



Complete IEC 61850 Product Family

Simplify IEC 61850 Applications

SEL-2411
Control and Monitoring



SEL-451-4 Bay Control



SEL-2440 Control and Monitoring



SEL-487B Bus



Transformer

SEL-387E



SEL-487E



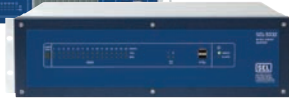
acSELERATOR
Configuration Software



SEL-3354 Computer



SEL-3332
Intelligent Server



SEL-421 Distance



SEL-311L Current Differential



SEL-487V Capacitor Bank



SEL-351, -351A, -351S Distribution



SEL-451 Distribution



SEL-787



SEL-2414



SEL-710
Motor



SEL-751A
Feeder



SEL-700G
Generator



SEL-700GW
Wind Power



SEL-700GT
Intertie



Combine IEC 61850 technology, Ethernet networking, and SEL high reliability to perform station protection, automation, and control.

Use Ethernet networks for protection, integration, automation, and synchrophasors via IEC 61850 and other protocols.

■ **Streamline Configuration With acSELERATOR Architect® SEL-5032 Software**

Easily configure and document IEC 61850 communications between devices from multiple suppliers.

■ **Easily Change Relay Message Configuration**

SEL relays accept Configured IED Description (CID) files to change the configuration of the IEC 61850 messages, as called for by the standard. Devices from other suppliers use CID files to document the messages, but require firmware changes or nonstandard settings methods to modify message configuration.

■ **Combine Multiple Ethernet Technologies**

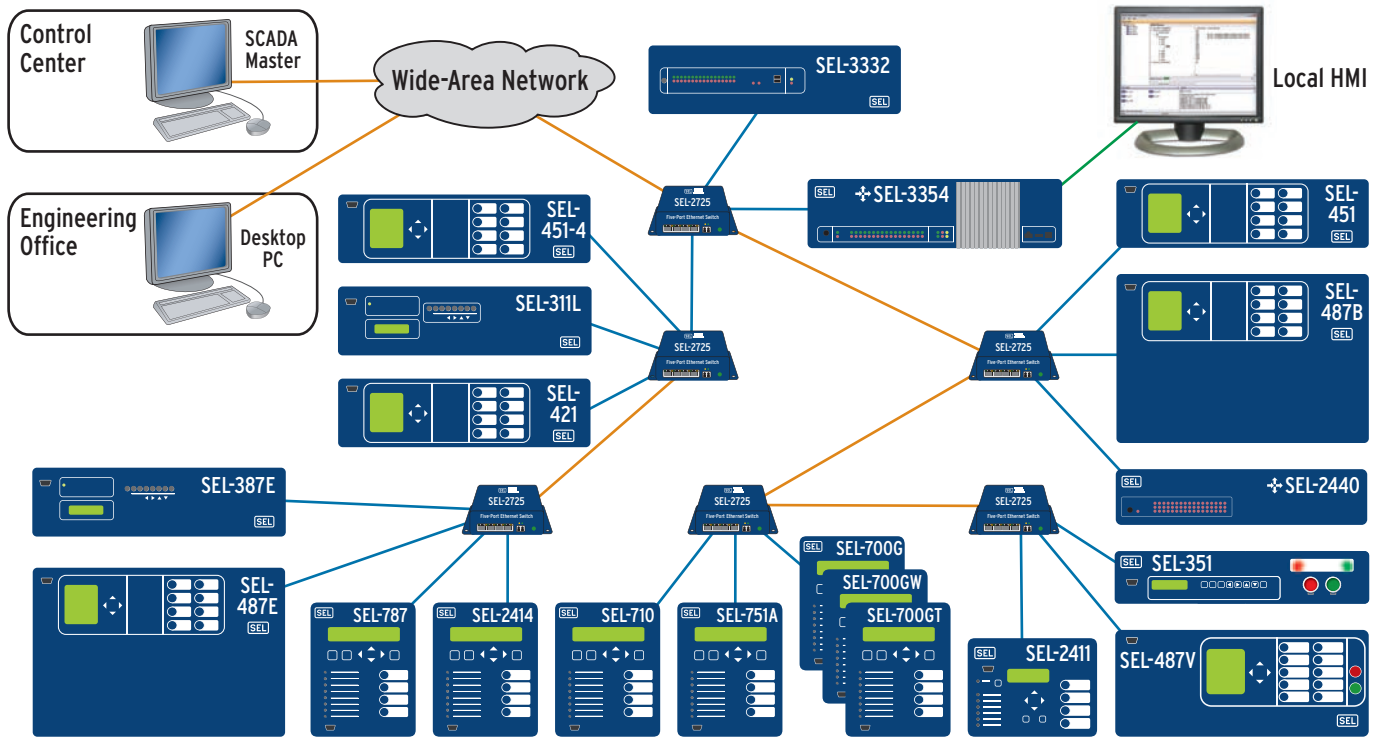
Merge appropriate new Ethernet technologies with existing, proven best engineering practices.

