

Service Assured Solutions

2021 Catalog



Your Network's Edge®

PUSHING THE EDGE OF
40 years
INNOVATION





Introducing SD-CloudAccess

Intelligent Multi-link Cloud Access for Cloud-Centric Business Customers

SD-CloudAccess is an economical SD-WAN solution, allowing application-aware traffic distribution across multiple links with SLA-guaranteed access to public, private and telco cloud services.

- Enables CSPs to offer differentiated, cost-effective SASE services
- Advanced traffic distribution policies
- Cost optimized pCPE, centralized DPI
- Eliminates the need to set multiple overlay tunnels
- High security over any transport link

SD-CloudAccess is a book-ended solution featuring a client that is either embedded in vCPE-OS or available as a uCPE-hosted VNF, and a hub software running as a VM in a cloud gateway.

Contact **market@rad.com** to learn more about SD-CloudAccess

Visit **www.rad.com** for more information



Your Network's Edge®



Table of Contents

Company Profile	2
Business Edge vCPE – Cloud Adoption Made Easy	5
Secure Industrial IoT Backhaul with Edge Computing	8
RAD's Products	39

Service Assured Access Solutions for Service Providers

| Business Services

Carrier Ethernet for L2 VPNS	12
vCPE	13
Industrial IoT Backhaul with Edge Computing	15
TDM Migration	16

| Mobile Services

4G/5G Mobile xHaul	17
Timing Synchronization for Mobile Networks	18
Performance Monitoring for Mobile Networks	19

| Wholesale Services

Wholesale Networking	20
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Service Assured Networking Solutions for Critical Infrastructure

| Utilities

Power Utility Communications	23
Oil and Gas Utility Communications	27
Water Utility Communications	28

| Transportation

Highway Communications	30
Train and Metro Communications	31
Air-Traffic Control Communications	33

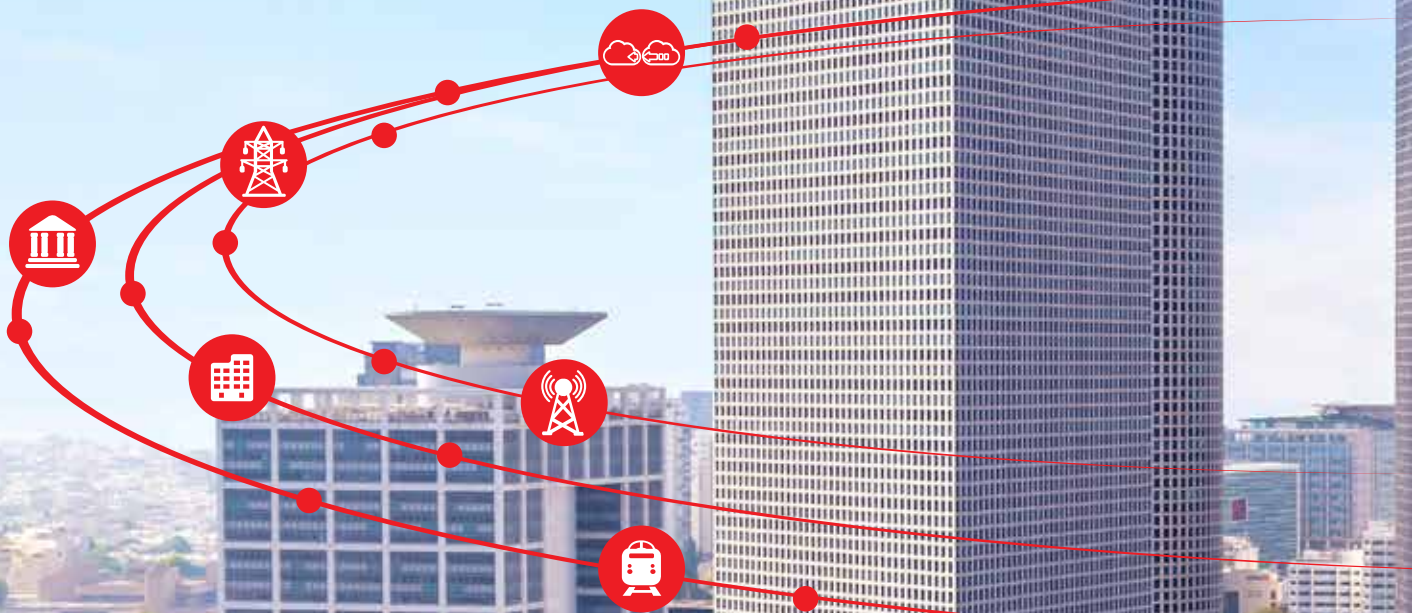
| Government

Smart City Communications	35
First Responders and Military Communications ...	37

Evolve Any Service over Any Network

As a global telecom access solutions vendor, RAD is committed to enabling service providers and critical infrastructure operators to evolve any service over any network.

