The Sage Advisor

SCADA, SECURITY & AUTOMATION NEWSLETTER

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Top Three Criteria to Look For in Your Next Water/Wastewater SCADA System

Water utilities have been using Supervisory Control and Data Acquisition (SCADA) for many years, during which SCADA systems have evolved from simple tone telemetry to web-centric solutions. A SCADA system's primary function is to monitor and control the conditions of remote assets, such as pump and lift stations, distribution networks, and treatment plants while ensuring data integrity, overall system visibility, and security. If you are expanding, upgrading, or developing a new SCADA system, selecting the right hardware and software components can help you cope with ever changing demands in securing your infrastructure and improving data collection and reporting.

Here are the top three criteria to focus on when specifying an advanced SCADA system:

1. Intelligent Field Controllers

Everyone claims that they offer intelligent hardware, but are they really that "smart"? Remote programming and configuration over the SCADA network is no longer an indication of smartness.

An integrated hardware and software solution that is able to detect and adapt to changes as they happen across the infrastructure represents the intelligence many utilities are looking for. For example, bringing a new remote pump station online in a traditional SCADA system would require manual downloading of the control logic application, customizing the HMI/SCADA host software at the central monitoring station to accommodate the new site, and manually integrating the pump station in all reports. An intelligent SCADA system has the ability to detect the newly added remote controller and automatically download the proper control application, provided that a communication link is available. Using templates, the existing screens and reports can be easily adapted to integrate the new site.

Other daily events such as losing the communication link between the remote controller and the control center would be immediately detected by the remote controller. To mitigate the risk of losing critical data and facing possible fines from regulatory agencies, the controller will log and time stamp data in its non-volatile memory during the time communication is down. Once the communication link is re-established, the controller will automatically upload the logged data to the SCADA host software to populate trend and event files based on actual time of occurrence rather than time of receipt of the data. If the communication loss persists for a longer period of time, the controller may automatically report critical data to an alternate server or even a mobile operator.

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Free June SCADA Seminars

SCADAWise

In our June 14 & 15 seminars, we will address two of the problems so often faced by SCADA systems planners: data throughput speeds and the single remote sensor conundrum. See how Firetide can address the Bandwidth question with their MIMO mesh network technology, and how Accutech can make reaching those small remote sites affordable.

For those who need the Ethernet but not the bandwidth, get a look at Trio's licensed UHF narrow-band Ethernet radio and how you can have both IP connectivity and long range for your radio system. Finally, get a tour of the greatly improved user interface in this Windows 7 compatible version of TelePACE Studio. See how the new browser-based menu system and drag-and-drop function library reduce programming time and ease access to all of the program's features.

See the registration form in this newsletter or go online to www.scadawise.com to register.

CBI SYSTEMS, LTD

MS4 Permit Manager™

CBI Systems Ltd's MS4 Permit Manager™ software is designed to serve as a comprehensive Storm Water Management Program (SWMP) designed specifically to assist Phase I and II MS4's in meeting centralized records and annual reporting requirements. This software provides an integrated tool which can be used by all permitees to develop required permit application materials, track and maintain data associated with implementation tasks, and simply generate annual reports required by the permitting authorities. With MS4 Permit Manager™, you can easily track outfalls, construction sites, structural controls, facilities, illicit discharges, citizen reports, and training records.

Features include SWMP development and implementation, field data collection for field inspections with simple "one button" synchronization, linking unlimited photos and documents, and built-in GIS map functionality. The map is based on the U.S. Census Bureau TIGER/ Line 2000 maps. The map base is ready for viewing, editing, addition of outfall locations and printing or plotting and consists of hydrology, roads, highways, urbanized area boundaries, and state and county boundaries.

Use of the MS4 Permit Manager™ will drastically reduce the time and effort required to apply for, manage and

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MS4 PERMIT MANAGER

Sage Designs, Inc. Passes 20 Year Mark

When we opened our doors in May of 1991, we could not have imagined how quickly the time would pass. Starting out with a number of sensor lines and an unknown product called the TeleSAFE from Control Microsystems, we forged ahead. While it was tempting to stay in our comfort zone selling flow meters and other sensors, this whole concept of SCADA was what caught our attention. After all, look at how much more fun it is to demonstrate software than it is to lug around heavy products.

Looking back, we see that we did well to move into the SCADA market as early as we did. It was really less of our choice than that of our customers, there being a great deal of forward thinking in our territory. Innovation comes naturally out west and all you have to do is listen to what your customers want.