■ **Decrease Maintenance Costs**

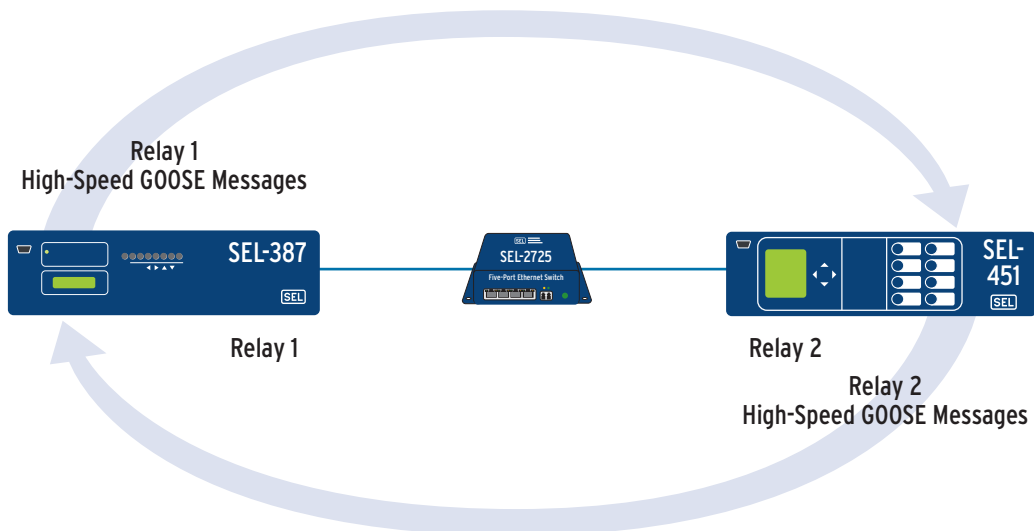
Reduce initial cost and maintenance using highly reliable devices with sophisticated self-testing and diagnostics.

Making Electric Power Safer, More Reliable, and More Economical®

Example System Applications



Display and control using operational data in IEC 61850 logical nodes via local-area network (LAN) for local HMI and wide-area network (WAN) for remote SCADA. Engineers use WAN to configure devices and to retrieve and analyze event reports and sequential events records.



Use IEC 61850 GOOSE messages to communicate high-speed information between local relays or other devices on the LAN. Examples include breaker position, breaker trip, interlocking, and load-shedding commands.

Example Installations

La Venta II Substation in Mexico

Wind Park La Venta II is the world's first substation to show IEC 61850 in action within protective relays from a wide variety of vendors and to prove interoperability among these devices. In October of 2006, IBERINCO Project Manager Daniel Lancha reported the substation's successful energization, saying, *"This is, without any doubt, a great advancement for the integration of control and protection systems, and for integration of the IEC 61850 international standard."*

SEL provided the majority of the relays; the RTU functions to the SCADA system; station-level, peer-to-peer, and client-server integration; bay-control logic, panel design, and construction; acceptance testing, commissioning assistance, and training as a supplier to the main contractor, IBERINCO.



First substation energized with true multisupplier integrated system using IEC 61850—La Venta II substation, Juchitán, Oaxaca, Mexico.

