

SecFlow[®]-2

Ruggedized SCADA-Aware Ethernet Switch/Router



- Compact ruggedized Ethernet switch/router with up to 16×10/100BaseT, and 2×100/1000BaseFX ports with optional PoE for deployment in harsh industrial environments
- Advanced security package, including SCADA-aware firewall, IEEE 802.1X port-based Network Access Control, L-2/3/4 ACL for incoming traffic, and L-2/3 VPN with IPsec
- Integrated serial interface with protocol gateway and tunneling functionality
- Ethernet switching, IP routing with integrated VPN and link protection per ITU-T G.8032, with optional cellular 2G/3G/HSPA+/4G (LTE) uplink for maximum service continuation IEC61850 certification
- IPsec VPN over cellular and fiber with X.509 certificates
- Wide range of AC or DC power input options

SecFlow-2 is a ruggedized Ethernet switch/router with a unique built-in packet processing SCADA-aware engine to fit the mission-critical industrial applications.

SecFlow-2 features two Gigabit Ethernet ports, up to 16 Fast Ethernet ports, and serial ports for legacy services. The device is designed for installation under harsh environmental conditions. It enables DIN-rail mount, ensures IP30 protection level, wide temperature operating range (-40°C to +75°C) without fans, EMI immunity (IEC61850-3, IEC61850-4 and EN50121-4) etc.

SecFlow-2 Ethernet ports comply new IEC 61850 standard to enable IED (Intelligent Electronic Device) solutions for automation and tele-protection applications in substations. Additionally, SecFlow-2 is equipped with the serial interfaces for connectivity between legacy RTUs and new IP-based IEDs. SecFlow-2 gateway converts legacy IEC-101 protocol to IP-based IEC-104, and Modbus RTU to Modbus TCP, enabling seamless IP SCADA communication to both old and new RTUs. This provides a single box solution for multi-service applications and smooth migration to all-IP networks.

MARKET SEGMENTS AND APPLICATIONS

SecFlow-2 addresses the following markets:

- Utility installations (electricity, water, gas and oil)
- Intelligent transportation (highway, railway)
- Manufacturing facilities (chemical, food industry)
- Military and defense applications (HLS, safe city).

INTEROPERABILITY

SecFlow-2 is compatible with SecFlow-1 and SecFlow-4. In addition, it operates with RAD's Airmux broadband wireless multiplexer, providing PoE feeding to the Airmux outdoor units (see Ordering).

SECFlow

SCADA-AWARE FIREWALL

SecFlow-2 features an integrated firewall per port, providing network-based distributed security designed especially for SCADA applications (IEC-104, DNP3-TCP). The device monitors SCADA commands, using deep packet inspection, to validate if they fit the intended application purpose.

Note: SCADA-aware firewall is a license-based feature.

ETHERNET

Flexible QoS techniques ensure differentiated service end-to-end delivery.

SecFlow-2 utilizes the following traffic management methods: strict priority, Weighted Round Robin (WRR), ingress policing and egress traffic shaping.



SecFlow-2

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ROUTER AND VPN SERVICES

SecFlow-2 features static routing, OSPF, RIPv2, VRRP, NAT.

In addition, the device features a VPN gateway with two operation modes:

- Inter-site connectivity, using IPsec tunnels
- Remote user access, using SSH.

Inter-site VPN, based on GRE tunnels over an IPsec encrypted link and DM-VPN, ensures L2/L3 Ethernet networks sites' transparent connection.

For remote access, SecFlow-2 uses an SSH-encrypted tunnel with user authentication and specific access authorizations.

OAM

SecFlow-2 provides the following Ethernet OAM types:

- Single-segment (link) OAM according to IEEE 802.3-2005 (formerly 802.3ah) for remote management and fault indication

- End-to-end connectivity OAM, based on IEEE 802.1ag, to monitor Ethernet services proactively and guarantee the contracted SLA
- End-to-end fault, service, and performance monitoring based on ITU-T Y.1731.

RESILIENCY

SecFlow-2 supports Ethernet protection ring according to G.8032, enabling fast failure detection and switchover.

