinets with a simple Ethernet CAT-5 cable. While the PLC was scanning the power quality meter MODBUS serial, the SCADAPack was scanning the PLC memory registers using Modbus Ethernet with time stamping and buffering in DNP. Then the ClearSCADA was scanning for evetns at leisure.



To optimize things, a major data mapping exercise took place. The original wind turbine PLC program was modified to add code to convert the data to floating point values and group the data in contiguous registers. The result was meeting all the requirements for the IEC standard. The side effect was learning about the wind turbines themselves.

The Matrix Wind Solutions MWS100 is an induction generator with dynamic blade pitch control. That means, the generator has to be running synchronous to the line frequency; in this case approximately 1800 RPM. The blades are motor controlled and move to the feather position, which essentially lets the wind blow past the blades in high wind. When there is adequate wind, the blades are moved incrementally to power producing angles. As the unit generates RPM, the PLC will trigger the soft start and synchronize to the utility. As wind speeds, increase the turbine will go into active control to position the blades with less pitch and keep the load on the blades in the power band. Should a gust of high wind come through, the system is designed to trip on over current and force a restart.

In addition to the IEC required weather information and kilowatts, the RTUs and ClearSCADA database was set up with other points of interest. The core data set includes generator RPM, blade target angle, blade actual angle, individual phase currents and voltages, run time hours and kilowatt-hour production.

To trigger any start, a low cost anemometer was used as the trigger for the initial run. Some units exhibited a number of false starts, and more importantly, some units were missing opportunities to run. The control program was changed to optimize the idling speed on each unit and to tune the startup curve. Further, the high wind detection was improved to eliminate start-up when the wind speed is too great.

To be perfectly honest, I don't believe there are many high speed data acquisition implementations in the installed base. When I first called the technical support group, the feedback I received was that it was an unusual request to attempt to get continuous one second data, particularly from four different locations via radio communications. But, the end result of the conversation was that the product had that capability. Nevada Controls can confirm that it indeed meets the 1 Hz data requirement, even when piggy backed on another product with limited SCADA capability.

— Dan Wadelton, VP Engineering
Nevada Controls

SCADAWise

SAGE ADVICE

ClearSCADA Basics

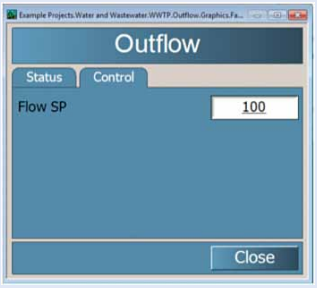
Drawing Layers

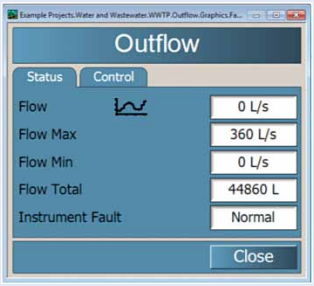
Among the many powerful graphical capabilities in ClearSCADA, Drawing Layers is often overlooked. Similar in concept to drawing layers in a CAD program, you can overlay graphical elements or hide areas of a Mimic by turning on or off different Layers.

The most basic way to use Layers is to determine visibility of a Layer based on the zoom level of a Mimic. This way, as an operator uses their wheel mouse to zoom in on an area of a map, layers that show more detail can become visible, much the way a map program will show only major highways when zoomed out and more minor streets as you zoom in. You can set up many Layers with Visibility for each Layer at differing magnifications as a way for an operator to access information about their system without navigating away from an Overview Mimic.

Another common use is to yield pop-up windows with tabs that provide multiple pages of information, again reducing the need for an operator to navigate away from a page to access more information.

The visibility of layers can be controlled by the operator, events, or logic adding more information to screens without clutter. Please let us know if we can help you to better understand and utilize Layers in ClearSCADA.





Need help in transforming remote asset data into valuable business insight?

Let's talk!

