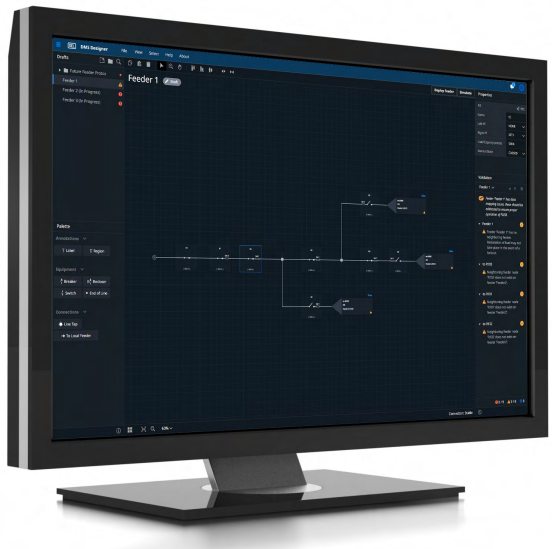
Fault Location, Isolation, and Service Restoration (FLISR)

Part of SEL Distribution Management System, a Blueframe Application Suite



Key Features and Benefits

- **Rapidly Detect Faults and Respond.** FLISR continuously monitors switching devices through a supported protocol connection and automatically detects permanent faults. After protection devices complete their action, FLISR isolates the fault and restores load from one or more neighboring sources. It maximizes the load restored and available margin and minimizes switching operations to increase field equipment life.
- **Streamline Feeder Configuration.** Build your system in minutes using an intuitive graphical interface that allows you to draw each feeder on a digital canvas. Simply drag and drop breakers, reclosers, and switches onto the screen, connect them, and add values for a few settings. Once configured, move feeders to testing or deployment at the click of a button.
- **Easily Scale Your System.** Scale your FLISR system one feeder at a time using the DMS Designer application. This eliminates the complexity of configuring a large distribution system. Deployed feeders remain operational while new feeders are configured.
- **Directly Test Performance and Safety.** The FLISR application package includes a simulator that allows you to test new feeder configurations and changes to existing configurations directly in Blueframe, without interrupting the live system. Integrating simulation in the configuration and commissioning process is also useful for operations training and for evaluating hypothetical scenarios during distribution design.
- **Automatically Generate Detailed Reports.** FLISR automatically creates reports that describe event type and location information, mitigation steps taken, any problems encountered, and a time sequence of events.
- **Integrate Existing Field Devices.** Deploy FLISR economically using existing breakers, reclosers, and switch controls that support the DNP3 protocol. As your system grows, add devices to existing feeder configurations at no additional cost.

Product Overview

SEL Distribution Management System (DMS) is a suite of integrated wide-area control applications designed to continuously monitor, optimize, and control distribution systems. DMS currently includes FLISR and DMS Designer, with more applications coming soon.

FLISR is a solution that reduces customer outage times during a permanent fault. It continuously monitors breakers, reclosers, and switches for a permanent fault and takes over after any involved protection is finished. FLISR opens switching devices to isolate the faulted area and uses adjacent sources to restore power to as many customers as possible. FLISR supports any circuit breaker, recloser, or switch control that uses the DNP3 protocol.

DMS Designer allows you to configure and test your system via a web-based interface. It is simple to use and allows you to easily scale to a large distribution system. The DMS suite does not require complicated modeling software, such as Geographic Information System (GIS) software, to function—all it requires is distribution feeder topology. Its graphical interface and integrated simulator allow you to build and test your system in minutes. Once tested and deployed, the feeder configuration transforms into the live view in the FLISR application, providing you with at-a-glance status information in the web browser.

DMS applications run as secure, container-based technology on SEL Blueframe, a secure embedded application platform. Deploy SEL Blueframe on any of the SEL computing platforms (SEL-3350, SEL-3355, and SEL-3360) or virtual machines.

