Orion SCADA

for Electric Utilities

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NovaTech Orion SCADA

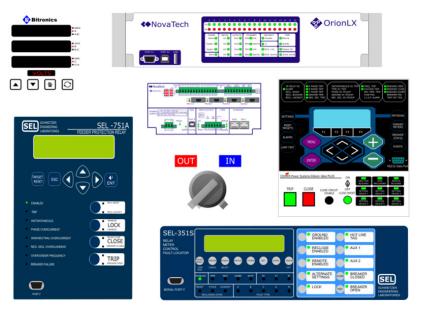
NovaTech Automation produces a license-free, lower-cost SCADA solution for electric cooperatives and municipalities. This document summarizes the key features, the differences between traditional SCADA and Orion SCADA, security features, and customer examples.

Key Features in Orion SCADA

Orion SCADA offers the same features as traditional SCADA, plus additional features for accessing nonoperational data such as fault records from protective relays. Features summarized below:

- System Overview screens
- "Real-time" visibility into substations
 - > Breaker positions
 - > Tap and regulator steps
 - > Relay and apparatus alarms
 - > Weather conditions
- Alarm Annunciation
 - > Preformatted Tile Annunciator
- Sequence of Event Records
- Remote control
 - > Circuit breakers
 - > Reclosers
 - › Voltage regulators
 - > Tap changers
 - > Capacitor bank controllers
- Data Archive and Reporting
- MultiSpeak protocol for transferring data to OMS, Dispatch, AMI, and other systems

- Secure access to non-operational data in protective relays
 - > SEL[®] relay fault records and oscillography
 - > ProView access to Cooper Recloser Controllers
 - > WinECP access to ABB DPU and TPU relays
 - › AcSELerator access to SEL[®] relays

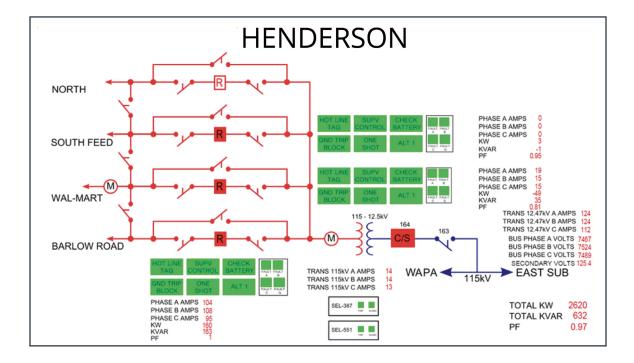


Large library of pre-drawn animated IED faceplates and symbols simplifies screen development.

DC Fuse Acknowledge all on page						
Acknowledge sele	Acknowledge selected FDR2 POTT/BU RLY FUSE FB/R12 On					
BUS BU DIFF FUSE	FDR1 PRI DCB	FDR1 PRI DCB RLY	FDR1 BU DCB FUSE	FDR1 BU DCB RLY	FDR1 FUSE FJ/ECC	
FB/C10	FUSE FB/ECC	FUSE FC/R9	FD/ECC	FUSE FE/R9		
FDR1 DTT TX FUSE	FDR1 DTT RX FUSE	FDR2 RLY/DCB	FDR2 230KV RLY	FDR2 DCB CARR	FDR2 DCB RLY	
FG/ECC	FF/ECC	FUSE FE/R10	FUSE FB/R11	FUSE FA/R13	FUSE FB/R13	
FDR2 POTT TONE	FDR2 POTT/BU RLY	FDR2 DTT TONE	FDR2 DTT RX FUSE	FDR2 DTT TONE	FDR2 DTT TONE TX	
FUSE FB/R12	FUSE FB/R12	SET FUSE FH/C13	FH/C13	MODE FUSE FH/C13	FUSE FC/R12	
FDR1 CB TRIP FUSE	FDR1 CB TRIP BUS	FDR3 CB CTRL	FDR3 CB CLOSE	FDR2 CB CTRL	FDR2 CB CLOSE	
FG/C9		FUSE FE/403P	FUSE FE/403P	FUSE FC/C13	FUSE FC/C13	
FDR1 CB BF TRIP	FDR2 CB BF TRIP	FDR2 CB BF TRIP	TRAN 1 MOAB FUSE	TRAN 1 HSGS FUSE	TRAN 2 MOAB FUSE	
FUSE FA/R9	FUSE FA/R11	FUSE FA/R12	FD/C15	FK/C15	FA/C7	
TRAN 2 HSGS FUSE	TRAN 3 MOAB FUSE	TRAN 3 HSGS FUSE	FDR1 LN MOAB	FDR1 LN MOAB	FDR1 BUS MOAB	
FH/C7	FA/C9	FK/C4	FUSE FN/C9	FUSE TS3-CP1	FUSE FP/C9	
FDR1 BUS MOAB	FDR2 LN MOAB	FDR2 LN MOAB	FDR2 BUS MOAB	FDR2 BUS MOAB		
FUSE TS3-CP1	FUSE FN/C13	FUSE TS3-CP1	FUSE FP/C13	FUSE TS3-CP1		

