Software-Defined Network Solutions for Critical Infrastructure

SEL-2740S Software-Defined Network Switch
SEL-5056 Software-Defined Network Flow Controller

Redefine Ethernet performance for mission-critical applications

- Maximize application performance under all conditions by pre-engineering primary and failover communications flows that fail over in less than 100 µs.
- Increase operational confidence through greater awareness of network health and status.
- Create tighter network security with deny-by-default access control.
- Simplify the design, testing, and implementation of critical power utility and industrial operational technology (OT) networks using the SEL-5056 Software-Defined Network Flow Controller.

Engineer Your Best Network

SEL software-defined networking (SDN) enhances the performance, configuration, and management of OT and networks. The SEL-2740S Software-Defined Network Switch leverages the OpenFlow® specification to improve Ethernet performance in mission-critical applications. By providing centralized traffic engineering, the SEL-2740S gives you path- and packet-level control of your communications flows.

Engineer your best network—it starts with SDN.

Secure, Fault-Tolerant, High-Performance Networks

Traffic-Engineer Each Communications Flow

Take control of how your network performs by configuring physical and logical circuits, or flow entries, for each application. Network administration focuses on the application requirements instead of network limitations. Traffic engineering lets you to decide how packets are forwarded by the deny-by-default architecture, regardless of the Ethernet type, giving you control of each Ethernet frame on the network and how it is transported.

Ensure Critical Applications Operate and Perform to Specification

Predetermine how your network will respond to failure states by proactively configuring primary and failover communications flows for each application. With network convergence times less than 100 µs, failover times are two orders of magnitude less than those achieved with traditional networking technology.

Maximize Utilization of Switch Resources and Bandwidth

With no blocking ports, all links are useable for communications flows. The SEL-2740S lets you balance flow transports by maximizing the use of every port and link on the system. You can control traffic congestion by logically and physically isolating the high-priority communications flows from lower-priority flows.

Simplify Network Design With Topology-Independent Traffic Engineering

Design topologies and communications flows based on your application requirements instead of optimizing them for dynamic control plane administrative protocols, such as Rapid Spanning Tree Protocol (RSTP). You can simply configure the communications attributes of a specific protocol session and the forwarding path instead of requiring MAC addresses and VLANs within the constraints of RSTP. This eliminates the additional network-required tags or labels and simplifies operations. Without RTSP topology design restrictions, the network bandwidth is free for operational data. Traffic engineering lets you identify the key attributes that make a unique communications flow, configure the specific circuit that flow should be forwarded through, and assign any change action set along the way.

Centrally Manage and Monitor Networks in Near Real Time

Enhance system awareness by using centralized network monitoring, and extend network visibility to the substation. The SEL-5056 Flow Controller provides comprehensive monitoring of all the path- and packet-level network statistics for each communications flow, giving you increased awareness of the network health and status.

Easily Test and Validate Your Network

Reduce deployment timelines and eliminate errors by using the SEL-5056 Flow Controller to automatically test the network implementation and validate all configurations and contingencies prior to commissioning.

Manage Network Scalability and Change Management

Use the SEL-5056 Flow Controller to manage all network changes without affecting existing services and applications. You can centrally configure all network additions and changes and push the configurations to the SEL-2740S Switches.

Easily Integrate Edge Facilities Into a Dynamic IT Network Infrastructure

Seamlessly integrate your OT network with corporate IT infrastructure systems in compliance with the OpenFlow 1.3 standard. You can maintain existing SDN flow controller network management models and deploy the SEL-2740S in field sites and substations. The SEL-2740S is designed, built, and tested for the harsh environments in field sites and substations. The SEL-2740S easily integrates with existing SDN infrastructure through its standards-based interoperability.