Thirty-Substation Modernization Project in Brazil

This project includes the complete modernization of 30 distribution substations belonging to Elektro Eletricidade e Serviços S.A., a large electric distribution utility in Brazil. SEL is responsible for designing, furnishing, and installing complete integrated systems using the IEC 61850 suite of protocols. The first of the stations energized in mid-2007, using GOOSE messages between devices for the following functions:

- Breaker failure and busbar protection
- Automatic line transfer and load transfer between transformers
- Neutral-protection automatic transfer
- Automatic substation restoration

A technical paper presentation in 2008 by Elektro and SEL reported that *"after the station was energized, a transformer fault occurred. The logic restored service to 17,000 customers in seconds, compared to the 1.5 hours it would have taken before the new system was installed."*

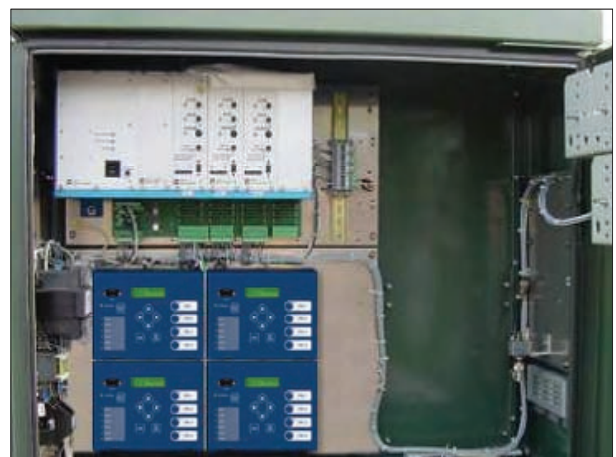


Guarujá 2, the first of 30 substations energized in a major modernization project for Elektro Eletricidade e Serviços in Brazil.

RTU Replacement in the United States

An electric utility distribution group evaluated replacing pad-mounted switch remote terminal units with IEC 61850-compatible programmable automation controllers (PACs). The group needed various I/O types and an easily scalable solution to support the different I/O requirements for each of three types of switches.

The system includes integration with the utility's radio communications network, including serial and Ethernet connections for SCADA, remote engineering access, and peer-to-peer communications.



RTU replacement with four programmable automation controllers communicating via high-speed Ethernet links.

SEL COMPLETE IEC 61



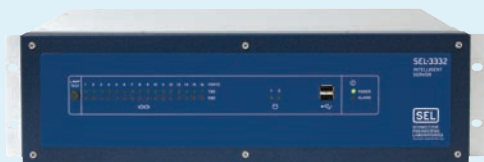
Substations and Plants

Perform high-speed control and data acquisition; protect and monitor motors; replace RTUs, PLCs, and other controllers.



Transmission Line

Apply innovative distance and line-current differential protection as part of a comprehensive station automation package.



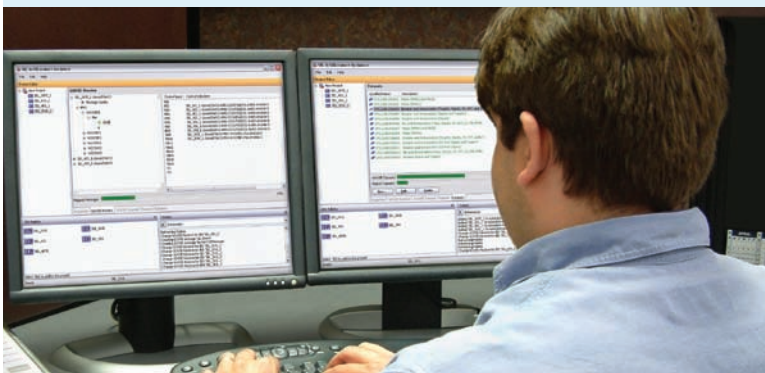
Intelligent Server and Computer

Improve reliability and decrease maintenance with a rugged computing platform. Perform HMI, SCADA gateway, and Ethernet network configuration, diagnostics, and testing.



Distribution Line/Feeder

Combine directional overcurrent protection with complete control for a two-breaker bay, or protect and monitor individual feeders.



850 PRODUCT FAMILY



Bus

Protection for busbar faults and breaker failure.



Bay Control

Quickly integrate bay control for breakers and disconnect switches with full automation and protection in one device.



Capacitor

Protect and control capacitor banks.



