Operational Technology (OT) Software-Defined Networking (SDN)

Engineer a better OT network

- Establish deny-by-default, zero-trust LAN access control.
- Improve network failover times to under 1 ms to support demanding real-time control applications, like sample measured values.
- Configure an entire IEC 61850 network within minutes using network drawings and Substation Configuration Description (SCD) files.
- Manage multiple networks from a single controller.
- Improve situational awareness with a modern, intuitive network management system.

Key Features

Use SDN to Optimize OT Networks

Traditional Ethernet switches generally behave similarly regardless of the environment—one size fits all. With OT SDN, LAN switching can be tuned or optimized for the specific requirements of the environment. SEL has implemented SDN with the goal of optimizing an OT network. OT SDN allows you to purpose-engineer networks like you purpose-engineer the power system.

Perform System-Wide Network Configuration Automatically

The SEL-5056 Network Management System (NMS) innovates OT LAN engineering and deployment by configuring entire networks at once rather than setting up individual switches manually. With a simple import function, the SEL-5056 uses IEC 61850 files and CSV files generated from your network drawings to automatically provision circuits, allowing you to configure a large IEC 61850 network within minutes. This capability reduces manual data entry, accelerates deployment, and ensures accuracy across large-scale OT systems. By configuring a network using a drawing, the SEL-5056 NMS offers a single source of truth for both people and technology.

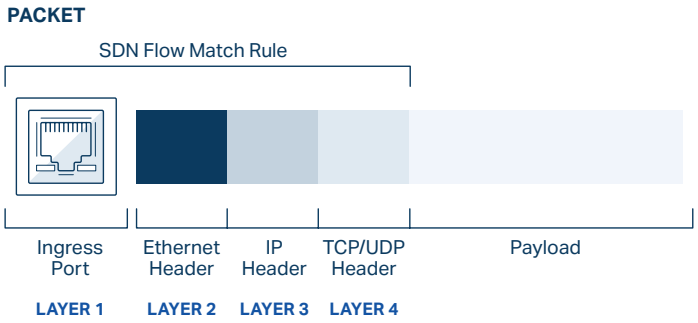
Eliminate Cyber Vulnerabilities

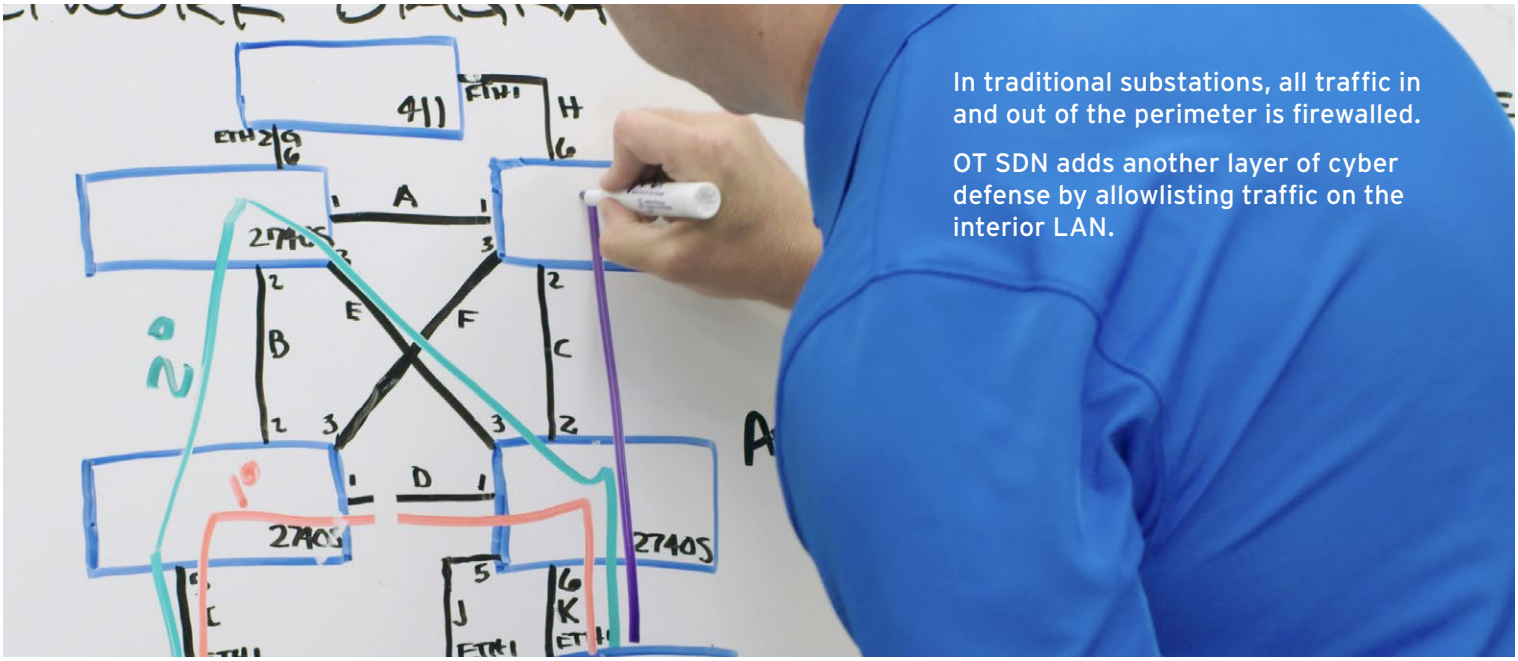
Traditional networks use features like media access control (MAC) tables, the Rapid Spanning Tree Protocol (RSTP), and cast types for many conveniences, including plug-and-play functionality. However, these features also make traditional networking vulnerable to cybersecurity threats, including MAC flooding and table poisoning, Address Resolution Protocol (ARP) spoofing, Bridge Protocol Data Unit (BPDU) attacks, and more. With OT SDN, all network flows and backup paths are proactively traffic-engineered, so there is no need for MAC tables or RSTP. In addition, OT SDN uses traffic engineering to process forwarding behavior, rather than relying on cast types.