As we reflect back, we have to acknowledge the risk our early customers took in being willing to work with such an unknown representative and for the most part, unknown products. We hope you feel as we do, that your gamble has paid off.

As we look forward, we count on you to keep us pointing in the right direction.

Thank you for 20 great years.

Inside This Issue

SCADAWise

SAGE ADVICE

SCADA vs. IT – Can't we just get along?

It seems that there are two separate and distinct disciplines at work here: the SCADA people on one side and the IT people on the other. I almost hate to say it, but also glad to say it: the two disciplines are rapidly converging. Ethernet is quickly becoming the standard for PLC and other types of SCADA communication. This means IT is more than happy to give its expertise to the SCADA group, sometimes without being asked.

There are two different and slightly biased views from both camps. IT views SCADA as simply a database, while SCADA views IT as simply a security firewall. If only IT folks saw the SCA in addition to the DA, and if SCADA folks saw network security as way more than firewall rules, perhaps we could get along better.

SCADA networks seem to be of the KISS philosophy (Keep It Simple Stupid) and for good reason. SCADA systems are complex enough without adding network complexity that decreases reliability. I have heard way too many times that a SCADA system worked fine for years until IT 'secured' it to death. Unfortunately, SCADA can't ignore security forever. The recent Stuxnet virus specifically targeted SCADA systems. Yes it exploited 4 zero-day Windows vulnerabilities, used a Conficker style attack, and the payload only affected Step 7 software and Siemen's S7-300 PLCs. Furthermore, they had to have been using the default password and had very specific VFD's attached before the virus did its damage.

The target for Stuxnet might have been extremely specific, but variations are bound to come to a system near you. More importantly, it was the first virus that infected down into the PLC level, and once a virus like this is released into the wild, it almost certainly inspires others to one up the original. Stuxnet is very sophisticated and undoubtedly the first of more to come. Media reports gave the impression that only systems in Iran (specifically centrifuges used for enriching uranium) were compromised, but there were at least 2,913 infected systems reported in the USA (most of which weren't enriching uranium).

One way to increase security while allowing the flexibility for SCADA to continue running reliably is to split the SCADA and business networks. A physical split is the most secure, but also very costly. Some smaller SCADA networks are nearly physically split already; a firewall between the business and SCADA networks is all that's needed. By a physical split, I don't mean going rogue from the IT people and having an isolated network. I'm suggesting working with IT and utilizing their security expertise, as long as they are receptive to your control system expertise. If your SCADA network is currently rogue, I implore you to work with your IT people, or hire someone who can provide security expertise if you haven't already. Believe it or not, IT security and SCADA reliability can (and do) coexist.

A logical split is more affordable and can be as effective as a physical split, if configured properly. A network that is logically split is usually larger than one location and uses VPN 'tunnels' for SCADA traffic to flow through the business network, in addition to one or more firewalls separating SCADA from business traffic. A firewall that separates the SCADA and business networks typically has a DMZ, a place for traffic to flow into or out of the SCADA network. The DMZ is a good place for services such as a historian to live, that way business users can access SCADA data without tapping into the SCADA network directly. After your SCADA network has gone though a security remodel, it is highly recommended to hire an 'ethical hacker' to poke and prod your business and SCADA networks to see just how secure the new network really is (or isn't). I know there are vulnerabilities that can sometimes (though rarely) be overlooked by the best network people and someone taking a fresh view from a hackers perspective would almost certainly discover them.

The key to a secure SCADA network that is also reliable is all in the planning. Understanding where you are now, what you need to do and how you're going to do it. And don't forget back out strategies; if a SCADA network security upgrade goes horribly wrong you don't want to wish you had a recovery scenario in place. Trust your IT team. It may not seem like SCADA needs their security expertise now, but you don't want to end up wishing, *"If we had only realized"*... If the wall between IT and SCADA can be lowered, both camps will be glad they worked together for the common good in the future.