By keeping at the forefront of pioneering technologies and engaging in **co-innovation** with our customers, we strive to help service providers move up the value chain at a pace that is right for them, while offering their end-customers and network operators added value – be it in **network edge virtualization and vCPE**, **industrial IoT**, or **5G xHaul**.



Service Providers

Migrate to NFV/SDN edge virtualization and 5G xHaul **today** with RAD's Service Assured Access solutions.

Critical Infrastructure

OT/IT convergence, industrial IoT backhaul with edge computing and cyber-secure operational WAN with RAD's Service Assured Networking solutions.

With 40 years of innovation, a significant worldwide presence in over 150 countries and an installed base of more than 16 million network elements, RAD has a proven track record of delivering value and addressing our customers' needs.

RAD is a member of the \$1.5 billion RAD Group of companies, a world leader in telecommunications solutions.



The 5G xHaul Cell Site Gateway

RAD offers comprehensive support for 5G fronthaul, midhaul and backhaul using a single, economical cell site gateway (CSG):

- Fits multi-RAT 4G/5G RANs.
- Supports various 5G RAN splits, including lower-level splits 8 and 7.2 with high bandwidth, low latency requirements.
- Provides highly efficient 4G/5G aggregation: 10G, 25G, 50G, and 100G, with timing synchronization.
- Highly accurate timing distribution and synchronization for 5G applications.
- Solves operational complexity and cost issues where different platforms are used.
- Enables future upgrades in the field to address new requirements without forklifts.