Allowlist All LAN Traffic

OT SDN provides deny-by-default, multilayer packet inspection at each hop to control what conversations each device is allowed to have on the network. Packets that do not match the rules do not get forwarded.

OT SDN provides strict network access control on both north-south and east-west traffic on the LAN. This provides protection against attacks that physically take place inside the firewalls and also adds protection against unauthorized traffic that slips past firewalls.





Manage Multiple Networks Securely From a Single Controller

The SEL-5056 provides a central controller for the configuration, management, and monitoring of all SEL SDN switches. The SEL-5056 centralizes change management, becoming the single point from which users can modify the network. This provides advanced situational awareness and certainty that users know exactly what devices are on their network and what communications each one is engaged in.

OT SDN switches have no engineering access user interfaces, saving you time and money, as there is no need to manage those accounts and passwords. SEL-5056 communication to all OT SDN switches occurs through encrypted and authenticated Transport Layer Security (TLS). Keys are securely managed through X.509 certificates.

Network Failover Times

Traditional RSTP Switches	OT SDN Switches
<10 ms	**<1 ms**

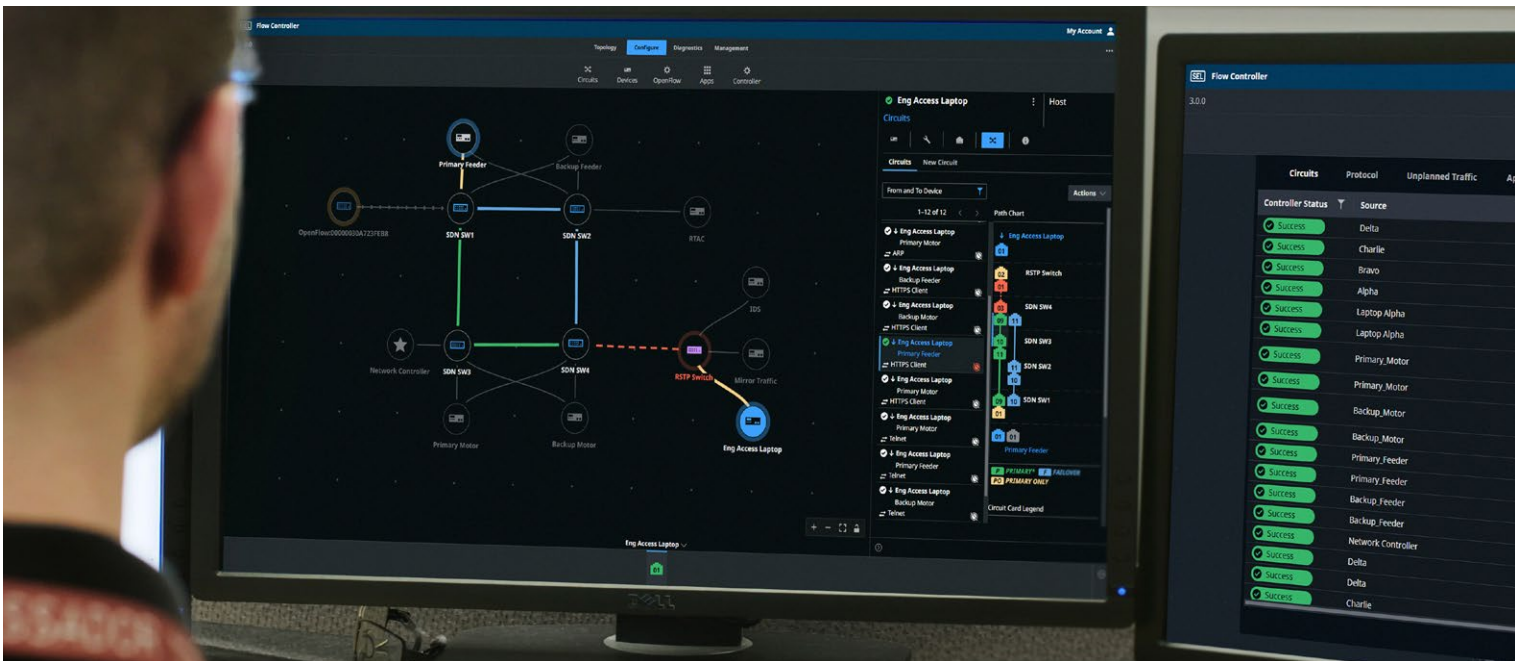
You can configure user accounts on the SEL-5056 or use the Lightweight Directory Access Protocol (LDAP) to authenticate users. The OT SDN solution supports Syslog for secure log management. In addition, the SEL-5056 provides backup and restore features for maintaining high reliability.

Reduce Network Failover Times by Two Orders of Magnitude

The SEL-5056 configures redundant paths for each circuit. This enables OT SDN switches to heal the network significantly faster than RSTP Ethernet switches because there is no waiting for discovery or convergence times. This fast failover is critical for applications using IEC 61850 GOOSE messages and IEC 61850-9-2 Sampled Values (SV).