—Rolland Domer, Network Analyst & SCADA Engineer, Sonoma County Water Agency

Control Microsystems Introduces the Trio ER45e Remote Ethernet Radio

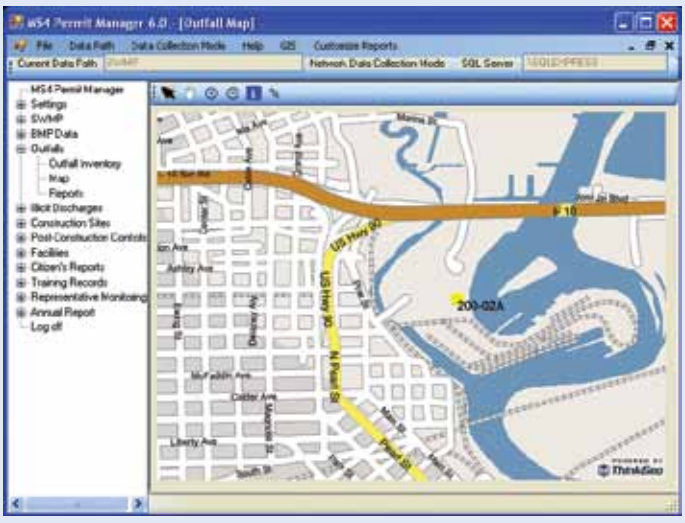
The Trio team has introduced the Ethernet E-Series family of licensed radio products based on the Trio ER45e advanced LINUX Ethernet radio platform. The ER45e radio provides both Ethernet and serial connectivity for the most complex and demanding requirements in Point-to-Point and Point-to-Multipoint (Multiple Address Radio) SCADA and Telemetry systems.

Features such as ChannelShare™, data compression, low latency and over-the-air firmware upgrades make the Ethernet E-Series a complete family of licensed Ethernet radios that can be used with all leading host systems and remote Ethernet RTU/PLCs.

In addition, the Ethernet E-Series features a flexible embedded terminal server which provides a smooth transition from serial based infrastructure to IP/Ethernet. Based on the highly successful Trio ER450 serial radio, the ER45e can integrate directly into existing E-Series systems and is also complimented by the full duplex EB45e Base/Repeater and the 1+1 redundant EH45e Hot Standby options.

- Advanced technology DSP-based GMSK digital data modem featuring error-checked high data throughput
- True 19,200bps over-the-air data rates
- Modbus, DNP3.0 and IEC 60870-5-101, and Ethernet/IP protocols - UDP, TCP, DHCP, ARP
- Local or remote configuration of all radios in a system
- MultistreamTM simultaneous data stream support
- Advanced commissioning tools and remote diagnostics including SNMP
- 128-bit AES encryption
- 3-year warranty (parts and labor)

CBI SYSTEMS LTD MS4 Permit Manager™ *Continued from page 1*



develop reports for compliance with Phase I and II MS4 stormwater permits. The traditional method for similar activities involves manual document development and data management. More efficient permit implementation will promote better compliance with the goal of stormwater pollution reduction and prevention. MS4 Permit Manager™ has been known to reduce permit application development costs by 80% for similar development work without the technology.

Have your MS4 Permit Manager call to get a schedule of online webinars or visit www.cbi-systems.com.

SAGE DESIGNS, INC.
SCADA & Security Products

SCADAWise

Free SCADA Seminar
A Spectrum of Possibilities

June 14, 2011
8AM – Noon
Ayres Boutique Suites Ontario Airport
204 N. Vineyard Avenue
Ontario, CA 91764

June 15, 2011
8AM – Noon
SpringHill Suites by Marriott
10593 Fairway Drive
Roseville, CA 95678

Control Microsystems is becoming Schneider Electric

firetide®

Accutech TRIO

8:00 – 8:15 **Continental Breakfast & Introductions**

8:15 - 9:00 **Accutech Tether-Free Wireless Instrumentation**
Greg Ochs, Western Regional Manager, Control Microsystems, will present the Accutech wireless network of true "tether free", battery powered, wireless instruments which allows for deployment of measurements in locations best suited for accountability and performance in over-the-air systems. Suitable for outdoor and indoor use and with approvals for hazardous locations, the Accutech system meets a wide range of conditions. The scope of "tether free" instruments includes pressure, temperature, flow and other parameters that can be tied into a scalable wireless network from 1 to 25,000+ real-time measurements. Greg will discuss the characteristics of industrial wireless instrumentation that have been successfully installed in industrial applications.

9:00 – 10:00 **Broadband Wireless Mesh Technology**
Mike Anderson, Regional Sales Manager, Western U.S., Firetide, Inc. will discuss design considerations for IP wireless networking, wireless technology options and how to pick the right one for the project, as well as Installation and performance expectations.

