Telemetry & SCADA Solutions in the Water Industry

An overview of Industry problems including security, communication protocols, pump management and wide area deployment.

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By 2050, the world will be a different place…

Critical and growing need for access to water

Growing world population +34%
World population living under water stress +40%
Projected increase in water demand +55%

1.4 Billion People without access to basic sanitation
240 Million People without access to an improved water source

Source: OECD (2012)
Main challenges faced by industrials & municipalities

- Ageing infrastructure
- Increased regulation
- Business factors (CAPEX decrease/ OPEX increase)
- Conservation and efficiency
- Energy costs
- Ageing workforce
- Environmental impact
- Climate change
- New water sources, recycle and reuse
- Infrastructure and cyber security
At Schneider Electric

Through our innovative smart water technologies and services, we help make water safe, reliable, sustainable and efficient across the entire water cycle.
Water resources: Enhance irrigation and water resource monitoring and management processes through a combination of telemetry, industry-leading weather services, and other intelligence enabling technologies.

Water treatment: The most comprehensive portfolio of automation, electrical, security, and plant optimization products and services for integrated solutions to ensure continued treatment and production of clean drinking water.

Desalination: Reduced risk for our customers by providing safe, reliable and efficient electrical distribution and automation solutions working with the top EPC’s.

Water networks: Minimize leakage, reduce operational costs, and maintain service quality through advanced asset management, network optimization, and water loss management technologies.

Wastewater networks: Achieve improved efficiency within wastewater lift/pump stations and collection network processes through our remote telemetry, intelligent power, and pump optimization solutions.

Wastewater treatment: The most comprehensive portfolio of automation, electrical, security, plant optimization and energy management products and services for advanced process control and up to 30% reduction in overall energy costs.
… through integrated architecture
from shop floor to top floor across the full water cycle

Products, solutions & services from field to enterprise

**Plant & Network optimization**
- Pump optimization, pump asset monitoring, network operation optimization, temperature optimization

**Plant & Network management**
- Energy monitoring, GIS, water network online simulation, cooling/heating network online simulation, EAM, NRW management, mobile asset management, weather services

**Automation & Control**
- SCADA/HMI, DCS, telemetry, PAC/PLC, instrumentation, motor control, communications

**Electrical Distribution**
- Power monitoring and meters, substation automation, LV, MV, power protection and control

**Critical Power and Cooling**
- Secure power, racks and enclosures, IT room management

**Facility Security & Safety**
- Video security, access control, fire and life safety, emergency lighting

**Business management**
- Energy and sustainability services, performance contracting, field services, cyber security, system integration, business intelligence systems, data historian

You deserve smart water

Method and integrated systems + Right information, right user, right time = Up to 20% savings on OpEx & CapEx

Life Is On | Schneider Electric
What makes Telemetry different?

- Wide Temperature Ranges
- Unreliable or Slow Communication Networks
- Harsh Environments
- Low Power Environments
- Wide Area Deployment
Transforming field data into business relevant information to manage and optimize operation of remote assets in critical infrastructures

Delivering tangible value...

- Connectivity & Integration
  - Make the most of your remote assets
- Production Optimisation
  - Optimise remote asset production
- Reliability & Security
  - Minimize risk of managing and operating remote assets
- Safe Operation & Compliance
- Scalability & Flexibility
  - Minimize cost along lifecycle of remote assets
- Simplicity & Open standards

Transforming field data into business relevant information to manage and optimize operation of remote assets in critical infrastructures
**Business System**

**SCADA Expert ClearSCADA**

**Efficient management of remote assets**
- Optimized to manage large number of remote assets in critical Infrastructures (Water Waste Water, Oil & Gas, Electrical Utilities, Renewable)
- Integrated scalable SCADA with ready to use telemetry features
- Open for easy connection to business and IT systems

**Trio Data Radios**

**Bringing versatility and reliability to your wireless network**
- Licensed/license-free radios for serial and Ethernet communication
- Support for Modbus, DNP3, IEC60870-5-101/104 protocols

**SCADAPack Smart RTU and rPAC**

**Compact, versatile controller for telemetry and remote SCADA solutions**
- SCADAPack
  - Modbus with Flow Measurement capabilities for Oil & Gas applications
  - DNP3/IEC60870 for Water Waste Water applications
- SCADAPack data loggers

**Accutech Wireless Instrumentation**

**Rapid deploy Self-Powered Wireless Instrumentation**
- Widest range of battery-powered instruments
- Available globally in license-free frequency bands 2.4Ghz and 900 MHz
Applications in WWW

Automation & Control in Water & Wastewater

- Asset Operation
- Network Operation
- Energy Operation
- Simulation

Enterprise

Engineering

Operator Station - Historian

Network Operation

- Operator Station
- Historian

Resource Advisor

ERP

Operator Station - Historian

- Operator Station
- Historian

Asset Operation

Network Operation

Energy Operation

Simulation

N1

- Small, simple network
- up to ~100 stations

N2

- Medium network
- Up to ~250 stations

N3

- Large, complex network
- More than ~250 stations

T1

- Wastewater treatment plants
- Small WWTP
- 1.000 to 10.000 PE

T2

- Water treatment plants
- Medium sized city WWTP or WTP
- 10.000 to 100.000 PE.