Make the most of your remote assets with complete end-to-end solutions for monitoring and controlling field operations across a widely dispersed infrastructure

Controlling cost of ownership

The installation, operation and maintenance of remote site SCADA operations is often the most significant overall long term expense factor. With scalability,flexibility and ease-of-use in mind, Schneider Electric's Telemetry and Remote SCADA Solutions are tailored to help lower this total cost of ownership.

Secure and Reliable SCADA

Safety and availability are must-have characteristics of critical infrastructure. This especially holds true when considering security for SCADA systems that monitor and control remote operations across a wide array of communications technologies. At Schneider Electric, our Telemetry and Remote SCADA Solutions incorporate solid security at all levels, from the field to the enterprise.

Minimising risk by improving safety and regulatory compliance

Many industries are challenged with increasing requirements for operational safety, compliance with environmental regulations and the overall security of assets. Schneider Electric's Telemetry and Remote SCADA Solutions address all of these critical requirements through flexible end-to-end integration and comprehensive feature sets.

Innovation at work

ClearSCADA Software – Providing functions to reliably and securely manage remote SCADA assets across a wide range of communication options, with easy integration into business systems.

Trio Data Radios – Ensuring data integrity over short and long-haul distances with versatile and reliable data transmission options.

SCADAPack Smart RTUs -The monitoring and communication capabilities of a Remote Terminal Unit (RTU) combined with the processing and data-logging power of a Programmable Logic Controller (PLC).

Accutech Wireless Instrumentation – Configurable startup and failsafe conditions, enhanced diagnostics and years of maintenance free operation.

Make the most of your energy℠

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Structured Text vs Ladder Logic Programming

In a recent conversation with the Sage Advisor, I was informed that ladder programming was the easiest to learn. I did not want to challenge the Sage, so I remained quiet. The wisdom to remain quiet was quickly trampled by the absurdity of the statement. Who on this earth would think that ladder was easier to learn than say, structured text?

Mr. Sannella offered me the opportunity to explain my perspective in this publication. Consequently, I would like to share my opinion of the pros and cons of both structured text and ladder programming. Yes, I do believe there are benefits of ladder programming and there are disadvantages of structured text.

First, for full disclosure, I normally use SCADAPacks and I always use ISaGRAF. Within ISaGRAF, 95 percent of the code I've written has been in structured text and the remainder in Function Block Diagram. I have been around, never wanting to develop in, and have a very limited working knowledge of ladder. I am a civil engineer and I have worked around canals my entire 30 year career at the Bureau of Reclamation.

ISaGRAF supports five standard programming languages: sequential function chart, function block diagram, ladder diagram, structured text, and instruction list. In addition, it supports a non-standard language called flow charting. I find flow charting to be a more graphical representation of the underlying programming language. In my case, the underlying programming language is structured text. If necessary, flow charting could easily be converted to structured text.

My initiation into PLC programming was primarily caused by the unsuccessful deployment of a ladder program written by others. We had just spent about $8,000,000 on canal improvements and automation, but the automation did not work. So it was a bit like, "get this automation working, or else." I did have experience writing in Fortran, so when I looked for a way to correct the ladder program, I found it much easier to use structured text.

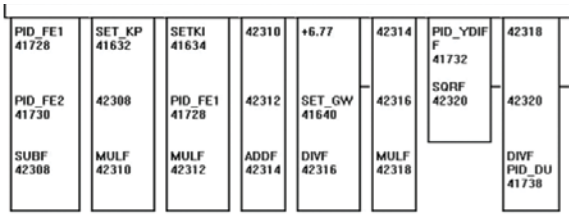
Most of the automation and control algorithms that we use have been developed by the Irrigation Training and Research Center (ITRC) in San Luis Obispo, California. The "problems" we had with our initial automation project were not caused by ladder. But, what we found is that the modern control algorithms and logic that are needed for good control are more easily written and coded using the same type of equations in both the development of the algorithm, as well as the PLC programming. By "development of the algorithm," I mean that the stability and characteristics of the control is always tested in a canal simulation model prior to programming it into the PLC, and implemented in the field.