Generation

Protect and monitor conventional generation, windpower, and distributed generation inertias.



Transformer

Perform protection, monitoring, and automation applications for important transformers, generators, and other power apparatus.



SEL acSELERATOR® Software Suite

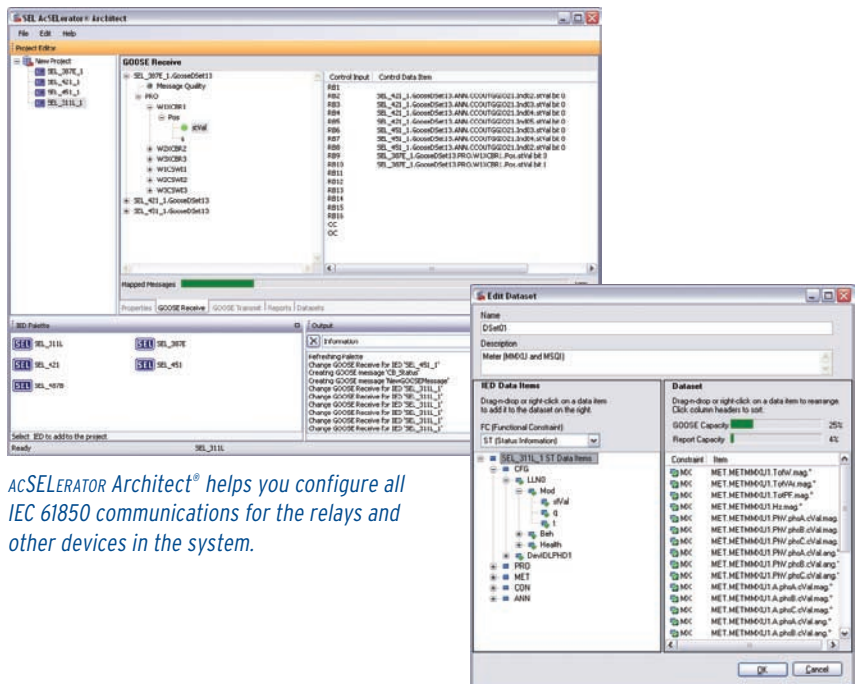
Streamline System Design With acSELERATOR Architect

Easily configure and document IEC 61850 communications between devices from several suppliers by using acSELERATOR Architect.

- Import and export Substation Configuration Language (SCL) files to simplify system implementation.
- Detect and report errors by automatically comparing SCL files to the IEC 61850 requirements.
- Reduce engineering effort with intuitive drag-and-drop graphical user interface.

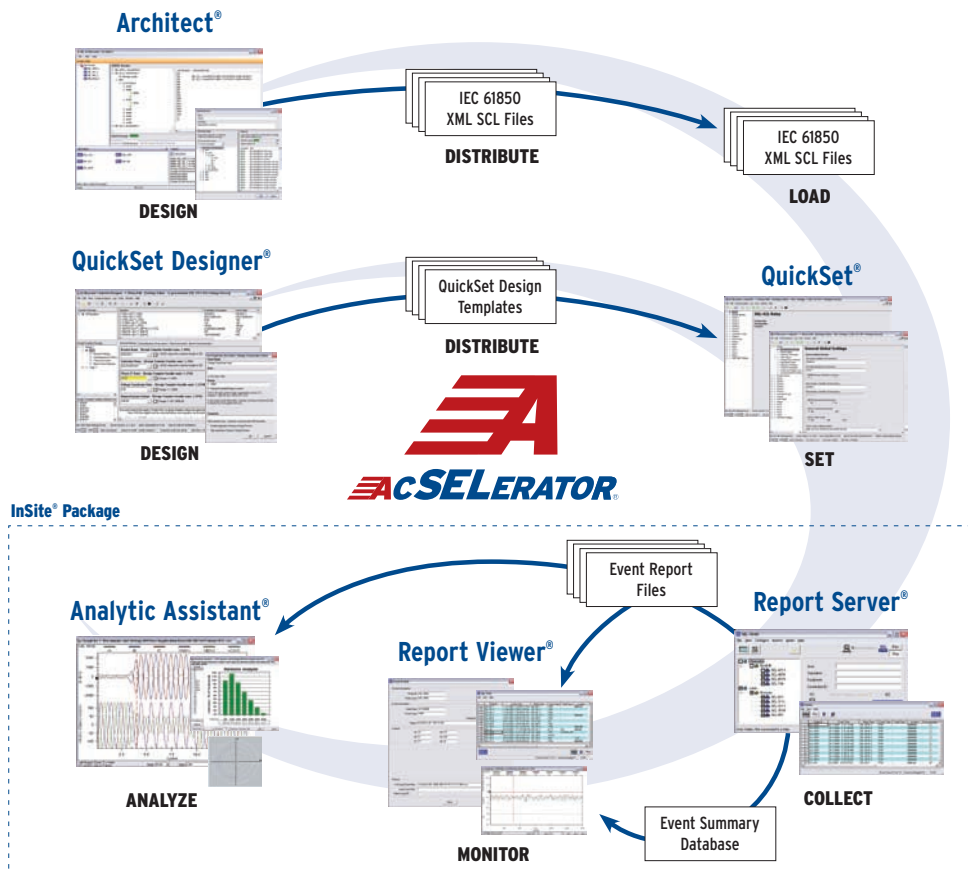
Reduce Engineering Effort With IEC 61850 Substation Configuration Language

