Simplify IEC 61850 Applications

- 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.

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.”

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

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.

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

Distribution Line/Feeder
Combine directional overcurrent protection with complete control for a two-breaker bay, or protect and monitor individual feeders.
Bus
Protection for busbar faults and breaker failure.

Capacitor
Protect and control capacitor banks.

Generation
Protect and monitor conventional generation, windpower, and distributed generation interties.

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

Transformer
Perform protection, monitoring, and automation applications for important transformers, generators, and other power apparatus.
Streamline System Design With SEL acSELErator® Architect

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

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.

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.

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

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

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.