Traditional resiliency protocols, such as RSTP (Rapid Spanning Tree Protocol) and MSTP (Multiple Spanning Tree Protocol) per IEEE 802.1D, are also supported.

Link aggregation is performed according to IEEE 802.3ad. LACP aggregates the point-to-point links operating at the same data rate. This enables SecFlow-2 to take advantage of increased bandwidth.

MANAGEMENT AND SECURITY

The device can be managed via:

- RADview, RAD's carrier-class NMS for Windows and Linux
- iEMS (Industrial Element Management System).

SecFlow-2 also supports a variety of access protocols including CLI, Telnet, Web, SNMPv3, and TFTP.

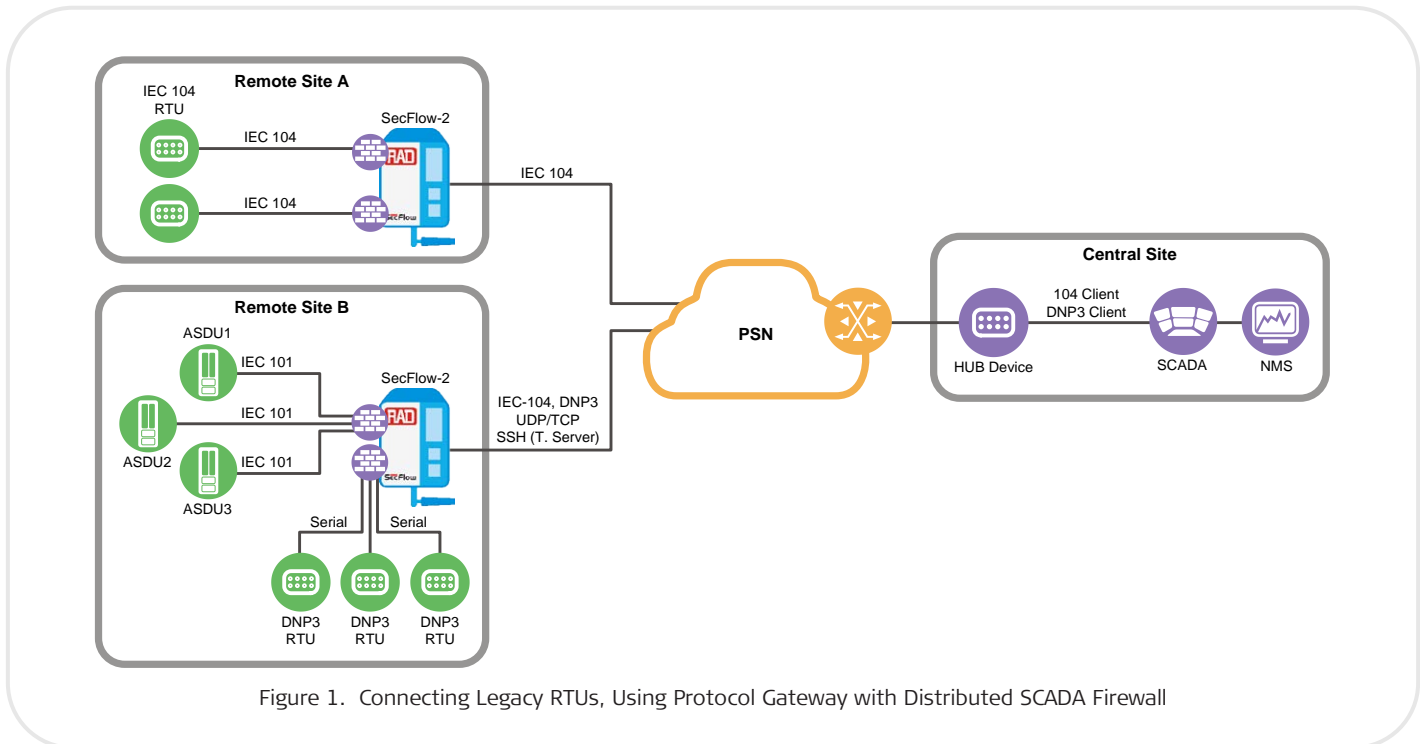


Figure 1. Connecting Legacy RTUs, Using Protocol Gateway with Distributed SCADA Firewall