Standardized and automated methods create and implement configuration information. Multiple suppliers use SCL files to report IED communications capabilities. Only SEL relays configure their communications based on received SCL files.



acSELERATOR Architect® helps you configure all IEC 61850 communications for the relays and other devices in the system.

Easily edit data sets for GOOSE messages and reports.



Apply acSELERATOR® Software to design and check IEC 61850 configurations (Architect®), create relay setting Design Templates (QuickSet Designer®), set devices (QuickSet®), and automatically collect (Report Server®), view (Report Viewer®), and analyze (Analytic Assistant®) oscillographic event reports.

Streamline Commissioning and Maintenance With Built-In Tools

New Tools for New Data Paths

Conventional protection and control systems convey control information between devices with hard-wired contact outputs and inputs. To diagnose problems in these hard-wired systems, engineers or technicians measured the signal state on each wire. In a system that uses GOOSE messages instead of hard-wiring, they must use alternative methods to determine that control signals are exchanged correctly.

Without "as built" drawings to document connections and logic, configuration revision control is even more important.

Retrieve GOOSE Reports

Quickly solve problems by capturing GOOSE reports with Telnet or through a serial link to review and analyze configuration, network settings, statistics, and diagnostic status points.

```
GOOSE Transmit Status

Reference: PAC_MASTER_01CFG/LLN0$GO$Dset14_PAC_M_DO
MultiCastAddr  Ptag:Vlan StNum  SqNum  TTL  Code
-----
01-0C-CD-01-00-05  4:2   367   10298  1000
Data Set: PAC_MASTER_01CFG/LLN0$Dset14_PAC_M_DO

GOOSE Receive Status

Reference: PAC_SLAVE_A_01CFG/LLN0$GO$Dset14_PAC_A_DI
MultiCastAddr  Ptag:Vlan StNum  SqNum  TTL  Code
-----
01-0C-CD-01-00-01  4:2    60   18106  1198
Data Set: PAC_SLAVE_A_01CFG /LLN0$Dset14_PAC_A_DI

Reference: PAC_SLAVE_A_01CFG/LLN0$GO$Dset15_PAC_A_AI
MultiCastAddr  Ptag:Vlan StNum  SqNum  TTL  Code
-----
01-0C-CD-01-00-02  4:2  73185    5     378
Data Set: PAC_SLAVE_A_01CFG /LLN0$Dset15_PAC_A_AI

Reference: PAC_SLAVE_B_01CFG /LLN0$GO$Dset14_PAC_B_AI
MultiCastAddr  Ptag:Vlan StNum  SqNum  TTL  Code
-----
01-0C-CD-01-00-03  4:2  102353    3     116
Data Set: PAC_SLAVE_B_01CFG /LLN0$Dset14_PAC_B_AI

Reference: PAC_SLAVE_C_01CFG /LLN0$GO$Dset14_PAC_C_AI
MultiCastAddr  Ptag:Vlan StNum  SqNum  TTL  Code
-----
01-0C-CD-01-00-04  4:2  93732    6      0  TTL EXPIRED
Data Set: PAC_SLAVE_C_01CFG /LLN0$Dset14_PAC_C_AI
```

Quickly identify failures and error codes with built-in diagnostics.