Visit www.rad.com for more information



Your Network's Edge®

Business Edge vCPE – Cloud Adoption Made Easy

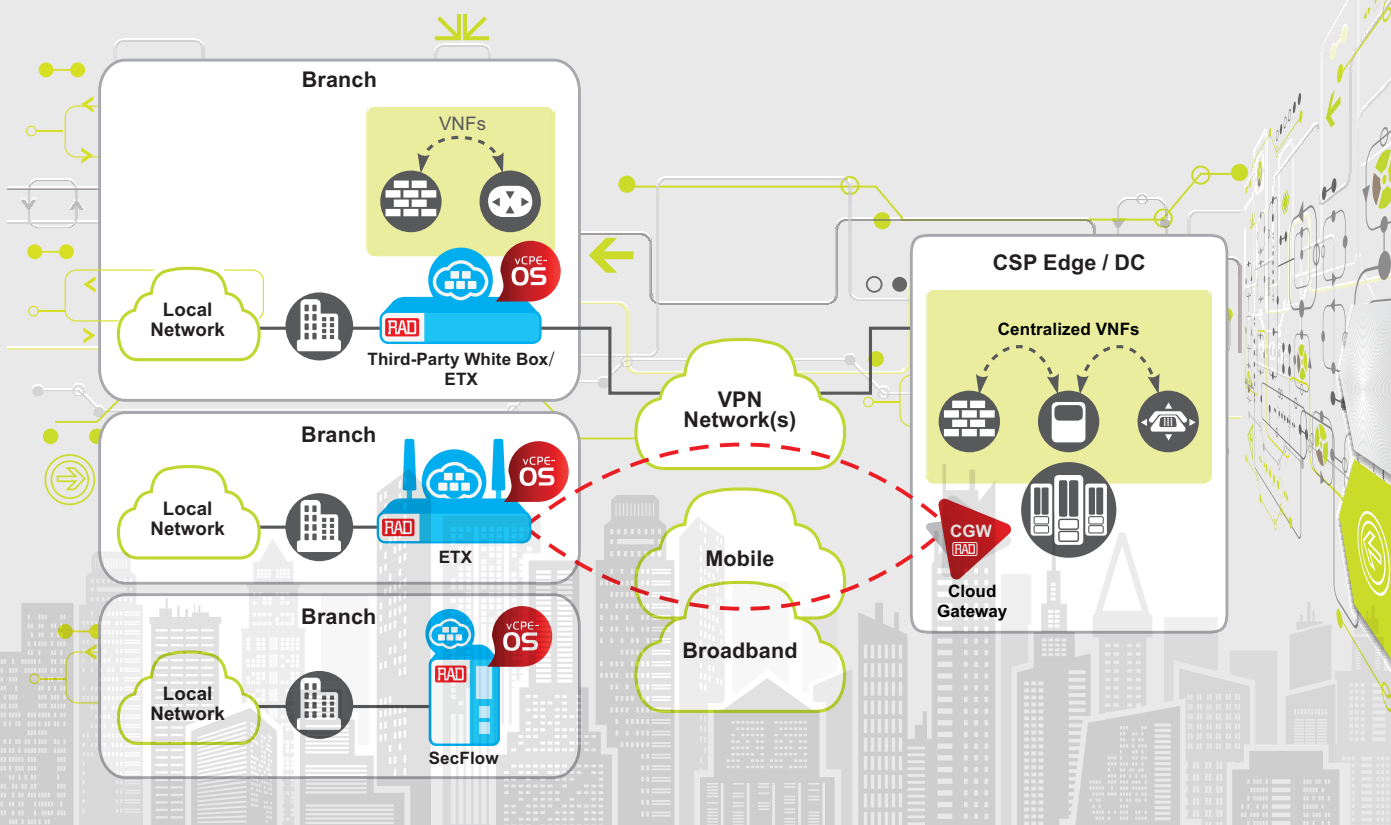


The acceleration in enterprises' digital transformation is driving major changes in telcos' business customer needs. As emerging services and applications pose special requirements in terms of performance, latency, resiliency, and local storage, compute infrastructure is getting increasingly closer to the edge. As a result, CSPs are extending compute services and storage closer to users.

RAD's vCPE edge portfolio includes everything CSPs need to deploy virtualization services today:

- Slim, high performance disaggregated operating system
- A range of thin and thick CPEs hosting VMs or containers
- A domain orchestrator to remotely manage virtualization functionalities and automate operations

It is designed to help service providers leverage their "real estate" – that is, the network and customer edge – in introducing value-added services (VAS) beyond simple connectivity, such as hosted zero-trust secured access (Secure Access Service Edge services – SASE). RAD's solutions enable managed business routers/customer edge replacement, overlay VPN over fixed/mobile broadband network and multi-cloud access.



Business Edge vCPE – Benefits and Principles



RAD's Virtual Business Edge Solution Benefits:

- Freedom to choose any vCPE hardware (x86 or ARM-based), per branch site requirements, with a common operating system in all vCPEs to minimize integration efforts and reduce costs.
- Host value-added VMs or containers at the end-customer's premises or in data center/cloud as needed.
- Rapid transition from branch-HQ connectivity to branch-cloud connectivity.
- Open, lightweight vCPE-OS with a powerful embedded router, firewall and virtualization resources manager. It runs on a fraction of a CPU core, requires extremely low memory and provides market-leading throughput.
- Support "cloud-first" business customers with economical SD-WAN and cloud access services.

RAD's vCPE architecture follows three main principles:

- **Disaggregation:** Freedom to use any hardware (x86 or ARM-based), with the same common vCPE-OS operating system.
- **Automation:** All vCPE solutions are managed by the RADview Domain Orchestrator for consistent operations of business services and edge devices, across all sites.
- **Virtualization:** vCPE functionality is shaped by the introduction of hosted virtual functions (VMs or containers) by any vendor, at any time.



Solution Components

RAD's business edge portfolio features a range of hardware devices catering to the requirements of business sites, all featuring an embedded router and a next-generation firewall. These include a disaggregated **uCPE (Thick CPE)** hosting VMs/VNFs over an x86 NFVI; a disaggregated **pCPE (Thin CPE)** – a cost-effective ARM-based platform hosting value-added services as containers; and an **IoT Gateway**, which is a pCPE packaged in a ruggedized device designed to address business sites with harsh environmental conditions.

The vCPE-OS serves as the virtualization infrastructure with embedded routing and firewall functionality. It is used to operate all CPE platforms, whether x86 or ARM-based, in ruggedized and non-ruggedized enclosures.

SD-CloudAccess – a book-ended economical SD-WAN solution comprised of a client that is either embedded in vCPE-OS or available as a uCPE-hosted VNF, and software embedded in a cloud gateway. It allows application-aware traffic distribution across multiple links with SLA-guaranteed access to public, private and telco cloud services.

The RADview Domain Orchestrator provides consistent operations of business services and edge devices, across all sites. It offers full life-cycle support (zero-touch provisioning, software updates and maintenance), SDN/NETCONF support, VNF onboarding and chaining, and automatic setup of network tunnels.