In my experience with several integrators, all prefer ladder. It is what they are used to. And many good electricians can understand, write and deploy ladder programs. I agree that as long as the control algorithm is manageable, such as a proportional – integral (PI) control, ladder is an OK tool. But, as the control algorithm becomes more complicated, the benefit of the comfort of using ladder is quickly replaced by the versatility of other languages, specifically structured text. As a buddy of mine put it, "Using ladder is like being a great carburetor mechanic. It was good when all you had were carburetors."

I believe it is time to move on to more advanced programming languages. Or at the very least, stop propagating the sole use of ladder. Eventually those fuel injected systems may be the only kind of engines out there.

I do not understand those who believe that ladder is easier to use and understand. I think what they are really saying is that ladder is the primary language they teach or have used. For the last several years I have taught PLC programming in a canal modernization class. One of the first questions I ask is whether or not anyone in the class has ever worked in Microsoft Excel. Most of the class will raise a hand. My next question is whether they have ever entered an equation in Excel. Not as many people will answer "yes" to the second question. If I took that same group of people and asked them if they have ever written a ladder equation, I would get a blank stare unless there was an integrator or electrical engineer in the class. My argument is that if you can write an equation in Excel, you can write structured text.

Actually, when I develop PLC programs, I will do my first round of testing in Excel. If I take the time to name cells, my Excel equations are nearly identical to the structured text in the PLC. For example, if I want to scale a water level sensor in Excel, I would write the equation in a cell as = Raw_Count * Slope + Offset. Now, to move that same equation to structured text, the equation would look like Water_Level := Raw_Count * Slope + Offset. To make this conversion, I needed to add a colon before the equal sign and end the line with a semicolon. A more complex example is one of the equations we use to calculate a desired gate move (PID_DU), it looks like this in ladder:



In structured text the equation is: PID_DU := [6.77*(Set_KP*(PID_FE1-PID_FE2)+(SETKI*PID_FE1))] / [SET_GW*SQRT(PID_Ydiff)]. Anyone who has had high school algebra can at least read that equation. I'm sorry, but I cannot fathom how the ladder version of that is easier.

I have also listened to ladder integrators complain, "Where are the coils? How do you turn something on?" I don't know, but Valve_Open := TRUE; looks pretty clear to me. Integrators also complain about the structured text syntax. They complain about the need for the ":" before the equals sign and ending the statement with a semicolon. Beyond the standard bracketing requirements in the equation above, the only difference between what is coded and a standard equation is the colon and semicolon. But, for some reason, they feel these syntax requirements are more burdensome than the ladder.

For timers, structured text has some really mystic conventions. (For those of you who watch Big Bang Theory, yes, that is sarcasm.) To start a timer, you have to enter a command like TStart(TMR1);. Or even more confusing, if you want to stop it, you code, TStop(TMR1);. Resetting a timer back to zero is a little bit different; here you have to code TMR1 := t#0s;. Yes, the t# stuff is different.

There are shortcomings in structured text. One of the main ones is in debugging. There is no equivalent to having the ladder rung turn red when the rung is in the true state. ISaGRAF does have two tools to help with debugging: Spy Lists and Spotlight, which require some effort to set up. When you are done setting them up, they are more useful than debugging in ladder.

Another liability of structured text programming is its lack of widespread use. This is a self-propagated problem aggravated by the continued belief that ladder is not only preferred, but superior.

The two remaining issues are with ISaGRAF, not structured text, and relate to Schneider Electric. The ISaGRAF application was developed by ICS Triplex ISaGRAF, which is now owned by Rockwell Automation Group. Schneider has not chosen to implement most of the improvements to ISaGRAF that Rockwell has made since the purchase in 2007 in the standard SCADAPack. For example, ISaGRAF is now on version 6 which is available with the E series SCADAPack but Schneider continues to sell version 3.5 ISaGRAF for the standard SCADAPack which will not run in native WIndows 7. The Schneider – Rockwell problem does not, in any way, deter from the advantages of more modern programming languages. I have been able to take IEEE compliant structure text and move the code from one brand of PLC to another.