Applications

FLISR

Continuously monitor the distribution system and provide fully automated service restoration. See your system's status at a glance using built-in graphical feeder topology. Additionally, issue behavior controls and view data from field devices.

DMS Designer

Configure your FLISR system using a digital canvas that allows you to draw settings one feeder at a time. Easily set device-specific settings and receive validation and error notifications that help you efficiently and successfully deploy your system.

Deployment Options

Centralized FLISR

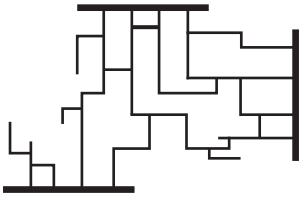


Figure 1 FLISR Installed on a Single Blueframe Instance

FLISR is well-suited to a centralized deployment. FLISR is designed to scale, making it equally simple to deploy the 1st, 10th, and 100th feeder without affecting currently deployed feeders. FLISR is designed to run on SEL's secure Blueframe operating system but is built using the same technology as modern cloud-native applications. It supports SEL's rugged computing platforms as well as a virtualized environment and a private Blueframe cluster.

Regional FLISR (Coming Soon)

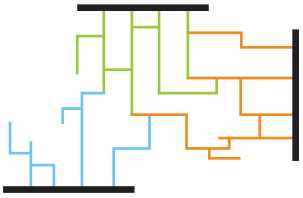
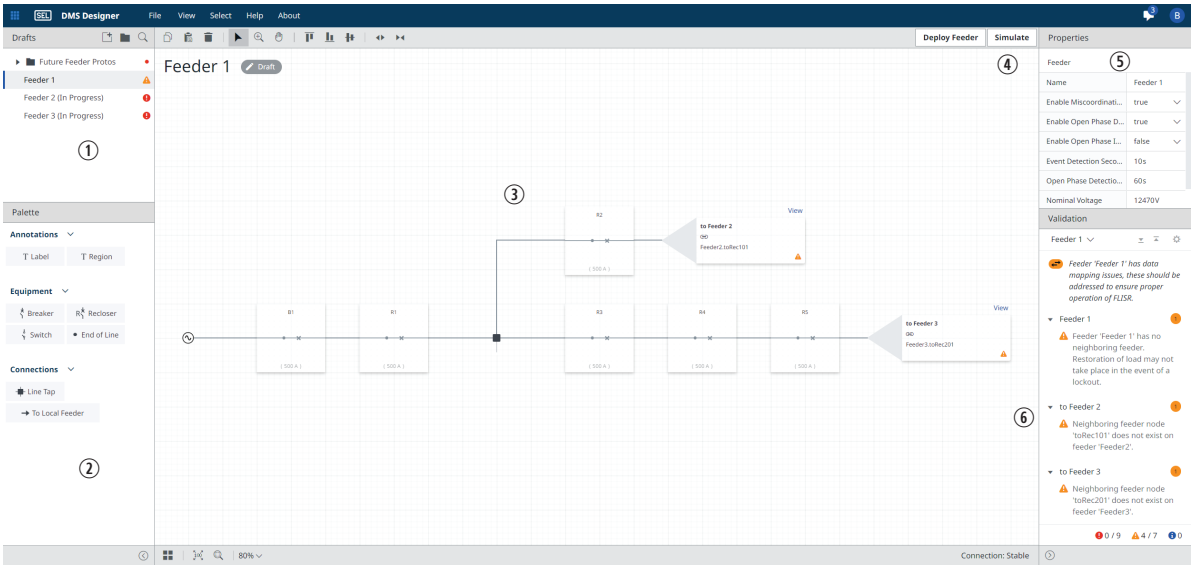


Figure 2 FLISR Installed at Each Substation

FLISR was built to be distributable, enabling utilities to push their automation intelligence solutions toward the grid edge. Many utilities deploy FLISR in regions, zones, or substations. This could mean the physical distribution of Blueframe instances or the organizational distribution of settings across multiple co-located Blueframe instances. Distributed systems can be more resilient to severe weather conditions and reduce the communications burden placed on radio systems.