ETX-1p, SecFlow-1p/vp
pCPE Platforms



ETX-2v/2i
Universal CPE Hosting VNFs



vCPE-OS
Open Carrier-Class Operating System



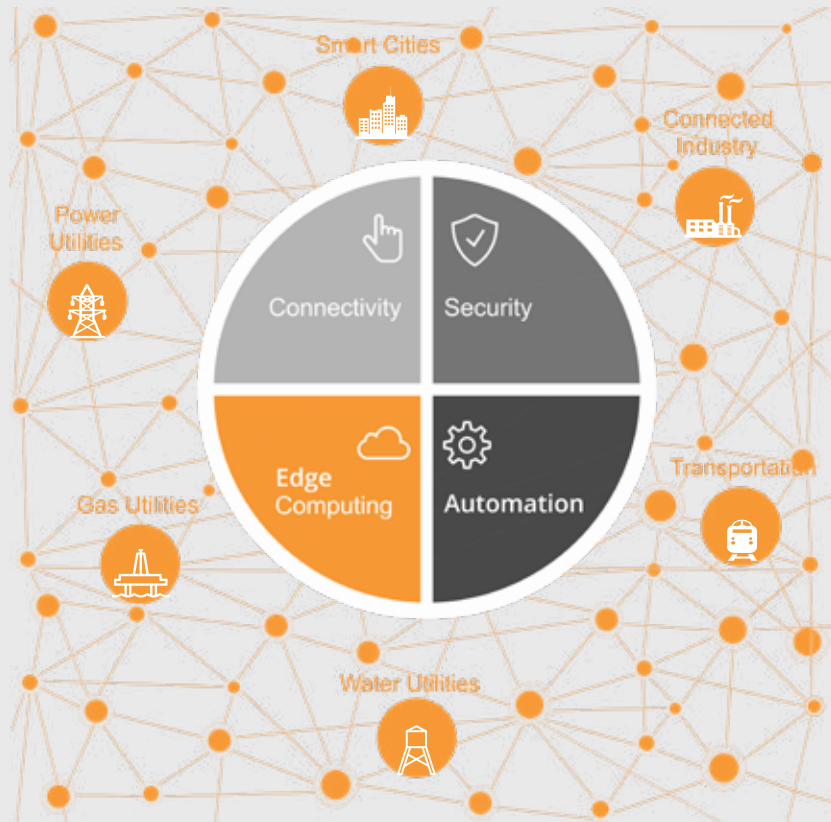
Cloud Gateway
SD-CloudAccess Hub



RADview
Management and Domain Orchestrator



Secure Industrial IoT Backhaul with Edge Computing



RAD offers a comprehensive solution for secure networking for Smart Energy (generation, transmission and distribution), Smart Transportation, Industry 4.0, Smart Cities, and more, to allow fast, secure and economical deployment of thousands of new remote IIoT sites with always-on reliability and mission-critical protection.



Power Utilities

- Smart Grid
- Re-closers
- Load breakers
- RTUs/SCADA PLC
- Secondary substations
- Meter concentrators



Transportation

- Traffic control
- Info boards
- Kiosks



Smart Cities

- Smart parking
- Traffic monitoring and control
- Bike sharing
- Smart lighting
- Public safety
- Payment kiosks (PoS)



Gas Utilities

- Flow meters
- Volume/pressure/level sensors



Connected Industry

(Smart Factory/Industry 4.0/
Society 4.0)

- Production floor monitoring
- Remote PLC control
- Automated quality control



Water Utilities

- Flow control
- Quality
- Leakage detection
- Pump/valve control
- Meters

RAD's Solution for Industrial IoT Backhaul with Edge Computing

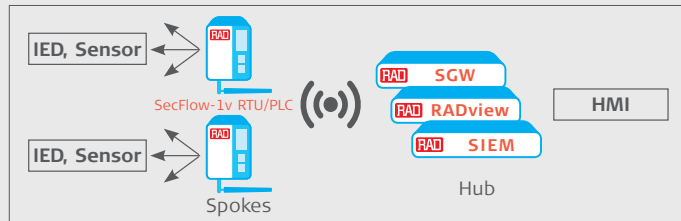


RAD's comprehensive offering for industrial IoT (IIoT) with edge computing includes ruggedized, multiservice and compact IIoT gateways, a VPN aggregator, and advanced security information and event management (SIEM). RAD's IIoT solution hosts both networking and non-networking-related functions on the same hardware to reduce the number of devices in the network and increase security and reliability.

Some key use cases and applications include:



Less Boxes, Better Security: IIoT Gateway with Built-in RTU/PLC

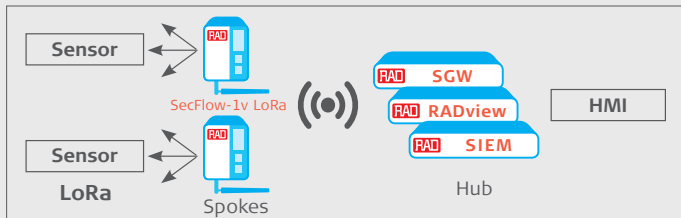
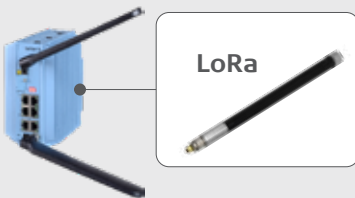


PLC software can be added to the SecFlow using edge computing. HMI users can remotely control all units in the field and adjust the operation of sensors and relays as necessary.