Display GOOSE Message Status on HMI

Set the display points in SEL-2411 Programmable Automation Controllers or relays to indicate the failures detected by GOOSE message diagnostics. Display GOOSE bits to replace the measurements you would use to diagnose problems in hard-wired systems.

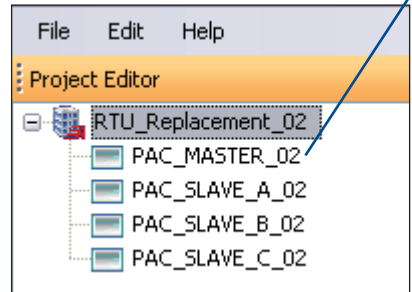


Easily Implement Revision Control

Increment the revision number each time project or IED configuration is modified. Use Telnet or a serial link to retrieve IED information from the device: The device ID shows the device type, and the IED name includes the network name and revision number.

```
"FID=PAC-R200-V0-Z002002-D20070810","08CB"
"DEVID=PAC_MASTER","05E0"
"iedName=PAC_MASTER_01","07F8"
"type=PAC","047A"
"configVersion=ICD-PAC-R201-V0-Z002002-D20080108","0D42"
```

Easily identify configuration version mismatches.



The ConfigVersion variable in acSELERATOR Architect® Project Editor defines the default SCL file.

SEL Complete IEC 61850 Product Family

IEC 61850 Device Capability Summary

IEC 61850 Configuration

Each SEL-300, -400, -700, and -2400 series product receives SCL CID files to configure device IEC 61850 messages.

IEC 61850 Connections

- Six simultaneous sessions for logical nodes
- Six buffered control blocks (reports)
- Six unbuffered control blocks (reports)
- Publish up to eight outgoing GOOSE messages
- Maximize GOOSE message subscriptions:

SEL Series	Number of Messages
SEL-400	24
SEL-300, -700, -2400	16

SEL-3332 OPC

- Access for IEC 61850 client functions
- Publisher and subscriber interface

Application Summary

Complete Solutions

SEL provides worldwide IEC 61850 support and services in addition to our complete product family.

Field-Proven Product Reliability

SEL Ethernet devices thrive in harsh station environments, with up to 50 times higher reliability than other substation devices.

Multifunction Ethernet Networks

SEL technology combines all Ethernet protocols on one LAN.

Interoperable Ethernet Networks

SEL devices are proven to interoperate with devices from many suppliers.

Configure IEC 61850 Messages Via Files

SEL devices accept SCL files that define IEC 61850 messages. Contrast this to many non-SEL devices that require firmware changes to modify the IEC 61850 messages.

Related Products



SEL-2725 Five-Port Ethernet Switch

Install this tough, unmanaged, five-port switch and copper-to-fiber media converter to build reliable, safe Ethernet networks in electrical substations, generating plants, industrial plants, and other mission-critical sites. Unmanaged switches have no settings, so it is very easy to build a small or medium-sized instrumentation and control network using unmanaged switches.

If your local network has enough other traffic to require a managed switch, use an SEL-2725 for each edge switch to communicate directly with nearby IEDs, and connect them with optical fiber to a centrally located managed switch.

The SEL-2725 withstands vibration, electrical surges, electrostatic discharge, fast transients, and extreme temperatures. It meets or exceeds IEEE 1613 (Class 2) and IEC 61850-3 standards for communications networking devices in electric power substations. The SEL-2725 drops no packets throughout this rigorous testing!



SEL-C627 Shielded Ethernet Cables

Install shielded, twisted-pair (STP) Category 5e Ethernet cables to connect devices to the edge switches in your network. Use shielded cables for greater noise immunity than office-class unshielded, twisted-pair (UTP) cables.



SEL-C807 Fiber-Optic Ethernet Cables

SEL provides high-quality terminated fiber-optic cables for safe, noise-free Ethernet connections to IEDs, computers, and networking components.



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