A typical "Alarm Tile Annunciator" is shown above.

A typical example of a "one-line diagram" is shown below.



Traditional SCADA vs. Orion SCADA

In traditional SCADA, PCs and servers contain all the software. In Orion SCADA, the Orion Automation Platform contains all the software; PCs only browse web pages served out from the Orion. If no PCs are desired at all, the Orion can support a direct connection to a local monitor.



When inside a substation, SCADA webpages for that local substation can be viewed when attached to the Orion RTU. SCADA pages from other substations can also be viewed. Photo is from a Colorado substation.

Orion SCADA Advantage

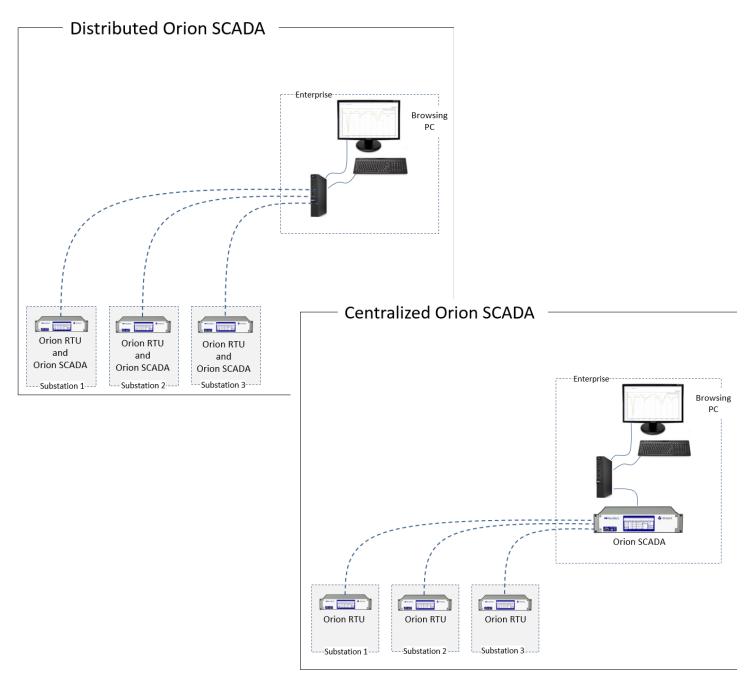
- No licensing fees.
- Orion SCADA maintained by same personnel that work on RTUs.
- Longer life expectancy Users can expect at least 10 years from the Orion when applied as a SCADA host.
- Any SCADA page can be viewed from any Orion RTU in any substation.
- The Orion Direct Video option enables users to connect a monitor to the Orion and view SCADA pages without a PC
- The Orion RTU is designed to access fault records from SEL[®] relays, and provide secure engineering passthrough using relay manufacturers' configuration software.
- Scalability and smaller initial investment.
- Orion SCADA is a good fit for a utility with three substations, or a utility with 30 substations. The investment for the utility with three substations may be only one tenth as much.

Challenges to Traditional SCADA

- Software licensing fees.
- Need for specialized personnel who understand servers and PC architecture.
- Short life expectancy PC-based systems required operating system upgrades every few years.
- SCADA page viewing options limited.
- Use of PCs for page viewing required.
- SCADA system and RTUs not designed for accessing nonoperational data from protective relays.
- Larger initial investment to get started.

Distributed & Centralized Orion SCADA

In Distributed Orion SCADA, the Orion RTUs in the substation serve out SCADA webpages. In Centralized Orion SCADA, an Orion Automation Platform at the enterprise consolidates data from the Orion RTUs in the substations and serves out SCADA webpages.



MultiSpeak Protocol Support





NovaTech is a member of the MultiSpeak Initiative. The MultiSpeak protocol enables breaker status and other data to be transferred from the Orion SCADA system to Outage Management Systems (OMS) from Milsoft, NISC, and other suppliers.