- No physical access to the SecFlow-contained PLC
- Includes SCADA firewall, stateful firewall IPsec, OpenVPN and PKI
- Ladder logic; master/slave inter-connectivity options
- Northbound interface to HMI: Modbus, DNP3, IEC 104, BACnet



Complete Wireless Coverage: IIoT Gateway with Built-in LoRa Base Station

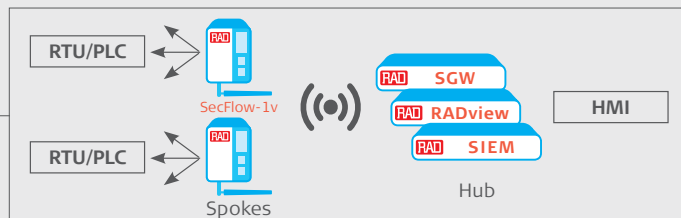
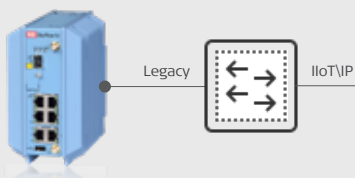


Connect large volumes of low-cost sensors using unlicensed LP-WAN backhaul to dramatically reduce CapEx and OpEx.

- Aggregate hundreds of battery-operated, low-cost sensors per base station
- Unlicensed spectrum
- LTE backhaul
- LoRaWAN gateway, optional LoRa server



Seamless Connection for Legacy SCADA: IIoT Gateway with Protocol Conversion

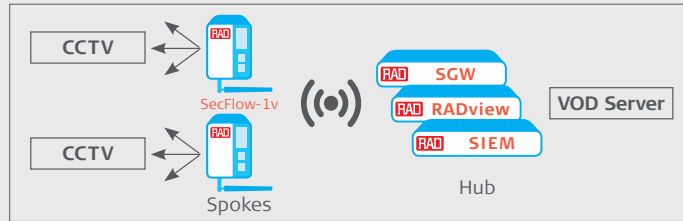
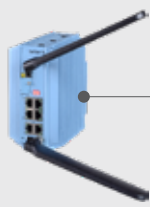


Enable brownfield deployments with built-in conversion or third-party, container-based software. Connect legacy SCADA, NG SCADA and cloud-based IIoT systems, using the following:

- IEC 101 to IEC 104, Modbus-RTU to Modbus-TCP
- DNP3-RTU to DNP3-TCP, IEC 104 to DNP3-TCP
- Modbus to MQTT
- Many more



Surveillance VOD over LTE: IIoT Gateway with Local DVR

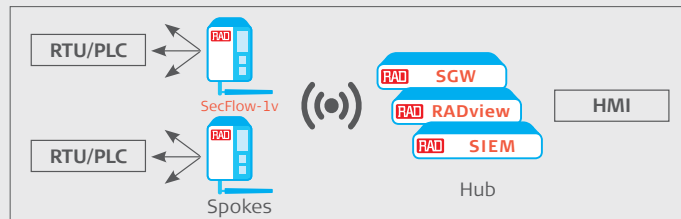
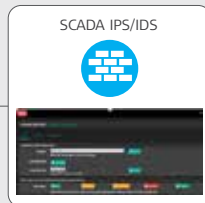


Monitor thousands of CCTV cameras without fiber while making LTE surveillance affordable.

- Videos retrieved per event and per relevant geography
- LTE data consumption only per event and on-demand to save LTE bandwidth and reduce OpEx
- Video recording, transcoding
- SD card local storage
- Fits greenfield or existing CCTVs
- Immune to camera vandalism



Bring SCADA Security to the Edge: IIoT Gateway with SCADA IPS/IDS



Monitor SCADA traffic between PLCs, log relevant activity and, if necessary, actively block traffic for intrusion prevention.

- SCADA firewall on top of SecFlow's stateful firewall
- IPsec, OpenVPN, PKI
- Intuitive UI for L3, L4 and L7 (SCADA) firewall configuration
- Syslog into RAD's SIEM
- SCADA protocols supported: DNP3, IEC 104, Modbus



BYO-GW – Build Your Own (IIoT) Gateway:

Customize your own solution with an open platform (LXC/LXD on ARM) and intuitive development environment to add various industrial IoT applications as edge computing virtual machines.



SecFlow

Industrial IoT Gateways with Edge Computing



SecurityGateway

VPN Aggregator, Router and Firewall



RADview

Network Management, Firewall Configurator and Security Management (SIEM)



Service Providers

Migrate to NFV/SDN edge virtualization **today** with RAD's Service Assured Access (SAA) solutions.