T3

- Desalination plants
- Large city WWTP or WTP
- 100.000 to 500.000 PE.

T4

- Large urban area WWTP or WTP; Desalination
- > 500.000 PE.

Water and wastewater networks

Water and wastewater plants

Asset Operation

Network Operation

Energy Operation

Simulation

Operator Station - Historian

Resource Advisor

ERP

Operator Station - Historian

- Operator Station
- Historian

Automation & Control in Water & Wastewater

- Asset Operation
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Life Is On

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Addressing Customer Challenges

> Offer Fit

> Complex Network architecture
- different communication media
- redundant solutions
- multiple control rooms, ..

> Comply to specific telemetry standards and features
- protocols (DNP3, WITS, IEC60870-5)
- manage time-stamped data for DB-backfilling
- integrated telemetry solutions with radios, RTUs, instruments

Delivering value in WWW

> Energy Management - Extensive event capture and logging allow customers to optimise their operations to save energy

> Regulatory Compliance – Integrated hardware and software that provide audit trail to meet the regulatory requirements

> Reliable and Secure Operations – End to end diagnostics & maintenance to ensure uninterrupted operations
Telemetry & SCADA Typical Applications in Water and Wastewater

- Pumping Stations (transportation)
- Booster Stations
- Water intake stations
- Pressure valve control stations
- Water storage tanks
- Portable/Modular Drinking water treatment plant
- Portable/Modular Wastewater treatment plants
- Lift Stations
- Rain water storage basin
- Storm water basin
- Ground water monitoring & control
- Irrigation Monitoring & control
- Environmental monitoring
- Water discharge stations
## Applications and Challenges

What are your primary challenges? Here are a few…

<table>
<thead>
<tr>
<th>Water Resources</th>
<th>Water Networks</th>
<th>Wastewater Networks</th>
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</thead>
<tbody>
<tr>
<td><strong>Challenges:</strong></td>
<td><strong>Challenges:</strong></td>
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</tbody>
</table>
| Efficiency – In Water & Energy Use | Critical Infrastructure:  
- Secure & 24/7 Operation  
- Rising Costs & Decreasing Budgets  
- Infrastructure  
- Energy  
- Cellular Data  
- Network management  
- Transparency to stakeholders and customers  
- Strict Reporting Requirements | Critical Infrastructure:  
- Secure & 24/7 Operation  
- Low Power Operation  
- Wide Area Networks & Stranded Assets  
- Efficiency in Energy Use  
- Rising Operation & Maintenance Costs with Decreasing Budgets |
| Strict Reporting Requirements | | |
| Information Transparency | | |
| Wide Area Networks & Stranded Assets | | |
| Critical Infrastructure:  
- Secure  
- 24/7 Operation  
- Low Power operation | | |

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Life Is On

Schneider Electric
Problem: I need to control and optimize my Lift Stations

Schneider Solution:

- Environmental Exposure
- Energy Optimization
- Hazardous Area Classification
- Deployed over a large area
- Critical 24/7/365 operation required
- Multiple communication networks

Challenges:

Ruggedized telemetry equipment with wide operating temperatures (-40°C to 70°C), conformal coating and Hazardous Area Classification (Class I Div II, ATEX)

Solutions can take advantage of TOU electricity pricing and advanced efficient variable speed drives

Wide area deployment is supported through remote firmware and programming configuration decreasing maintenance time, site visits and gives central visibility

Low power modes allow battery backup to last longer, keeping monitoring infrastructure up longer during power disruptions

Multiple communication options allows flexible integration into existing infrastructure as well as taking advantage of lower cost data with optimized data transmission
Pump and Lift Stations

SCADAPack Controller reduces the cost of configuration and deployment and provides instant alarms and control access to mobile operators. When combined with ClearSCADA, pump station templates are provided, allowing for quick and consistent deployment.

- Reduces cost of ownership through remote configuration & diagnostics
- Enhanced security suite supporting encryption & authentication
- Improves operation & compliance through time stamped data & priority reporting
Problem: I need to reduce site visits and have real-time usage information

Schneider Solution:

- Deployed over large area
- 24/7/365 operation required
- Multiple installation types
- Multiple communication networks
- Tampering detection

Challenges:

- Real-time view of demand on system, over wide areas which can be used to inform water management systems like Aquis and SCADA hosts like ClearSCADA
- Operation and recording available on data logging devices that record information independent of end customer power interruptions
- Rugged hardware allows flexible installation options specifically in high temperatures and not needing temperature controlled enclosures, saving both capital and operating cost
- Wide area deployment as well as site-specific restrictions and performance require flexible communication platforms
- Cabinet entry can be monitored and communicated to central control room as well as optional recording without mains power
Demand Billing

SCADAPack intelligent controllers is used by a large water wholesaler in the US serving 28 million people, to provide accurate demand billing information from over 470 sites using a combination on private radio network, public mobile network and Low Earth Orbit Satellite system.