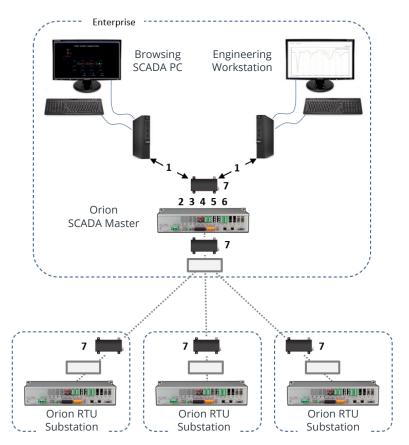
Image courtesy of MultiSpeak website, multispeak.org.

IEC 61850	Server/GOOSE and Client supported
Advanced Math & Logic	Advanced Math & Logic editor built on the powerful Lua programming language. Includes simulation tool.
Alarm/Archive/Retentive	Stores both discrete and analog events based on time (e.g. every 15 minutes) or change (e.g. ON-OFF or analog change out of deadband). Alarm Annunciation and Alarm Archive functionality included in web tables. Retentive function retains alarm status through power cycling.
Configuration Backup Manager	Retrieves configuration files from substation cyber assets (currently Orion configuration files and SEL [®] relay settings), names and zips the files, and stores them in non-volatile Orion memory. MDS checksum available. Useful for tracking configuration changes.
Email	Enables email messages containing alarms, SEL [®] fault record information (<i>Short Event Summary</i> or <i>Full Length Event Report</i>) to be sent out from Orion SCADA.
IEC 61131-3	IEC 61131-3 is a graphical PLC-style editor with five Math & Logic editors: Ladder Diagram, Instruction List, Structured Text, Function Block, and Sequential Flow Chart. Online simulation available.
LogicPak	LogicPak provides pre-configured logic functions for commonly used routines, including: "Calculator" where equations can be typed in using the same format as MS Excel "Delay" where a time delay can be applied to any point before it is report as an Event "AND", "OR" where alarms or health data can be OR'd and AND'd together to simplify SCADA reporting "XYZ" where pulse can be accumulated from energy meters "Primary/Secondary" where data can be accessed from either a primary or secondary IED depending on availability of communications.
Points Blocking	Also known as "Alarm Shelving", enables users to manually and temporarily block the logging or displaying of alarms. Can be useful during commissioning/testing.
Redundancy	Hot Active-Standby Redundancy enables two identical Orion SCADA systems to work together as a redundant pair. Includes features to manage connections to Orion RTUs, and to synchronize HMIs. Monitor or Browsing PC Primary active Orion SCADA Primary active Orion SCADA To Substation RTUs
Relay "Data Logger"	Enables Orion to access full length fault records from $SEL^{(\!R\!)}$ relays and to place records in a file in Orion memory. Requires $SEL^{(\!R\!)}$ client protocol.
Tile Annunciator	A web-based, software-defined alarm annunciation product. The Tile Annunciator webpages are served directly from Orion and provide simplified setup as well as categorization and viewing of active and acknowledged alarms. Requires Alarm/ Archive/Retentive (AAR).

Making Orion SCADA Secure

Orion SCADA provides the highest levels of security to prevent unauthorized access, eliminate eavesdropping, and restrict device control to only users with specific predefined privileges.

The diagram below summarizes security features:



- 1. Use only encrypted communication using secure protocols (HTTPS, SSH, SFTP)
- 2. Use Orion firewall
- 3. Set up users with strong passwords
- 4. Establish specific user privileges (who can do what)
- 5. Use "IP Address Lockout" on controls
 - Only PCs at preauthorized IP addresses
 can control breakers and other apparatus
- 6. Log all access attempts and activity with syslog, and can be sent to a central syslog server
- 7. Install a network data guard, such as "Binary Armor" from Sierra Pacific Corp.
 - Processes every byte to and from Orion ensuring only safe traffic reaches Orion
 - Provides two factor authentication through secure key token
 - FIPS 140.2 encryption for all traffic

Improve Operational Performance with Orion SCADA

The following comments were reported to NovaTech by users of Orion SCADA.