For mobile, business and wholesale service providers, RAD provides an economical migration path to network edge virtualization via the disaggregation of software and hardware.

RAD's solutions allow service providers to enrich their business service offering as they add value off the edge to businesses transitioning to the cloud.

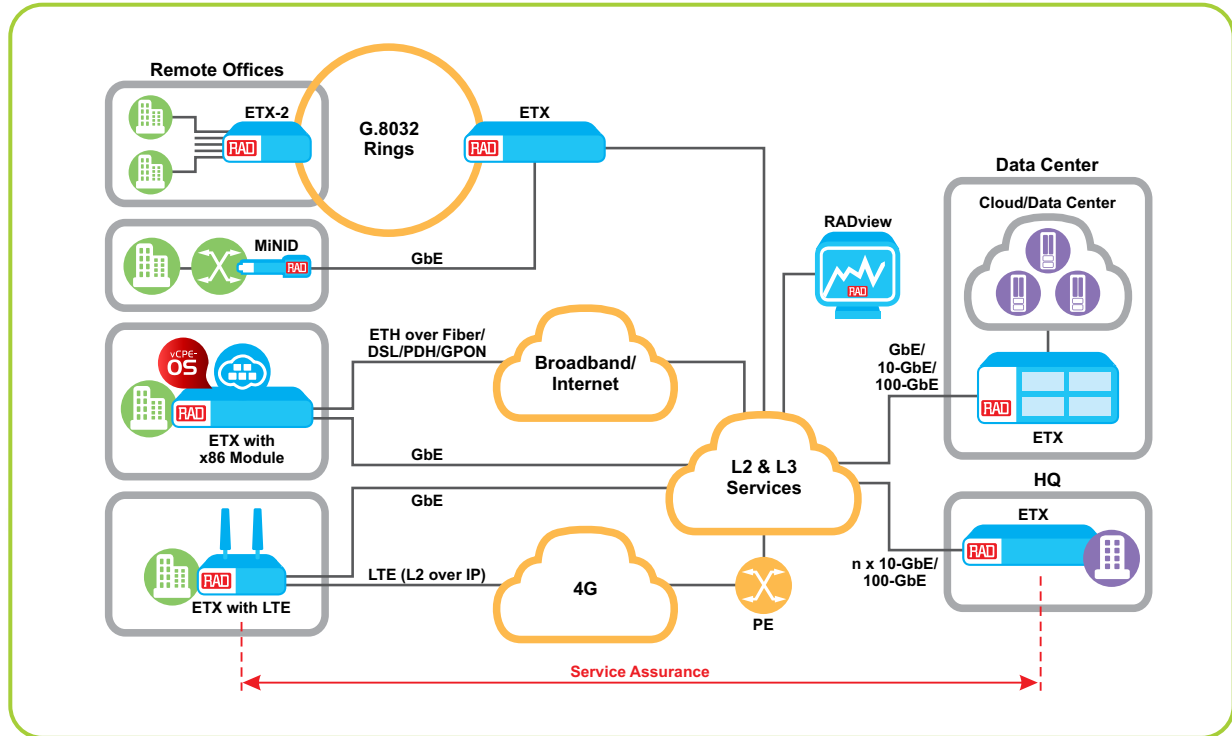
In addition, RAD's solutions deliver edge virtualization and cloud access with performance assurance, service flexibility and operational efficiency, as well as 5G xHaul.

Key SAA solutions include:

- Market-leading EAD portfolio supporting the latest MEF 3.0 specifications for delivering Carrier Ethernet services, including comprehensive SLA assurance, end-to-end visibility and life-cycle management capabilities over any access
- Programmable cell site gateways for fast rollouts of 5G deployments with fronthaul/midhaul/backhaul support and future 5G upgrades
- Service-assured vCPE Toolbox portfolio allowing service providers to introduce IP VPN and value-added services off their own data center and/or off the vCPE platform itself
- Seamless migration from TDM to IP, supporting an existing installed base and services, while introducing next-gen communications



Carrier Ethernet for L2 VPNs



Your Benefits:

- Easily plan, deploy, provision, and maintain SLA-based business services over any access: fiber/copper/TDM/mobile
- Carrier Ethernet demarcation and aggregation switch up to 100G
- MEF 3.0-certified with standard NETCONF/YANG northbound interfaces
- Cost-effective aggregation with dynamic edge support for monitoring and policing
- vCPE functionality at the customer edge for introduction of value-added services
- Enhanced service provisioning, visibility and reporting using RADview Service Manager and RADview Performance Monitoring portal