Control Network Traffic With Greater Precision

With OT SDN, it's easier to manage large amounts of network traffic than it is with traditional networking. The difference is that OT SDN eliminates unnecessary traffic on your network. Instead of having a node broadcast to all other nodes on the LAN, you can engineer specific paths and remove the extraneous ones. This ensures bandwidth availability and high performance in critical applications, such as IEC 61850 GOOSE messaging. And unlike RSTP switches, there are no blocked ports limiting bandwidth. For Ethernet-based control, OT SDN eliminates several problems inherent in traditional Ethernet switches.



Import IEC 61850 SCD and RTAC Connection Service Files

Import your IEC 61850 and RTAC Connection Services files directly to the SEL-5056, and watch all the required circuits get provisioned through automated, guided workflows. Have confidence your network is doing exactly what it should and nothing else by unifying the baseline configuration with a single source of truth. The same configuration file used to program your relays or RTAC is now used to program your network, saving you time and improving reliability.

Control Network Flows Precisely

The SEL-5056, the NMS software for OT SDN configuration and management, comes either Microsoft Windows Server-based or as an embedded application on the SEL Blueframe® platform. This software provides topology management, circuit provisioning, and telemetry monitoring. The SEL-5056 provides automated OpenFlow programming through user-friendly circuit orchestration tools. This eliminates the additional network-required tags or labels and simplifies operations. With the removal of RSTP, the network bandwidth is free for operational data and free from RSTP topology design restrictions.