Specifications

CAPACITY

Throughput

Line rate L2/L3 switching throughput

Switching

Switching latency below 10 µsec

Max. Number of MAC Addresses

16K

Max. Number of VLANs

4K

Internal Memory

1 GB DRAM

ETHERNET INTERFACES

Fast Ethernet Port

8 x 10/100BaseT RJ-45 ports

16 x 10/100BaseT RJ-45 ports

8 x 10/100BaseT RJ-45 + 8 100BaseFX SFP ports

UTP ports are available with several PoE ordering options

Autonegotiation IEEE 802.3ab

Max Frame Size

9216 Bytes

POE

Compliance

IEEE 802.3at-2009 up to 30W per port

SERIAL INTERFACES

Up to 4×RS-232 ports

Transparent tunneling of serial streams

SCADA protocol gateway – serial over IP

Terminal server

CELLULAR

Dual SIM GPRS/UMTS/LTE cellular modem

ETHERNET

VLAN segregation per IEEE 802.1q

VLAN tagging according to L2-L4 headers

User policy for traffic type

L2 multicast with guaranteed QoS

IGMP snooping (V1, V2, V3) for traffic optimization

ROUTER

Static routing, OSPF, RIPv2 routing, VRRP, NAT

MANAGEMENT

Control Port

RS-232

USB Port

Local USB port for emergency boot

Management Capabilities

Command-line interface with password protected access and authorization levels, Telnet/SSH, SNMPv1, SNMPv2, SNMPv3, RADview-EMS, SFTP

