SecFlow®-4

Modular Ruggedized SCADA-Aware Ethernet Switch/Router

- High-density, modular, ruggedized Ethernet switch, deployed in harsh industrial environments with up to 28 GbE ports and optional PoE
- 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 RS-232 and RS-485 serial interfaces with protocol gateway and tunneling functionality for easy migration of legacy services to IP
- Ethernet switching, IP routing and Ethernet Ring protection per ITU-T G.8032
- IEC61850 compliant

The SecFlow-4 industrial Ethernet switch/router combines ruggedized Ethernet platform with unique SCADA-aware processing engine to fit the mission-critical industrial applications.

SecFlow-4 is a modular device with 7 interface slots. Each interface slot can house either an Ethernet module or a serial RS-232 module, enabling a flexible network configuration.

The system overall capacity can scale up to 28xGbE full-duplex throughput, with wire-speed switching for both Ethernet and IP.

SecFlow-4 is designed for installation under harsh environmental conditions. It features DIN-rail mount, IP30 protection level, wide temperature operating range (-0°C to +75°C) without fans, EMI immunity (IEC 61850-3, IEEE 1613, and EN 50121-4).

MULTI-SERVICE GATEWAY

SecFlow-4 utilizes Ethernet ports for new IEC 61850 compliance IEDs for automation and teleprotection applications in substations. Additionally, SecFlow-4 is equipped with the serial interfaces for connectivity of legacy RTUs with new IP based IEDs. SecFlow-4 gateway converts legacy IEC-101 protocol to IP-based IEC-104, enabling seamless communication from the IP SCADA to both the 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-4 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).

SCADA-AWARE FIREWALL

SecFlow-4 supports an integrated firewall per port, providing a network-based distributed security designed especially for SCADA applications (IEC 104, Modbus TCP, and DNP3 DCP). The device monitors SCADA commands, using deep packet inspection, to validate if they fit the intended application purpose. Additionally, 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 ensures L2/L3 transparent connection of the Ethernet networks sites.

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

ETHERNET QUALITY OF SERVICE

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

SecFlow-4 utilizes the following traffic management methods: strict priority, Weighted Round Robin (WRR), MDDR, and egress traffic shaping.

SecFlow-4 IP address might be private behind NAT, or public.

OAM

SecFlow-4 provides these types of Ethernet OAM:

- 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 that customers receive the contracted SLA
- End-to-end service and performance monitoring based on ITU-T Y.1731. Fault monitoring and end-to-end performance measurement.

RAD
Your Network's Edge

SecFlow-4

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RESILIENCY

SecFlow-4 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 with LACP allowing aggregation of point-to-point links operating at the same data rate. This enables the switches to take advantage of increased bandwidth.

INTEROPERABILITY

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

MANAGEMENT

The device can be managed via RADview, RAD's carrier-class NMS for Windows and Unix, and SecFlow Network Manager that provides end-to-end management for SecFlow devices.

SecFlow-4 also supports a variety of access protocols, including CLI, Telnet, Web, SNMPv3, and TFTP.

Specifications

CAPACITY

Throughput
Line rate L2/L3 switching throughput

Switching
Switching latency below 10 µsec

Max. Number of MAC Addresses
32K

Max. Number of VLANs
4K

ETHERNET

4×100/1000BaseTx ports (optional PoE with max 30W per port/180W per chassis) on SF4-M-4GbE module

4×10/100/1000BaseFX SFP ports on SF4-M-4GbE module

Max Frame Size
12 kB

SERIAL INTERFACE

4×RS-232 ports

2xRS-232 + 1xRS-485

Transparent tunneling serial streams

Protocol gateway – serial to Ethernet, IEC 101/104
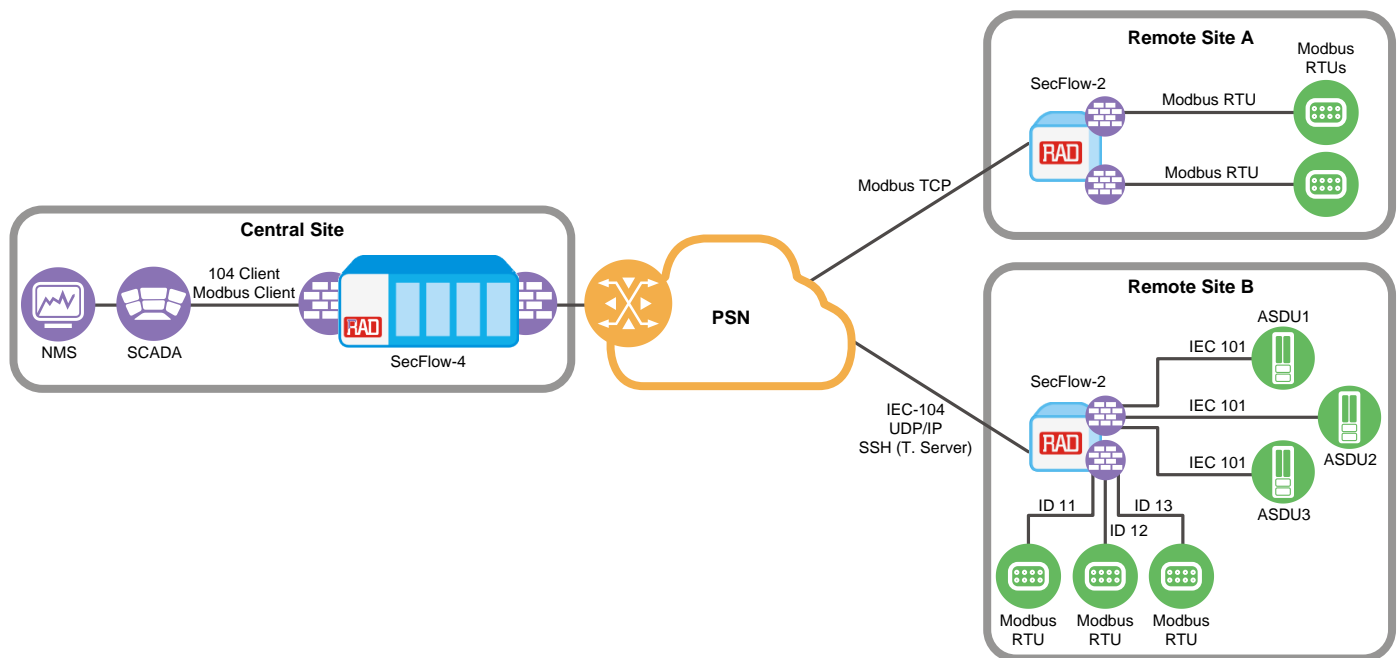
Terminal server