10:00 – 10:15 **Break**

10:15 – 11:00 **Trio UHF Ethernet**
As more and more devices are moving from serial to Ethernet, customers face the challenge of deploying a cost-effective, wireless infrastructure that link their remote asset over a secure, reliable and scalable network. Trio's new ER45e is an Ethernet solution in the Licensed 370 to 520 MHz bands. Greg Ochs, Western Regional Manager, Control Microsystems, will discuss the features and capability of this radio that offers an IP communication network with reliability and coverage.

11:15 - Noon **First look at the Version 5 Release of TelePACE Studio**
Get a tour of the greatly improved user interface in this Windows 7 compatible version of TelePACE Studio. See how the new browser-based menu system and drag-and-drop function library reduce programming time and ease access to all of the program's features.

Pre-registration Required

To Register: **Call 1-888-275-7243 to reserve your seat. Then complete the information below and send to us via fax to 1-888-329-7243 or by email info@sagedesignsinc.com.** A confirmation will be emailed to you. Hotel Directions can be found on the Events Page of our website: http://www.sagedesignsinc.com/events.

☐ **Register me for the free seminar in Ontario on Tuesday, June 14, 2011**
☐ **Register me for the free seminar in Roseville on Wednesday, June 15, 2011**

Name (*please print):*	Title:
Company:	Phone:
Address:	Fax:
	Email:
City/State/Zip:	Dietary Restrictions:

*** * * Registration Deadline: June 10, 2011 * * ***
There is no charge for this event, but we would appreciate notification if you must cancel your reservation.

SAGE DESIGNS, INC.
SCADA & Security Products

CONTROL MICROSYSTEMS

SCADAWise™ Training Classes

ClearSCADA

SCADAPack

ClearSCADA Training Course

May 16-19, 2011 - Palm Springs, CA
October 24-27, 2011 - 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 $1,890

SCADAPack TelePACE Studio Training Course

May 3-5, 2011 - Palm Springs, CA
November 1-3, 2011 - Mill Valley, CA

An optional SCADAPack 350, SCADAPack 334 or SCADAPack 32 is available at a special price with the course—an excellent way to get started using Control Microsystems' Controllers.*

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 $1,340

* Optional SCADAPack 350 Training Kit – adds $1040
* Optional SCADAPack 334 Training Kit – adds $1040
* Optional SCADAPack 32 Training Kit – adds $1,100

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

Instructors: ClearSCADA & SCADAPack TelePACE classes will be taught by Tony Sannellla, Sage Designs, a Control Microsystems' Factory-Certified Instructor. The ClearSCADA Test Drives will be conducted by Ian Metcalfe, US ClearSCADA Sales, Control Microsystems.

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 of Win 2K or XP with 15mb free disk space, CD ROM, mouse with a scroll wheel, working serial, USB or Ethernet port, and necessary permissions to install software on your computer.

What is provided? Lunch and coffee, soft drinks and snacks each day.

Optional Training Kits at special course pricing (TelePACE class only): *Limit one (1) for every two (2) students per organization. *Training Kits will be shipped N/C to training facility, provided your registration is received approximately 4 weeks before the first day of the course, or shipped to you after the course when available. Training kits include a SCADAPack 350, SCADAPack 334 or SCADAPack 32 Controller, TelePACE Studio Software, Hardware Manual (on CD-ROM), I/O Simulator board, AC/2 Transformer, & programming cable. Prices do not include applicable California sales taxes.*

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

SAGE DESIGNS, INC.
SCADA & Security Products

Please send me the Registration Form

ClearSCADA: ❑ **May 16-19, 2011 - Palm Springs, CA** ❑ **October 24-27, 2011 - Mill Valley, CA**
SCADAPack TelePACE: ❑ **May 3-5, 2011 - Palm Springs, CA** ❑ **November 1-3, 2011 - Mill Valley, CA**

Name (*please print):*	Title:
Company:	Phone:
Address:	Fax:
	Email:
City/State/Zip:	

* * * Registration Deadline: 2 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.

Advanced ClearSCADA

Control Microsystems is becoming Schneider Electric

ISaGRAF IEC 61131-3

Advanced ClearSCADA Training

May 24-25, 2011 – Roseville, CA

This 2-day training course is for experienced ClearSCADA users who want to learn more about understanding the architecture of ClearSCADA, project design considerations, using ODBC and SQL with ClearSCADA, and more:

- Advanced mimic and symbol design
- Advanced reporting and trending
- The ClearSCADA Logic Engine
- Data Grids and Data Tables
- Advanced system troubleshooting and fine tuning

*** PRE-REQUISISTES APPLY: To participate in this class, attendees must have completed the introductory 4-day ClearSCADA class. No exceptions permitted. ***

Who should attend? SCADA engineers, system integrators and any other SCADA related personnel who have completed the 4-day ClearSCADA Introductory Course and desire advanced training.