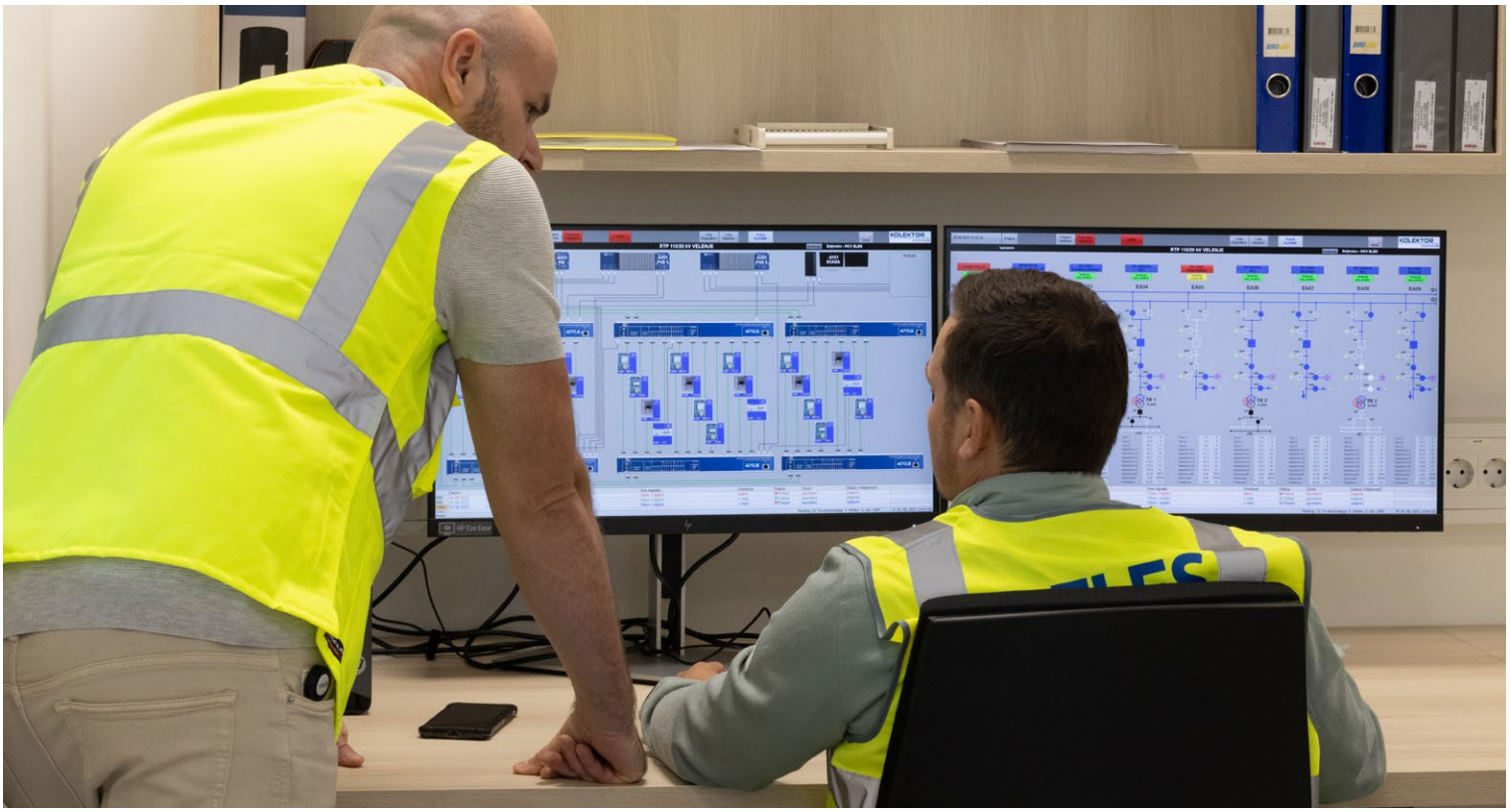
Improve Networking Situational Awareness

Gain a deeper understanding of your OT network activity with OT SDN. The SEL-5056 delivers advanced monitoring capabilities, enabling precise identification of all connected devices and detailed visibility into their communications patterns.

By providing comprehensive path- and packet-level statistics for each communications flow, the SEL-5056 gives network operators actionable data to troubleshoot issues, manage changes, and plan for future infrastructure needs.

Engineer Your Entire Network Before It's Deployed

Don't wait until deployment to design, configure, test, and validate your network. The SEL-5056 offers 100 percent offline design, configuration, testing, validation, and baselining. These capabilities accelerate deployment, reduce installation downtime, and minimize configuration errors.