I would like to close with my second structured text application. When I was developing this code, I was not adept at making various pieces of hardware "talk" to each other, so I hired an integrator to work with me. This integrator was, and is, very proficient in ladder. Actually, during development, he would write the code in ladder and then figure out how to do the same thing in structured text. At the end of the project, this ladder aficionado said to me, "Boy, I'm glad we did not try to do that application in ladder."

— Robert Norman, Civil Engineer, US Bureau of Reclamation, Grand Junction, CO

8 CAMERA TIPS FOR PROTECTING WATER FACILITIES, PART 2 of 3

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4. Don't get stuck in the Dark – It's easy to get caught up in the perimeter layout, taking time to evaluate camera locations, lenses and image resolution only to forget that all of that changes when the sun goes down. In most cases, the limiting factor in coverage occurs in the evening hours. How do you intend to cover the scene in darkness? Will you use some type of illuminant, such as infrared or a visible light source, or perhaps the choice is a thermal sensor? A camera that can cover a 500m fence line during the day may be reduced to 200m at night due to the type of illumination being considered. This not only impacts the layout, but obviously has consequences in the final budget. An IR illuminated camera will provide you some facial details and can allow viewing of license plates, but this adds a piece of equipment (mounting, power and maintenance) and is susceptible to weather conditions like rain, snow and fog. A thermal camera may cost you a little more and not be able to provide you facial or license plate details, but copes better with weather conditions. Bottom line, take the time to consider how the scene will be covered in nighttime operations.

5. Get an image – The saying is really true, *"A picture is worth a thousand words."* If at all possible, try to get an image from each proposed camera location, mimicking the intended view. Getting the image at about the same camera height is ideal, but just getting a snapshot at ground level can also be helpful. If you are a consultant or integrator, this is often difficult to achieve, given the nature of site visits and other restrictions, but it will provide you an added level of confidence in your design and help retain some of those small details you may have forgotten after being on site. If you are the site owner or consultant, making the effort to allow these views to be captured can go a long way in uncovering problems early in the design. Images can be used as a great collaboration tool to gain consensus on the objective of the camera and insure that the location and view will achieve the cameras' intended mission.

To be continued next issue

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Calendar of Events

March 14-15, 2013	**ISA Instrumentation & Oil and Gas Expo,** Carson, CA.
March 25-28, 2013	**CA-NV/AWWA 2013 Spring Conference,** Las Vegas, NV
April 16-19, 2013	**CWEA Annual Conference 2013,** Palm Springs, CA
April 16-19, 2013	**USCID 7th Annual International Conference on Irrigation & Drainage,** Phoenix, AZ
April 30 – May 2, 2013	**Telepace Studio Ladder Logic Training Course*,** Mill Valley, CA
May 6-9, 2013	**ClearSCADA Level 1 Training Course*,** Mill Valley, CA
June 9-13, 2013	**ACE '13 Expo,** AWWA, Denver, CO - visit our manufacturers' exhibits.
Aug 19-21, 2013	**Telepace Studio Ladder Logic Training Course*,** Reno, NV
September 16-19, 2013	**ClearSCADA Level 1 Training Course*,** Reno, NV
September 10-12, 2013	**CWEA 2013 Northern Regional Training Conference,** Modesto, CA
September 24-26, 2013	**Tri-State Seminar on the River,** South Point, NV
Sept. 30- Oct 3, 2013	**CA-NV AWWA 2013 Fall Conference,** Sacramento, CA
October 5-9, 2013	**WEFTEC 13,** Chicao, IL - visit our manufacturers' exhibits.
Oct 22-25, 2013	**USCID Agriculture/Urban Water Interface — Conflicts & Opportunities,** Denver, CO
October 29-31, 2013	**Telepace Studio Ladder Logic Training Course*,** Mill Valley, CA.
November 4-7, 2013	**ClearSCADA Level 1 Training Course*,** Mill Valley, CA

* Download the registration form from our website or call for more information.