RADIUS, TACACS+

Conditioned/scheduled system reboot

Remote management and upgrade

TFTP/SFTP Client

Safe Mode

Syslog

LLDP discovery per IEEE802.1AB

DHCP client

DHCP relay, option 82

TIMING

PTP transparent clock per 1588v2

NTP v.2

Date/Time Setting

SNTP

RESILIENCY

Ethernet Ring

Ethernet ring per ITU-T G.8032v2

IEEE 802.1s MSTP

IEEE 802.1w RSTP

Link Aggregation

LAG with LACP per IEEE 802.3ad

SECURITY

Enable/disable port

Port-based authentication per IEEE 802.1X

Protection against DoS attacks

L2, L3, L4 Access Lists

OS Image Protection

SCADA firewall per port (IEC 104, DNP3 TCP)–license-based

Industrial VPN Agent

Remote access using SSH tunnel

Layer 2 GRE Transparent Ethernet Bridging

Layer 3 mGRE DM-VPN

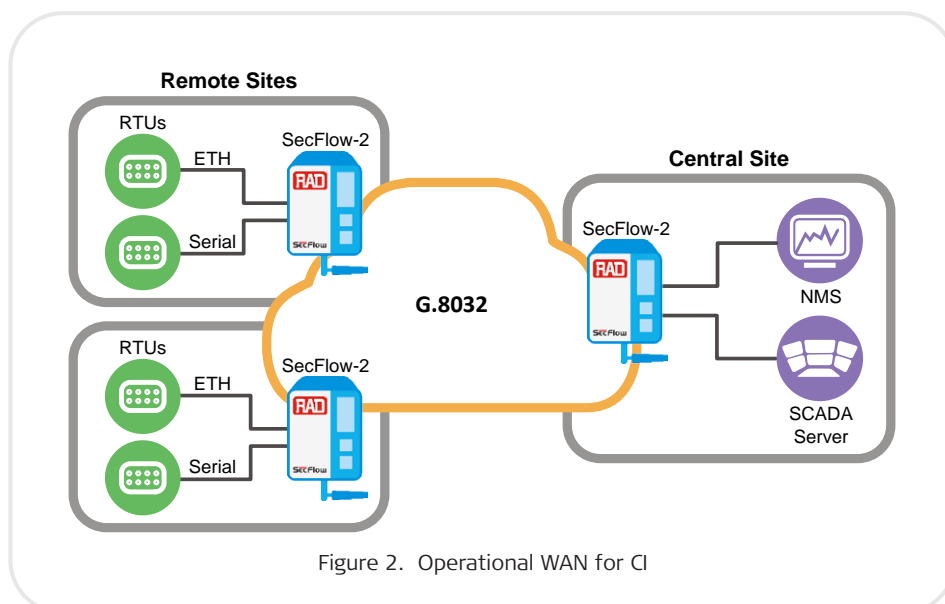


Figure 2. Operational WAN for CI

SecFlow-2

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IPSec VPN

- Policy-based
- Route-based
- IKE, AES or 3DES encryption
- Dynamic key exchange
- X.509 certificates, IPsec CRL server, IPsec CA server

GENERAL

Compliance

UL 60950-1 and IEC 60950-1 safety regulations

EN 55022 Class A/B and FCC Class A/B emission requirements

Physical

Height: 148 mm (5.66in)

Width: 72 mm (8-port DC), 95 mm (16-port DC), 112 mm (4.4 in) (AC)

Depth: 123.0 mm (4.84 in)

Weight: 1.7 kg (3.75 lb) (8-port DC), 1.9 kg (4.19 lb)(16-port AC)

Power

AC: 90–250 VAC

DC: 48VDC (36-60 VDC), 24VDC (18-32 VDC)

Power Consumption

15W (regular operation)

24 VDC: 135W (120W for PoE, max 30W per port)

48 VDC, AC-powered units: 135W or 255W (120W or 240W for PoE)

Environment

Temperature:

Storage: -40 to +85°C (-40 to 185°F)

Operating: -40 to 75°C (-40 to 167°F)

Humidity: 5 to 95%

Rugged enclosure – fanless, IP 30-rated

Substation automation per IEC 61850-3/IEEE1613 EMI

Vibration and shock resistance per EN50121-4

Ordering

RECOMMENDED CONFIGURATIONS

SF2/S/48VDC/2GE16UTP

Routing with secured VPN and serial gateway, 48 VDC (36-60 VDC) power supply, 2xGbE SFP and 16x10/100BaseT Ethernet ports

SF2/S/48VDC/2GE8UTP8SFP

Routing with secured VPN and serial gateway, 48 VDC (36-60 VDC) power supply, 2xGbE SFP 8x10/100BaseT and 8x100FX Ethernet ports

SF2/S/48VDC/2GE8UTP

Routing with secured VPN and serial gateway, 48 VDC (36-60 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

SF2/S/48VDC/2GE8UTP/*

Routing with secured VPN and serial gateway, 48 VDC (36-60 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

*	Power over Ethernet (PoE) + Interface	
	POE/CEL	PoE on 8 x 10/100BaseT ports up to 120W, GPRS/UMTS cellular modem
	POE/RS232	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports
	RS232	4 x RS-232 ports
	POE/RS232/CEL	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports, GPRS/UMTS cellular modem
	POE2AM/RS232	PoE on 2 x 10/100BaseT for RAD's Airmux and standard PoE for the remaining 6 x 10/100BaseT ports, 4 x RS-232 ports
	POE2AM/RS232/CEL	PoE on 2 x 10/100BaseT for RAD's Airmux and standard PoE for the remaining 6 x 10/100BaseT ports, 4 x RS-232 ports, GPRS/UMTS cellular modem
	POE/RS232/HSPAP	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports, High-speed packet access, modem, 3.5G
	RS232/HSPAP	4 x RS-232 ports, High-speed packet access, modem, 3.5G
	RS232/LTEEU	4 x RS-232 ports, LTE cellular modem with European bands
	RS232/LTENA	4 x RS-232 ports, LTE cellular modem with North American bands

POE/RS232/HSPAP	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports, High-speed packet access, modem, 3.5G
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SF2/B/48VDC/2GE8UTP/1RS232

Basic option with Ethernet features, 48VDC (36-60 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports, single RS-232 interface

Note: This option is also known as SF-2E.