SEL Managed Ethernet Switches

SEL managed Ethernet switches provide reliable and flexible OT SDN and RSTP network performance in rugged environments, such as substations and industrial facilities.

Designed to meet rigorous industry standards, like IEEE 1613 (Class 1) and IEC 61850-3, SEL switches feature a solid-state design that provides dependable operation in extreme conditions. In addition to durability, SEL switches offer advanced features like VLAN and Precision Time Protocol (PTP) transparent clock support.

Like all our products, SEL switches are backed with a ten-year warranty and include lifetime technical support at no additional cost.

SEL-2731

Affordable rack mount for IEC 61850 SV

The most cost-effective rack-mount 24-port Ethernet switch in the SEL portfolio. It offers flexible networking technology for station bus and engineering access applications in IEC 61850 digital secondary systems.

SEL-2741

High-bandwidth, all-gigabit performance

A high-performance, all-gigabit 24-port Ethernet switch designed for demanding protection and control applications. It offers maximum bandwidth and speed for IEC 61850 process bus.

SEL-2742

Compact switch for tight spaces

A compact, 12-port high-speed Ethernet switch engineered for space-constrained environments, like substation field cabinets and plant floors. It provides robust performance in a small form factor.

SEL-2743

Lowest-cost DIN-rail managed switch

Our most affordable DIN-rail managed 8-port Ethernet switch. Designed for rugged and space-constrained environments like substation cabinets, pad and pole installations, plant floors, and emergency services, it offers reliable performance and small form-factor pluggable (SFP) transceiver and power supply flexibility in a compact form factor.

SEL-2744

Economical 10 GigE switch for high-bandwidth applications

An economical 10 GigE, 10-port managed Ethernet switch built for data-intensive applications, like video streaming, measured samples, and data aggregation. It delivers reliable performance plus flexible power and SFP transceiver options in demanding environments.

SEL Managed Ethernet Switch Comparison

	SEL-2731	SEL-2741
Technology	RSTP and SDN*	RSTP and SDN*
Ports	24	24
Speed	8 × 10/100/1000BASE† 16 × 10/100BASE†	24 × 10/100/1000BASE†
SFP Transceivers	Yes, SEL and third-party	Yes, SEL and third-party
Power over Ethernet (PoE)	No	No
Power Supply	Dual integrated, 24—250 V	Dual integrated, 24—250 V
Digital Input	No	Yes
OT SDN Table	8K	16K
Mounting	1U rack, panel, or surface	1U rack, panel, or surface
PTP Transparent Clock	Yes, optional feature	Yes, standard feature
Compliance	IEC 61850-3 and IEEE 1613 compliance	IEC 61850-3 and IEEE 1613 compliance
Form C Alarm Contact	Yes	Yes
Operating Temperature	−40° to +85°C (−40° to +185°F)	−40° to +85°C (−40° to +185°F)

*Supports field conversion between RSTP and OT SDN.

†The 10BASE ports are supported only over copper.

SEL-2742	SEL-2743	SEL-2744
SDN	RSTP and SDN*	RSTP and SDN*
12	8	10
4 × 10/100/1000BASE 8 × 10/100BASE	8 × 10/100/1000BASE†	8 × 10/100/1000BASE† 2 × 1000BASE/10GBASE SFP+
No	Yes, SEL and third-party	Yes, SEL and third-party
PoE+ Type 2 per IEEE 802.3at-2009	PoE+ Type 2 per IEEE 802.3at-2009	PoE+ Type 2 per IEEE 802.3at-2009
Dual connections, 24—250 V	Dual integrated, 12—250 V	Dual integrated, 12—250 V
Yes	Yes	Yes
8K	8K	8K
DIN rail or surface	DIN rail or surface	DIN rail or surface
Yes, standard feature	Yes, standard feature	Yes, standard feature
IEC 61850-3 and IEEE 1613 compliance	IEC 61850-3 and IEEE 1613 compliance	IEC 61850-3 and IEEE 1613 compliance
Yes	Yes	Yes
−40° to +85°C (−40° to +185°F)	−40° to +85°C (−40° to +185°F)	−40° to +85°C (−40° to +185°F)

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