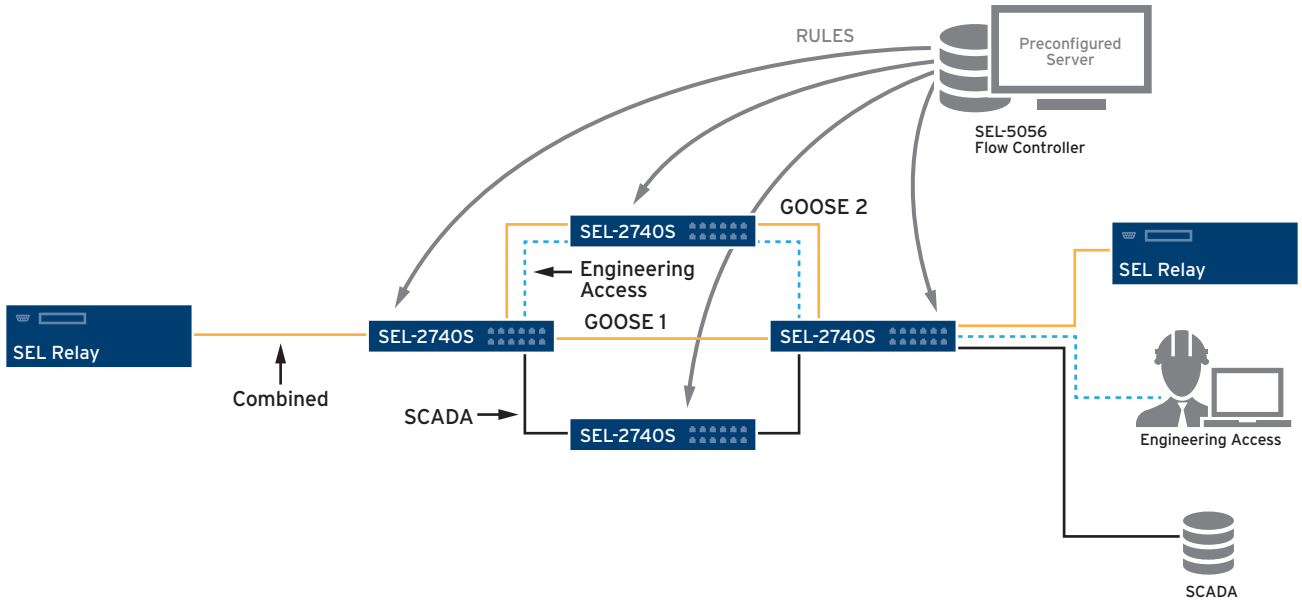
Accurately Synchronize Time Over LANs

The SEL-2740S acts as a transparent Precision Time Protocol (PTP) clock that supports the IEEE C37.238 power system profile, ensuring submicrosecond time synchronization of end devices.

Applications

Partition Bandwidth Into Controlled Communications Flows for Reliable Packet Transport

Traffic-engineer communications flows for each application by selecting the logical and physical forwarding attributes. You can physically separate high-priority traffic from low-priority traffic, which minimizes latency deviations. Logically traffic-engineering the total circuit lets you maximize the efficiency of the high-speed ports to safely share the bandwidth between applications, and the SEL-5056 Flow Controller lets you monitor the peak loads. You can segregate critical real-time traffic, such as IEC 61850 GOOSE, from operational status traffic, such as SCADA, and protect both traffic types from engineering access bandwidth-intensive actions, such as event report downloads.

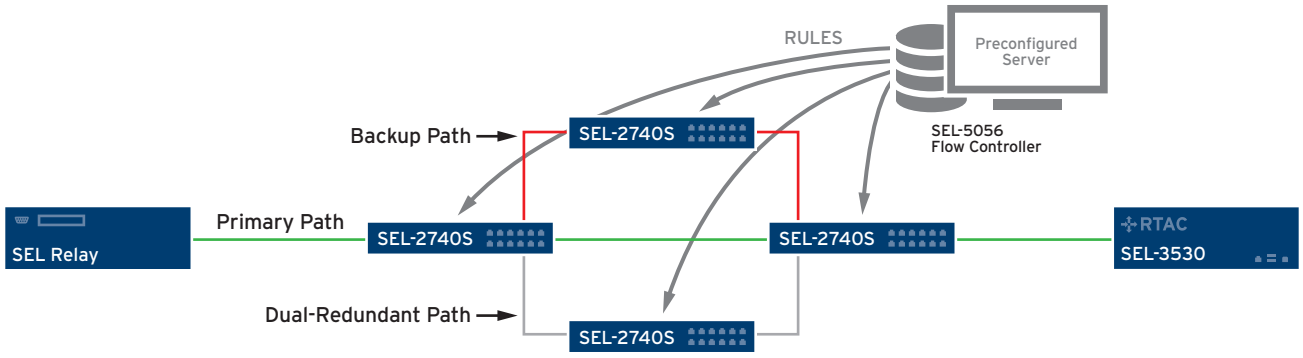


Design Network Topologies Based on System Requirements

Instead of being restricted to rings, trees, or stars, optimize the network for the equipment and applications. Now you can design the best flow circuit possible for each application and pre-engineer the failover flow so when link or switch failures happen, there is next-ingress packet healing. The SEL-5056 Flow Controller allows you to configure the allowed traffic flows and to monitor the current run-time state of the entire network. SEL-5056 Flow Controller connectivity with each switch is not needed to maintain continuous operations after configuration. This means that if an event causes the SEL-5056 Flow Controller to lose connectivity, there is no impact on the operation of the network.