User Interface

DMS Designer



① **Feeder Settings.** Each feeder has a dedicated digital canvas where settings are drawn, which allows you to scale your system without adding complexity. Navigate to or search for feeders from this location.

② **Palette.** To draw your settings, simply drag and drop items from the palette onto the digital canvas.

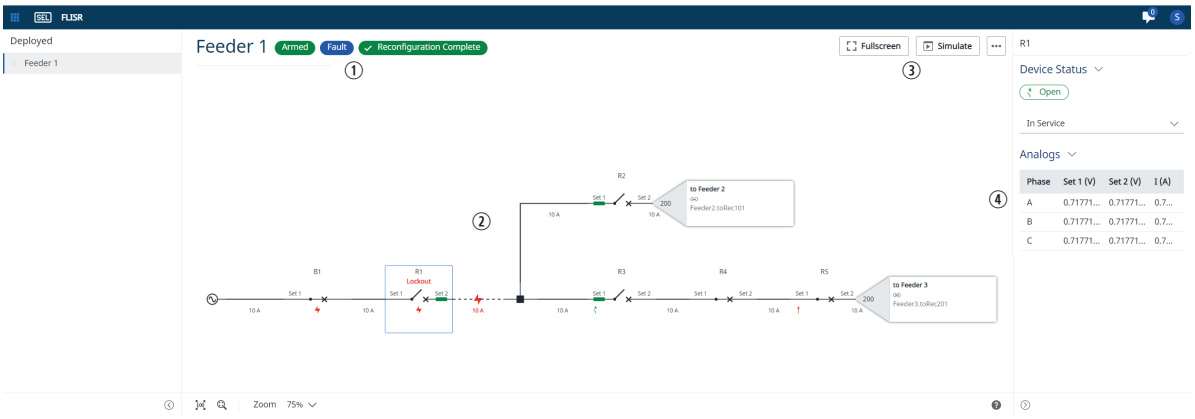
③ **Digital Canvas.** Draw your settings quickly using DMS Designer's digital canvas. Once commissioned, the diagram you draw becomes the FLISR application view, providing at-a-glance insight into your system's status and operations.

④ **Integrated Simulator.** Test your system with a simulator that launches at the click of a button.

⑤ **Property Grid.** Quickly set device-specific settings for your system.

⑥ **System Validation.** Active validation and error notifications help you efficiently and successfully configure your system.

FLISR



① **Status Indicators.** See FLISR's current state with color-coded status indicators.

② **Graphical Feeder Topology.** See your system operate at a glance using the built-in graphical feeder topology.

③ **Behavior Controls.** Issue behavior controls, such as automated "Return to Normal."

④ **Detail Pane.** View data received from field devices.

SEL Blueframe Application Platform

Platform

DMS applications run on the SEL Blueframe application platform. Blueframe is a secure, embedded container-based system for installing SEL applications and for managing and exchanging data between supported applications. Blueframe is designed to minimize the attack surface and includes several security measures, like allowlisting, to prevent unauthorized access and attacks. It provides a scalable and customizable solution to accommodate your specific needs.

Hardware

Blueframe runs on powerful and reliable SEL computing platforms that ensure system availability in the most demanding applications and environments. Select the right hardware for your application by choosing from models that offer a variety of processing power options, drives, memory modules, expansion capabilities, and form factors. Blueframe and its specialized applications come embedded in your chosen computing platform.

Blueframe can also be deployed virtually on other server-grade hardware through a subscription contract. For more information about virtual deployments and minimum hardware requirements, contact us at blueframe_sales@selinc.com.

Specifications

- Event Detection Capabilities: Permanent fault with and without miscoordination
- Supported Protocols: DNP3 Client and Server
- Scalability: By feeder
- Operating System: SEL Blueframe
- Deployment Options: Embedded on SEL computing platforms or virtualized on server-grade hardware

Technical Support

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

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