What should I bring? Laptop Computer with minimum 1 GB of free disk space and minimum of 512MB Ram (1 GB preferred) with serial port.

What is provided? Continental breakfast, lunch, coffee and refreshments breaks, & training materials, plus SCADAPack controller for course use.

Instructor: Jeff Klumpp, SCADA Systems Analyst, Control Microsystems

Course Fees: $945.00 (plus taxes)

Control Microsystems Online Registration & more info:
http://www.controlmicrosystems.com/resources-2/training-1/event-calendar/index.cfm?view=daily&m=5&d=24&y=2011&eid=31133

ISaGRAF Training Class

May 10-12, 2011 – Roseville, CA

3-Day session includes topics such as SCADAPack hardware installation, maintenance and system overview.

- Introduction to ISaGRAF Workbench and Control Microsystems' custom extensions (functions).
- ISaGRAF programming languages.
- SCADAPack communication methods and protocols.

Who should attend? Individuals interested in participating in an introductory, in-depth course on ISaGRAF Programming Language and how it applies to Control Microsystems products.

Optional Training Kits: Training kits, which include a SCADAPack & I/O simulator, are not required to participate in the course; however, they are only offered in conjunction with certain courses and cannot be purchased separately. If you are interested in one, please inquire.

What is provided? Continental breakfast, lunch, coffee and refreshments breaks, & training materials, plus SCADAPack controller for course use.

Instructor: Johnny Gutierrez, Applications Support Specialist, Control Microsystems

Course Fees: $1580.00 (plus taxes)

Control Microsystems Online Registration & more info:
http://www.controlmicrosystems.com/resources-2/training-1/event-calendar/?C=5331&i=31132

Top Three Criteria to Look For in Your Next Water/Wastewater SCADA System

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2. Tight Security Suite

Water utilities, large and small, are part of the national critical infrastructure. Cyber security threats against this infrastructure can take different forms:

- Potential destructive cyber malware including viruses, Trojans, and worm attacks.
- Network spoofing and "denial of service" threats causing network performance implications.
- Confidentiality breach with eavesdropping and password cracking.
- Data integrity including data tampering and packet modification.

Intelligent field controllers are now capable of encrypting data before it is transmitted over the communication link using industry standard, government-grade encryption algorithms. The controller can also authenticate messages received from external devices and reject those from unidentified sources. This protects the infrastructure from eavesdropping, interception, and intrusion attacks.

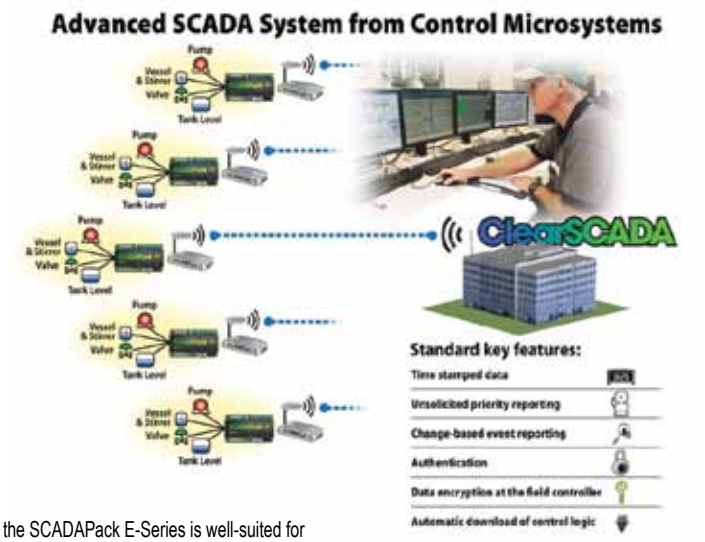
3.Integrated Host Software

An integrated host software is designed from the ground up to manage small and large Wide Area SCADA systems and address critical issues such as unreliable communication links, security, data integrity, and ease of deployment. It includes, as a standard, all the needed components required to effectively operate a SCADA system such as:

- Alarm redirection engine to alert mobile users of operation disruptions via email and mobile phones;
- Efficient trending and audit trail engines that are capable of dealing with communication link interruptions and data retrieval delays;
- Integrated reporting engine capable of meshing-up data from multiple sources to produce operation and compliance reports with ease.