Provide Fast Failover With Next-Ingress Packet Healing

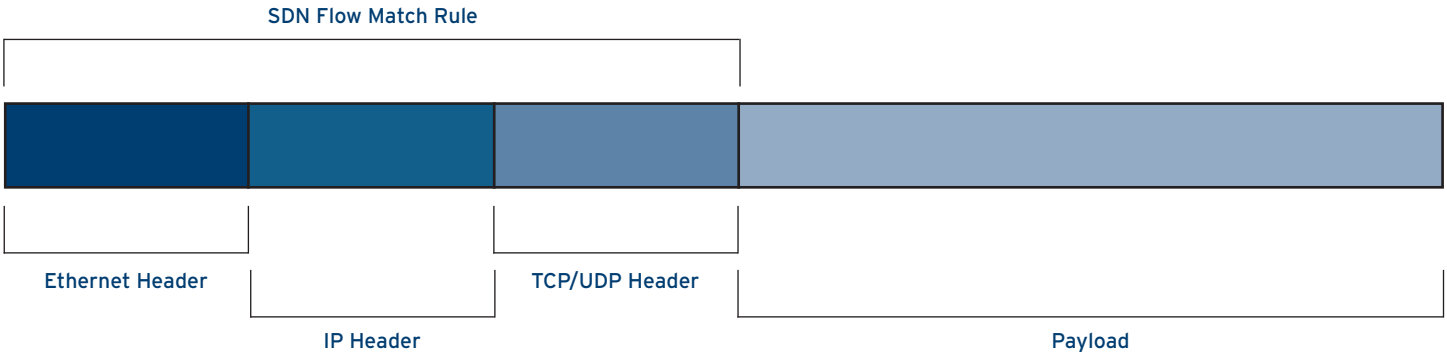
Traffic engineering with the SEL-5056 Flow Controller lets you define all primary and failover communications flows at commissioning. This functionality provides faster failover times than traditional methods because there are no discovery or convergence times to identify the next path. This means that the network immediately knows the next path to use for the very next ingress packet, and the flow can be successfully sent to its destination.



Deploy software-defined networks to take advantage of the ability to engineer network traffic with predetermined primary and backup paths that fail over in less than 100 µs when any link is lost.

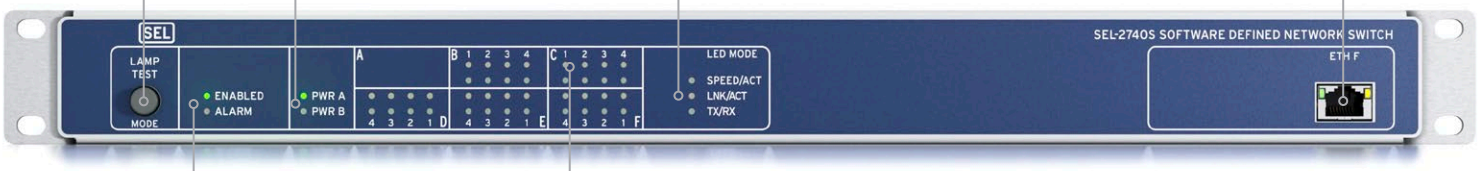
Whitelist Your Network Flows

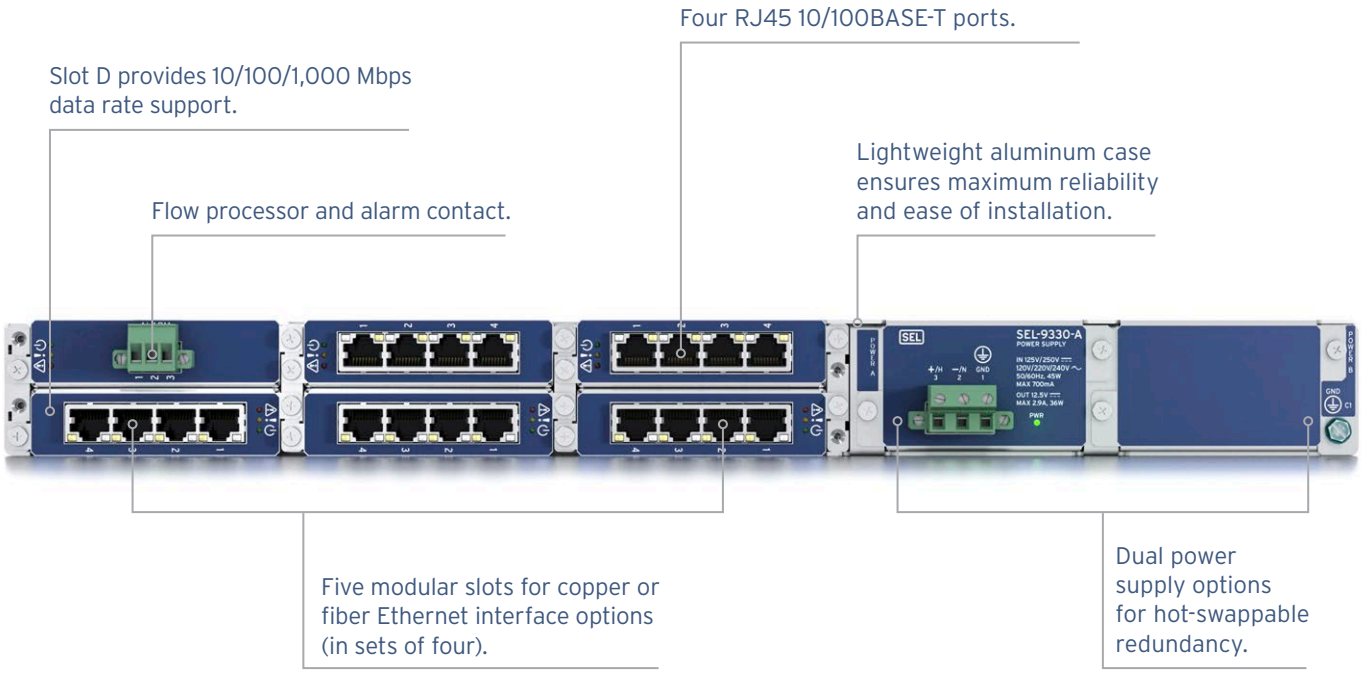
Control exactly what is allowed on your network with the deny-by-default architecture of the SEL-2740S. The flow table configuration allows matching rules on fields in Layer 1 through Layer 4 of the packet. This gives you control of what is allowed on the network at every layer of the network. Only configured flows are permitted. You can preconfigure these rules on the SEL-5056 Flow Controller.