SF2/S/AC/2GE16UTP

Routing with secured VPN and serial gateway, 90-240 VAC power supply, 2xGbE SFP and 16x10/100BaseT Ethernet ports

SF2/S/AC/2GE8UTP

Routing with secured VPN and serial gateway, 90-240 VAC power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

SF2/S/AC/2GE8UTP/#

Routing with secured VPN and serial gateway, 90-240 VAC power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

#	Power over Ethernet (PoE) + Interface	
	POE	Power over Ethernet
	RS232/HSPAP	4 x RS-232 ports, High-speed packet access, modem, 3.5G
	RS232/LTEEU	4 x RS-232 ports, LTE cellular modem with European bands
	RS232/LTENA	4 x RS-232 ports, LTE cellular modem with North American bands

SF2/S/24VDC/2GE8UTP

Routing with secured VPN and serial gateway, 24 VDC (18-32 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

SF2/S/24VDC/2GE8UTP8SFP

Routing with secured VPN and serial gateway, 24 VDC (18-32 VDC) power supply, 2xGbE SFP, 8x10/100BaseT Ethernet ports, and 8 x 100Fx Ethernet ports

SF2/S/24VDC/2GE8UTP/#

Routing with secured VPN and serial gateway, 24 VDC (18-32 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

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* Power over Ethernet (PoE) + Interface	
RS232	4 x RS-232 ports
POE/ RS232	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports
RS232/CEL	4 x RS-232 ports, GPRS/UMTS cellular modem
LTEEU	LTE cellular modem with European bands
RS232/ HSPAP	4 x RS-232 ports, High-speed packet access, modem, 3.5G
RS232/ LTEEU	4 x RS-232 ports, LTE cellular modem with European bands
RS232/ LTENA	4 x RS-232 ports, LTE cellular modem with North American bands
POE/ HSPAP	PoE on 8 x 10/100BaseT ports up to 120W, High-speed packet access, modem, 3.5G

SF2/B/AC/2GE8UTP

Basic option with Ethernet features, 90-240 VAC power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

SF2/B/AC/2GE8UTP/\$

Basic option with Ethernet features, 90-240 VAC power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports

\$ Power over Ethernet (PoE) + Interface	
CEL	GPRS/UMTS cellular modem
POE/RS232	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports
POE/RS232/CEL	PoE on 8 x 10/100BaseT ports up to 120W, 4 x RS-232 ports, GPRS/UMTS cellular modem
RS232	4 x RS-232 ports
RS232/CEL	GPRS/UMTS cellular modem
POE240W	PoE on 8 x 10/100BaseT ports up to 240W

SF2/B/AC/2GE16UTP/POE240W

Basic option with Ethernet features, 90-240 VAC power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports, PoE on 16x10/100BaseT ports up to 240W

SF2/B/48VDC/2GE8UTP/PoE

Basic option with Ethernet features, 48 VDC (36-60 VDC) power supply, 2xGbE

SFP and 8x10/100BaseT Ethernet ports, Power over Ethernet on 8x10/100BaseT ports

SF2/S/48VDC/2GE8UTP/RS232/CEL

Routing with secured VPN and serial gateway, 48 VDC (36-60 VDC) power supply, 2xGbE SFP and 8x10/100BaseT Ethernet ports, 4xRS-232 interfaces, GPRS/UMTS cellular modem

SF-ESEC-LIC

License for enhanced security features (SCADA-aware firewall and X.509)

OPTIONAL ACCESSORIES**CBL-SF-RJ45-CONSOLE**

Console port cable

CBL-RJ45/DB9/NULL

Serial port cable

SF-ANT3G-2M

Outdoor antenna for SF-1/SF-2 3G cellular modem, 2m connecting cable

SF-ANT3G-5M

Outdoor antenna for SF-1/SF-2 3G cellular modem, 5m connecting cable

SF-ANT4G-2M

Outdoor antenna for SF-1/SF-2 4G cellular modem, 2m connecting cable

SF-ANT4G-5M

Outdoor antenna for SF-1/SF-2 4G cellular modem, 5m connecting cable

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