For the past 30 years, Control Microsystems has been the leader in developing intelligent field controllers for telemetry, SCADA, and remote asset monitoring. The Control Microsystems SCADAPack Series of rugged, cost-effective, programmable field controllers is designed specifically to operate in harsh remote environments. Control Microsystems' offering also includes ClearSCADA, an advanced SCADA Host Software platform. Even though SCADAPack controllers and ClearSCADA software can be integrated with a variety of third party HMI/SCADA software and PLCs respectively, an integrated solution combining the two products drives substantial cost savings and dramatically increases system efficiency.

The SCADAPack E-Series is a line of remote field controllers that has an embedded historian, allowing time-stamped event logging for extended periods of time. Events can be logged in the unit's internal memory and are easily accessible to the user. With multiple serial and Ethernet ports on-board, the SCADAPack E-Series is well-suited for concurrent communications with multiple field devices. It can simultaneously report to several master servers based on user preferences. Additionally, it can share information with other peer units in the field, thereby reducing network traffic to the main server and increasing the system's overall reliability. Control algorithms are developed using an IEC 61131-compliant programming package and downloaded to the field controller remotely over any communication link.



The SCADAPack E-Series uses a secure, standard communication protocol and data transfer mechanism that transfers the data based on priority and event changes. This frees up communication links to be used for other demanding services such as remote asset video surveillance. Data values include data quality flags, a time stamp with millisecond resolution to indicate when the event occurred, and a class/priority to indicate how it should be handled by the SCADA host.

To realize the concept of Intelligent SCADA, ClearSCADA was designed from the ground up to manage small and large Wide Area SCADA systems and address critical issues such as unreliable communication links, security, data integrity, and ease of deployment. The product is optimized for low and high bandwidth communication links over public networks, such as dial-up landlines, mobile networks, and WiMAX. It is also well-suited for private serial and Ethernet radio networks. Extensive diagnostics features are available for monitoring the performance of the communication network. ClearSCADA supports main and standby communication links to remote devices for uninterrupted monitoring and control.

Data integrity is maintained across the system as a result of its inherent ability to synchronize historical events in its database after a communication loss with the intelligent field controllers, such as SCADAPack E-Series. Since all data is time stamped in the intelligent field controller, less important data can be buffered by the controller until it is convenient for the SCADA host to receive it. In addition, time-stamped data allows the system to tolerate failure of the communication links.

Eliminating gaps in data helps users to comply with regulatory requirements by providing accurate reporting and maintaining a high level of data availability.

Multiple security models are available in ClearSCADA. Security is configured to the object level where a wide range of permissions are applied to discrete system points. For example, depending on the permission policies, a group of users may see details on a screen which are not available to another group with a lower level of security permissions. This level of intelligence and flexibility allows users to offer access to a much larger group of internal and external stakeholders without compromising system security and integrity.

Furthermore, to reduce deployment time and ongoing maintenance, ClearSCADA offers a zero-configuration Web client that is ideal for monitoring and controlling the SCADA system through a standard web browser. All features, including full mimic display support, control and trending capabilities, and alarms and reporting, are made accessible through a secure SSL connection that is managed by security login privileges.

For more information on Control Microsystems' products, please visit www.controlmicrosystems.com

About the author:

Hany Fouda is the VP of Marketing at Control Microsystems Inc. He holds a Masters degree in Engineering from Carleton University, Ottawa, Canada and has over 20 years experience in industrial automation, SCADA, and telecommunications.

Demand Response — A Journey

Over the past five years I have surveyed scores of commercial and industrial facilities for their demand response potential. I've done this work on behalf of Southern California Edison Company, which provides power to over a quarter million businesses. Many of my surveys have been productive, identifying many megawatts of demand that can be taken off the electric grid when it is under stress or when energy prices are particularly high.

The term "demand response" is firmly established in the utility industry, but I think it is widely misunderstood among utility customers. At least, many businesses I approach have the impression that demand response means the utility will turn them off when they most need the power. In fact, most programs are voluntary, and participants can opt out of any call to reduce demand, even if demand response is automated. Secondly, most participants turn down their usage rather than shut down entirely—variable-speed pumps can be slowed, air conditioners can be cycled, and so on.