PACKET

SEL-2740S Overview





Software-Defined Interface Functions	
SEL-5056 Flow Controller Interface	Supports OpenFlow 1.3 with Transport Layer Security (TLS) for secure connections.
Flow Tables	Supports 4 flow tables for a total of 4,096 flow entries per SEL-2740S.
Central Authentication and Central Logging	Supports Lightweight Directory Access Protocol (LDAP) and syslog for central authentication and logging.
Flow Match Support	Supports OpenFlow 1.3 match attributes: ingress port, MAC source, MAC destination, IP, IP source, IP destination, Ethertype, TCP and UDP port source and destination, VLAN ID, VLAN Priority Code Point (PCP), Address Resolution Protocol (ARP) opcode, and ARP target and source IP address.
Security	Implement deny-by-default network access control with simple commissioning, and use central management through the SEL-5056 Flow Controller with secure connections through TLS.
Network Monitoring	Maintain and monitor the health and diagnostics of the network through the use of the OpenFlow counters. This gives network operators full visibility of each communications view, their telemetry counts, and the near-real-time operational state.
Modular Hardware	Configure the switch to match your network needs with flexible modular switch interface modules.
Group Support	Provides OpenFlow 1.3 support for 256 groups, which you can select as All, Select, Fast Failover, or Indirect. You can configure each group with up to 30 action buckets.
Egress Actions	Provides OpenFlow 1.3 support for the following actions: Drop, Packet Out, Forward, and Send to Group.
Multilayer Inspection	Use the flow rules to send any packets to an intrusion detection system for inspection or configure local flow rules in the switch to perform inline inspection within Layers 1 through 4.

SEL-2740S Specifications

General

Module	**10/100/1000BASE-T Copper** Number of ports: 4 Maximum cable distance: 100 m **1000BASE-SX Fiber-Optic Multimode** Number of ports: 4 Maximum cable distance: 500 m **100BASE-FX Fiber-Optic Multimode** Number of ports: 4 Maximum cable distance: 2 km **1000BASE-LX10 or -LX Fiber-Optic Single-Mode** Number of ports: 4 Maximum cable distance: 10 km **1000BASE-LX Fiber-Optic Single-Mode** Number of ports: 4 Maximum cable distance: 10 km **1000BASE-EX Fiber-Optic Single-Mode** Number of ports: 4 Maximum cable distance: 40 km **Alarm Contact and Coprocessor**[1]
Power Supply Ratings	Base unit includes one power supply; second supply is optional. **Voltage Options** 100/120/220/230 Vac at 45—65 Hz 100/125/220/250 Vdc 24/48 Vdc[1]
Operating Temperature Range	−40° to +85°C (−40° to +185°F)
Relative Humidity	5—95%, noncondensing
OpenFlow 1.3.4 Support	Number of tables: 4 Flow rules per table: 1,024 Number of groups: 256 Number of action buckets per group: 30 Number of unique action buckets: 128 Number of meters: 64 Number of meter bands per meter: 1
IEEE 1588 PTP Support	Transparent clock, peer-to-peer, IEEE C37.238 power system profile

[1]One alarm contact flow coprocessor module is required in each SEL-2740S, installed in Slot A.

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