Figure 1. Aggregating Traffic from Remote Substations with Protocol Gateway Functionality

QUALITY OF SERVICE (QoS)

VLAN segregation per IEEE 802.1q

VLAN tagging according to L2–L3 headers

L2 multicast with guaranteed QoS

IGMP snooping for traffic optimization

DSCP to 802.1p QoS mapping

LLDP

DHCP client

DHCP relay, option 82

ROUTER

Static routing, OSPF, RIPv2 routing, NAT

MANAGEMENT

Control Port
RS-232

USB Port
Local USB port for emergency boot

Management Options
Command-line interface with password protected access, authorization levels

Telnet/SSH, SNMPv1, SNMPv2, RADview-EMS, iSIM, SFTP

RADIUS, TACACS+

Date/Time Synchronization
SNTP

SECURITY

Access Control
Enable/disable port

Port access filter per MAC/IP addresses

Port-based authentication per IEEE 802.1x

Protection against DoS attacks

Service Validation
Egress filtering per VLAN

SCADA firewall per port (IEC 101/104, DNP3.0)

Industrial VPN Agent
Remote access using SSH tunnel

Layer 2 GRE Transparent Ethernet Bridging

Layer 3 mGRE DM-VPN

X.509 certified IPSec encryption:

- User policy for traffic type
- IKE, AES or 3DES encryption
- Dynamic key exchange

Remote Access Agent
Remote access using reverse SSH tunnel

Limited access authorizations per user

Local and remote user authentication and authorizations

Traffic activity log for trail audit

TIMING

PTP transparent clock per 1588v2

NTP v.2

RESILIENCY

Ethernet Ring
Per ITU-T G.8032v2

Link Aggregation
LAG with LACP per IEEE 802.3ad

Rapid Spanning Tree
MSTP per IEEE 802.1s, RSTP per 802.1w

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GENERAL

Physical
Height: 14.5 cm (5.70 in)
Width: 38.0 cm (14.96 in)
Depth: 13.9 cm (5.47 in)
Weight: 2.4–4 kg (5.51–8.81 lb)

DIN rail mounting, optional wall mount

Power
Dual DC power supply: 24, 48 VDC

Power Consumption
Maximum power consumption for SecFlow-4:

65W without PoE

250W with PoE

Maximum power consumption per module:

SF4-PS-24/48VDC – 8W
SF4-M-MNG – 18W
SF4-M-Service – 10W
SF4-M-Serial – 4.5W
SF4-M-4GBE/U – 4W
SF4-M-4GBE/S – 6W

Environment
Temperature:
Operating: -40 to 75°C (-40 to 167°F)

Storage: -40 to +85°C (-40 to 185°F)

Humidity: 5 to 95%

Rugged enclosure – fanless, IP 30-rated

Substation automation per
IEC 61850-3/IEEE1613 EMI

Voltage transient immunity per EN50121-4

Vibration and shock resistance per
IEC 60255-21

Ordering

RECOMMENDED CONFIGURATIONS

Chassis

Switch Configuration

SF4/SP/48DCR
SecFlow-4 chassis, L-2 switch functionalities, central processing and management module, dual 48 VDC power supply

SF4/SP/24DCR
SecFlow-4 chassis, L-2 switch functionalities, central processing and management module, dual 24 VDC power supply

Router/Switch Configuration

SF4/RP/48DCR
SecFlow-4 chassis, L-2/3 router/switch functionalities, central processing and management module, dual 48 VDC power supply

SF4/RP/24DCR
SecFlow-4 chassis, L-2/3 router/switch functionalities, central processing and management module, dual 24 VDC power supply

Modules

SF4-PS-24VDC
24 VDC power supply

SF4-PS-48VDC
48 VDC power supply

SF4-M-4GBE-U
SecFlow-4 module with four 100/1000BasteT UTP Ethernet ports

SF4-M-4GBE-POE
SecFlow-4 module with four 100/1000BasteT UTP Ethernet ports and 30W PoE

SF4-M-4GBE-S
SecFlow-4 module with four 10/100/1000BasteFx SFP Ethernet ports

SF4-M-4RS232
SecFlow-4 module with four RS-**232** serial ports

SF4-M-2RS232-1RS485
SecFlow-4 module with two RS-232 serial ports and one RS-485 serial port

SF4-M-Service
Service module with firewall, serial tunneling, VPN functionalities and discrete input/output interfaces

SF4-M-MNG
Central processing and management module with local terminal and out-of-band management ports

SUPPLIED ACCESSORIES

CBL-SF-RJ45-CONSOLE
Console cable (delivered with SF4-M-MNG)

OPTIONAL ACCESSORIES

SF4/RM1
Kit for mounting SecFlow-4 into a 19-inch rack

CBL-RJ45-DB9/null
Serial cable, DCE wiring

International Headquarters
24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North America Headquarters
900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

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