Electricity is unlike any other commodity in that its wholesale price can vary by a factor of 20 or more within a given day. The familiar time-of-use rates mask the extreme variations. The principle of demand response is simple: make electric rates more transparent to these variations, thereby giving participants a strong incentive to take demand off the grid at critical times. These occasions are rare—occupying only 50 to 100 hours per year—but they can account for 10 to 20 percent of a utility's annual costs.[1] By partnering with the utility to reduce these costs, participants not only reduce their own bills, but the bills of all ratepayers. Demand response costs less than building more peaker plants and stringing more wires.

Figure 1 compares the energy charges of Edison's standard large-user rate (TOU-8) over the course of a day with two demand response programs—Critical Peak Pricing (CPP) and Real-Time Pricing (RTP)—and the increasing transparency of the programs is evident. Other utilities across the U.S. and Canada offer similarly structured programs. The obvious question is: why would anyone want to enroll in a program that charges over $1.00 per kilowatt-hour, even if only a few hours per year? The answer is that the program includes compensating changes at other times. The breathtakingly high costs now become lucrative opportunities to save, by shedding load while they are in effect.

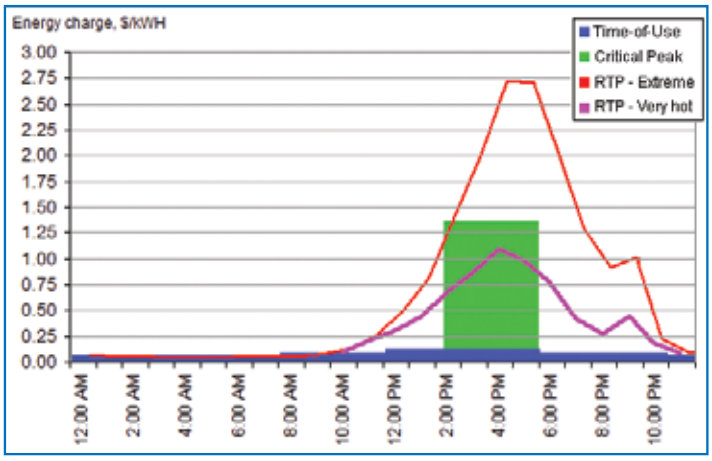


Figure 1: For simplicity, only two of the five possible RTP curves are shown.

Water, Water Everywhere

Part-time work as a SCADA integrator equipped me to make water districts a specialty in my demand response work. Storage and operating flexibility make water districts particularly good candidates. Furthermore, the SCADA systems that most water districts employ can be harnessed for automated demand response (Auto-DR). This can be as simple as tying a signal from the statewide Demand Response Automation Server (DRAS) into the SCADA system. The SCADA system can give the operating staff a heads-up, since many programs provide day-ahead notification, and to allow any or all of the facilities to opt out of a given event.

Edison offers rebates for automating demand response up to $300 per kilowatt of verified demand reduction. Other California utilities offer similar incentives. If a water district is contemplating SCADA upgrades—as many are—the case can often be made that that they can increase demand response potential or improve Auto-DR reliability. These rebates are a strong driver of Auto-DR.

Demand response strategies for water districts include the obvious: drawing down storage a little further during the peak, or topping up reservoirs just ahead of the peak to minimize a pump's on-peak operation. A burst of work in late 2010 gave me some insights that my work to date had not. One is a concept that I call "hydraulic vs. economic efficiency." Normally, these are closely aligned. A 1,000 HP booster station that I evaluated pushes water through three miles of hydraulically constrained mains. The 1.5 ratio of on-peak to mid-peak energy charges is not sufficiently high enough to overcome the hydraulic penalty of squeezing pumping into the mid- and off-peak hours. That is, the hydraulically and economically efficient thing to do is to pump around the clock. Demand response increases this ratio to nearly 20:1, and the hydraulic and economic efficiencies diverge sharply. Operators incur the hydraulic penalty, and save $1.36 per kilowatt hour during the four-hour critical peak. Similarly, operators can lift water over a zone with lean storage, and supply the zone by gravity during the peak.

A Science Project

In January Edison asked me to build a tabletop Auto-DR display. It was to include a client device that communicates with the DRAS, a low-end energy management system, and miniature loads that represent the primary candidates for demand response—pumping, lighting, HVAC, and so on. The display was well received at the annual expo that Edison hosts for its small army of 300 customer service representatives. While these folks promote demand response and energy efficiency on a daily basis, few of them had seen an Auto-DR system working end-to-end.