+ Accurate billing information improving revenues
+ High availability through multiple communication links
+ Improves security through data encryption
Problem: I need to have a complete view of my Water Distribution Network 24/7

Schneider Solution:

• Data loss when communication fails
• Network Security
• Manage monitoring and control assets from one location
• System management during inclement weather situations
• Deployed over a large geographical area
• Critical 24/7/365 operation required
• Multiple communication networks

Challenges:

SCADAPack solutions employ DNP3 Level 4 allowing automatic database synchronization and backfilling after communication restoration, preventing loss of data

Tight integration between hardware and software allow secure remote management of firmware and device configuration from central location using secure authentication or encryption

Low power modes allow reporting to continue for extended periods after power failure

Automatic communication failover adds level of robustness to continue operations during inclement weather situations taking advantage of multiple network types

Rugged equipment allows for continued operation even the most demanding environments
Water Quality Monitoring

ClearSCADA maintains data integrity through its inherent ability to synchronise historical events in the database after a communication loss with the intelligent field controllers.

Irrigation Monitoring and Control

SCADAPack E-Series supports time stamped data and buffers less important data until it is convenient for the SCADA host to receive it.
TRSS Products supporting the WWW Offer
Why Choose DNP3 protocol for Water?

- **Open Standard**: Allows integration of equipment from various vendors (which are also using this open standard)

- **Time-stamping of events**: As every input/output and derived data item has its own time-stamp, historical data from the RTU shows what “actually” happened, even with slow polling, or loss of communication

- **Buffering of events**: No loss of data – Even if communication is lost

- **Unsolicited Messaging**: Upon alarm (noticeable event), DNP3 protocol initiates the call to the remote SCADA software (no need to increase the polling rate to catch events, or wait for a poll to happen)

- **Communication Awareness**: DNP3 will automatically retry communication in case the network is down or not performing

- **Peer-to-peer communication**: RTU's can talk to each other, independent of the remote SCADA software allowing for flexible network configurations and reliable inter-site control

- **Secure Authentication**: When changes are requested (start/stop a pump, change the configuration, change the embedded logic), DNP3 ensures the requesting party is authorized to make the change

- **Multiple active SCADA Masters**: Simultaneous connections to multiple active DNP3 SCADA masters, allows data availability even if one master becomes unavailable

- **Data Concentrator**: Data from multiple remote DNP3 sites can be collected via multiple remote protocols and made available from one point
One example of the power of DNP3

Event-driven (DNP3/IEC60870): No Lost data

Data logged in SCADAPack during communication interruption is back-filled in ClearSCADA when communication resumes.
Success Stories

Just a taste!
Al Hessa Irrigation, KSA

Challenge:
• 24/7 Monitoring of water quality
• Reduce travel and on-site time
• Proactive water quality control

Solution
Full scale SCADA solution using:
1500+ SCADAPack RTUs
500+ Trio Radios
1000+ Advantys STB Expansion I/O
6 x 50Kpoint redundant SCADA Expert
clearSCADA Servers
10 x ViewX Clients

Customer Benefits
• Increased confidence in Water Quality
• Increased data integrity and value
• Increased response time to quality issues

Agricultural area in Al Ahsa
• 80 Square Km
• 24,500 Farms in 10 Zones
• 25M + Palm Trees
Anglian Water, UK
Water Loss Solution detects leaks for system reliability and operational efficiency

Customer Challenge
• Maintain position as leading innovator in leakage control and water resource protection
• Detect leaks quicker and improve response times
• Reduce the cost of outsourced leak detection
• Regulatory compliance
• Reduce the cost of ownership

The Solution
• Water Management Suite
• Struxureware SCADA Expert ClearSCADA

Customer Benefits
• Improved decision-making
• Improved water loss management
• More efficient and effective operations

The Results: Life is On with...
500,000 connected telemetry data points

25 years of data to inform decision-making

“Telemetry is incredibly important to us. We’ve got a very large geographical area...and several thousands assets spread across that and we have to monitor them and to make sure they are working and working effectively”

Chris Boucher
Dir. of Information Services, Anglian Water
Customer Challenge
- Design and implement complete, highly interoperable, smart system for electrical, automation and energy management
- Apply the desalination process control system and integrate components seamlessly

The Solution
- Plantstruxure™ Process control system designed and implemented, quickly and seamlessly by Schneider Electric Service experts
- 24-hour technical team to support the critical installation including SCADA/PLCs/VSDs/transfomers and switchgear

Customer Benefits
- 2010 GWI award for Public Water Agency of the Year

The Results: Life is On with...
1500 MWh energy savings

1.5 million people get their drinking water from Sydney Water
Some of the most well known water companies and utilities in the world partner with Schneider Electric.