Midwest customer:

- Integration with Outage Management System (OMS)
 - > OMS system is configured to automatically create a device outage based on feedback from SCADA about breaker operations.
 - This helps to streamline operations during an outage and reduce call volume to our dispatcher.
- Data trending
 - Trend KW, KVAR, PF, etc. for breakers during different load cycles.
 - Provides historical data for system studies and contingency analysis.
- Reporting
 - > Custom Substation Reports
 - Overall System Peak Load on each substation during a coincident peak.
 - Substation Peak Max load on substation regardless of coincident loading.
 - > Reporting package
 - Export to Excel
 - Graphs

Southwest customer:

- The SCADA system has eliminated the need to drive to the substation during a power outage, which shortens the outage time for the customer.
- Allows the City to monitor the power factor on individual circuits, and then adjust the capacitance of the system without having to depend upon other companies.

- "We are able to monitor and capture events such as low voltage or high voltage at the bus; this helps when trouble shooting customer complaints."
- History of events can be accumulated such as: breaker trips, breaker lock outs, reclosers blocked or enabled, low voltage events, high voltage events, and maximum amperage for each circuit.
- It allows the dispatcher to determine at a glance the position of the breaker being opened or closed and the position of the load and line side knife blade switches.

Midwest customer:

- Provides secure web access to any user with appropriate access.
- The SCADA system will eliminate the need to drive to the substation during a power outage, which shorten outage times.
- Substation one-line diagrams show the status of the entire sub at a glance dispatch can quickly tell what feeders are open, if any are on Hot Line Tag and if there are voltage issues.
- Feeder breaker zoom screens allow more detailed information to be viewed at the office such as: ground trip blocked, non reclosing, max amperage, power factor, and fault currents.
- Cooper software can be used to remotely log into the substation breakers and regulators to view settings, sequence of events, and make changes if needed.

Customer Application Examples

The four users of Orion SCADA below prepared presentations summarizing their application and experience. Details can be provided upon request.





Other users of NovaTech Orion SCADA:

- Athens Utility Board (TN)
- Augusta (KS)
- Bartow, City of (FL)
- Beatrice Board of Public Works (NE)
- Butler County PUD (NE)
- Chanute (KS)
- Chickasaw Electric Coop (TN)
- Cochran Marine (WA)
- Conway (AR)
- Colby, City of (KS)
- Coles-Moultrie Electric Coop (IL)
- Fairfield, City of (IL)
- Farmington, City of (MO)
- Fremont, City of (NE)

- Gardner (KS)
- Gladstone Power and Light (MI)
- Goodland, City of (KS)
- Hyrum, City of (UT)
- Kinston, City of (NC)
- Kirkwood (MO)
- Lena, Village of (IL)
- Lindsborg, City of (KS)
- Loudon Utilities (TN)
- McPherson, City of (KS)
- Milford, City of (IA)
- Monroe County Electric Coop (IL)
- Natchitoches (LA)
- Nebraska City (NE)
- North Carolina State University



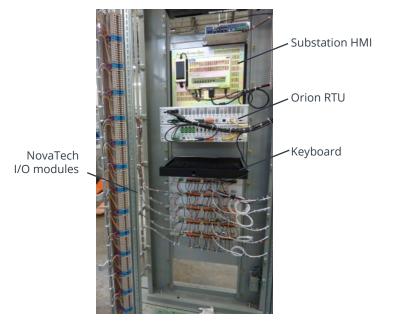


- Norris Public Power District (NE)
- Norris Electric Coop (IL)
- Oak Ridge, City of (TN)
- Pampanga Electrical Cooperative (Philippines)
- Paris, City of (KY)
- Pulaski Electric System (TN)
- Russel, KS (converted from NV+)
- Seward, City of (NE)
- Shrewsbury, City of (MA)
- Siloam Springs, City of (AR)
- Southwestern Electric Cooperative (IL)
- Smithville Electric System (TN)
- United Electric Coop (ID)

NovaTech Engineering Services

Almost half of the NovaTech utility business is comprised of services: engineering design, packaging, commissioning, and training. We work closely with utility customers to define and engineer RTU panels and custom cabinetry, design HMI screens, create special logic, and manage complete web-based SCADA systems. On-site installation, commissioning, and training services are dispatched from local offices in seven US locations to assist users to implement projects quickly and safely. NovaTech provides high levels of post-project support.

Examples of projects shown below:



RTU cabinet for corn processing plant



The new RTU cabinet located at Keys Energy Thompson Street Substation



Rob DePhillips, Keys Energy Project Engineer, in front of the new RTU cabinet located at Thompson Street Substation



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