For the EMS, I opted for a SCADAPack 350 because the standard I/O were well-matched to the task. Digital outputs, wired in parallel with the thermostat's buttons, raised and lowered the setpoint. Analog outputs controlled the lamp brightness and pump speed, and digital outputs controlled the other loads.

Edison's demand response staff walked the onlookers through the process, tracing signals through the visible wiring. The display was actually on-line with the DRAS which triggered simulated events. When the "heads-up" came through, the SCADAPack lowered the thermostat setting by two degrees, a pre-cooling strategy that maximizes HVAC demand reduction. When the event started, the setting was raised to four degrees above normal, and the little air-conditioner shut down. The LED lamp dimmed visibly and the pump's speed and flow rate dropped. A cell-phone charger cycled on and off. All eyes then shifted to the power meter, which registered the drop. At the end of the event, everything returned to normal. Voila!

High-Hanging Fruit

Edison is interested in identifying cost-effective Auto-DR solutions for the 280,000 facilities it serves that have demands less than 500 kilowatts. To that end, the utility is moving to streamline its Auto-DR assessment and qualification process. Low-cost controllers like the SCADAPack have a role here.

Residential customers are not to be ignored. The parade of people leaving WalMart and Best Buy with large-screen TVs is now having an impact on California's statewide demand curves. A second peak shows up at about 7:00 PM every evening, and it's the dominant peak during the winter. While no one is suggesting giving up "American Idol" for demand response, another potentially larger residential load is looming—electric vehicle chargers. Who wouldn't drive several blocks to save 5 cents a gallon on gasoline? Now, think about the daily variations in energy costs and how they might translate to the "fuel" cost of a plug-in vehicle. If we normalize power prices to $3.50 per gallon, a wall plug in our garage might offer "gas" for less than $2.00 per gallon during most nights. Consider what that might do for plug-in vehicle sales. Charging ports are also showing up at the workplace, which can double the commuting range of these vehicles and create more demand response potential there.

Demand response has become an integral and essential part of the 21st Century power grid. For now, it helps reduce power bills and makes the grid more resilient and reliable. Renewables like wind and solar are growing dramatically, and demand response can become a key regulating technology to accommodate their intermittencies.

I've spent my entire career working in the utility industry, and I can honestly that say it's a far more interesting and exciting place than it was to that fresh-out-of-college engineer four decades ago.

— John Howard, P.E.
Power & Process Engineers
Ventura, CA

[1] *NPR, "All Things Considered", interview with Dan Delurey, president of the Demand Response Smart Grid Coalition,, July 7, 2010* http://www.npr.org/templates/story/story.php?storyId=128365808

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Calendar of Events

March 28-31, 2011	**CA-NV/AWWA 2011 Spring Conference**, Long Beach, CA
April 12-15, 2011	**CWEA Annual Conference 2011,** Ontario, CA
April 26-28, 2011	**CA Rural Water Association EXPO 2011,** South Lake Tahoe, NV
May 3-5, 2011	**SCADAPack - TelePACE Studio Ladder Logic Training***, Palm Springs, CA.
May 10-12, 2011	**Control Miscrosystems' SCADAPack - ISaGRAF Training***, Roseville, CA.
May 16-19, 2011	**ClearSCADA Training***, Palm Springs, CA.
May 24-25, 2011	**Control Microsystems Advanced ClearSCADA Training***, Roseville, CA.
May 24-25, 2011	**ENTELEC,** Houston, TX. *Visit Control Microsystems' booth.*
June 8, 2011	**Wine Country Water Works Assoc. 25th Annual Symposium,** Healdsburg, CA
June 14, 2011	**Free SCADAWise Seminar*,** Ontario, CA
June 15, 2011	**Free SCADAWise Seminar***, Roseville, CA
August 18, 2011	**I&C Expo 2011**, San Diego, CA
September 21, 2011	**CWEA Northern Regional Training**, Redding, NV
September 22-24, 2011	**Tri-State Seminar on the River**, Primm, NV
October 17-20, 2011	**CA-NV AWWA 2011 Fall Conference**, Reno, NV
October 24-27, 2011	**ClearSCADA Training***, Mill Valley, CA
November 1-3, 2011	**SCADAPack - TelePACE Studio Ladder Logic Training***, Mill Valley, CA
November 15-18, 2011	**USCID Sixth International Conference on Irrigation & Drainage,** San Diego, CA

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