ETX-2/2i
1G/10G/100G Carrier
Ethernet Demarcation



ETX-2/2i
EADs with x86 Module, LTE
and Broadband Options



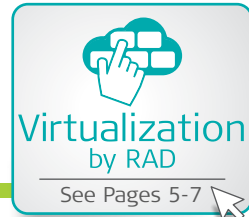
MiNID
Miniature Programmable
Network Interface Device



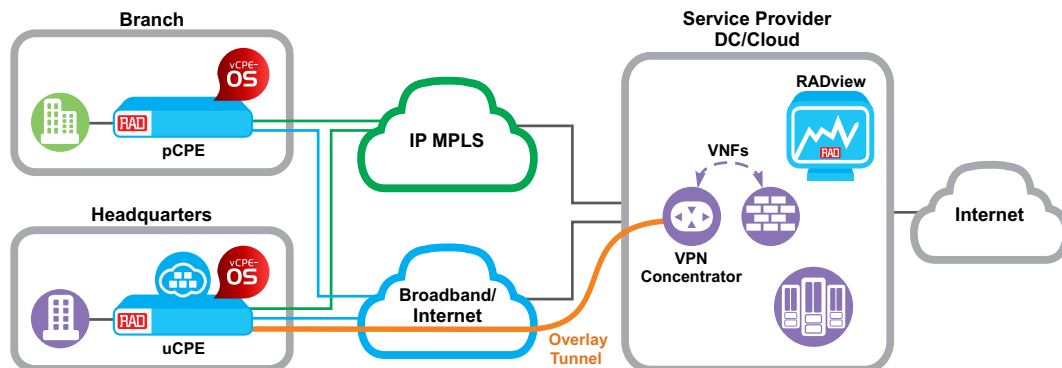
RADview
Management and Domain
Orchestration



vCPE



1 uCPE and pCPE for L3 VPN



Your Benefits:

- Disaggregation: Freedom to choose any vCPE hardware, per branch site requirements, with a common operating system in all vCPEs to minimize integration efforts and reduce costs
- Virtualization: Enrich business offerings by hosting value-added VNFs and CNFs (Container Network Functions) at the customer or network edge
- Embedded advanced router with NG-Firewall reduces TCO by eliminating the need to purchase third-party router VNF
- Expand L3 VPN services over fixed/mobile broadband networks with secure overlay tunnels to enhance connectivity and cost options
- Automation with full life-cycle support, ZTP, SDN/NETCONF support, and more, using the RADview Domain Orchestrator



ETX-1p, SecFlow-1p
pCPE Platforms



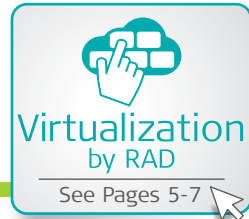
ETX-2v
uCPE Platforms



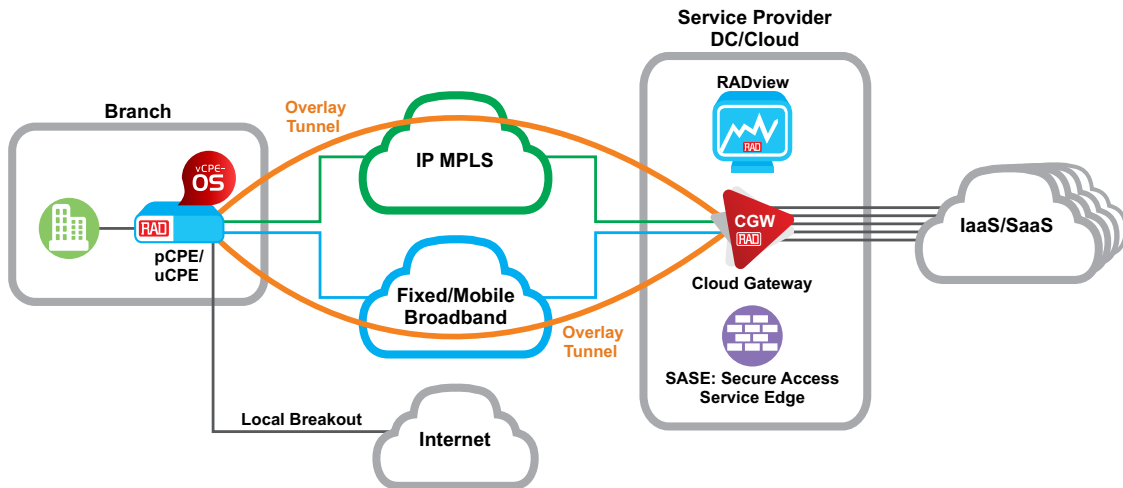
vCPE-OS
Open Carrier-Class
Operating System



RADview
Management and Domain
Orchestration



2 SD-CloudAccess



Your Benefits:

- Differentiated business services for “cloud-first” customers enabling SLA-assured, multi-cloud access
- Highly cost-effective vCPE by embedding SD-CloudAccess intelligence in the Cloud Gateway
- Enhances branch connectivity with application-aware traffic steering across multiple links
- By landing traffic in network edge locations, service providers can apply value-added services to cloud-bound traffic, including SASE for zero-trust secured access, from any endpoint to any service
- Use pCPE/uCPE as customer edge clouds, hosting value-added virtual functions in containers/VMs
- Enable secure local internet breakout with embedded next-generation firewall functionality
- Ubiquitous service offering over any access network, using a range of edge devices



ETX-2v, ETX-1p, SecFlow-1p
pCPE Platforms



Cloud Gateway
SD-CloudAccess Hub



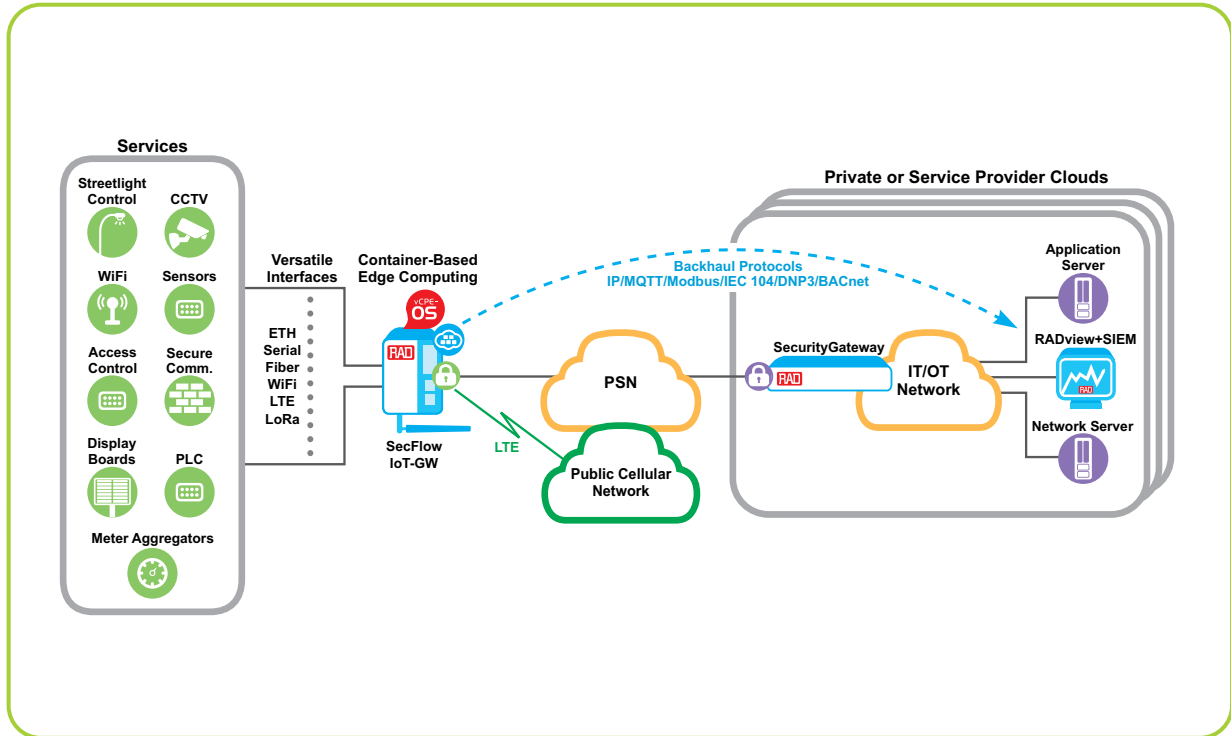
vCPE-OS
Open Carrier-Class
Operating System



RADview
Management and
Domain Orchestration



Industrial IoT Backhaul with Edge Computing



Your Benefits:

- Offer competitive IoT services for monitoring and automation devices, Smart City projects, etc.
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Zero-touch provisioning, enhanced
- cyber security (IPsec, PKI, FW, IDS/IPS, SIEM)
- Seamless communications over fiber optics, radio links and 2G/3G/LTE cellular links
- Secure remote access for end-user device management
- Integrated IEC 61131-3 RTU/PLC
- Integrated PLC functionality and LoRaWAN gateway reduces the number of devices in the network
- Transparent delivery of SCADA, protocol conversion and terminal server
- Complies with IEC 61850-3 and IEEE 1613 environmental standards



SecFlow
Industrial IoT Gateway
with Edge Computing



vCPE-OS
Open Carrier-Class
Operating System



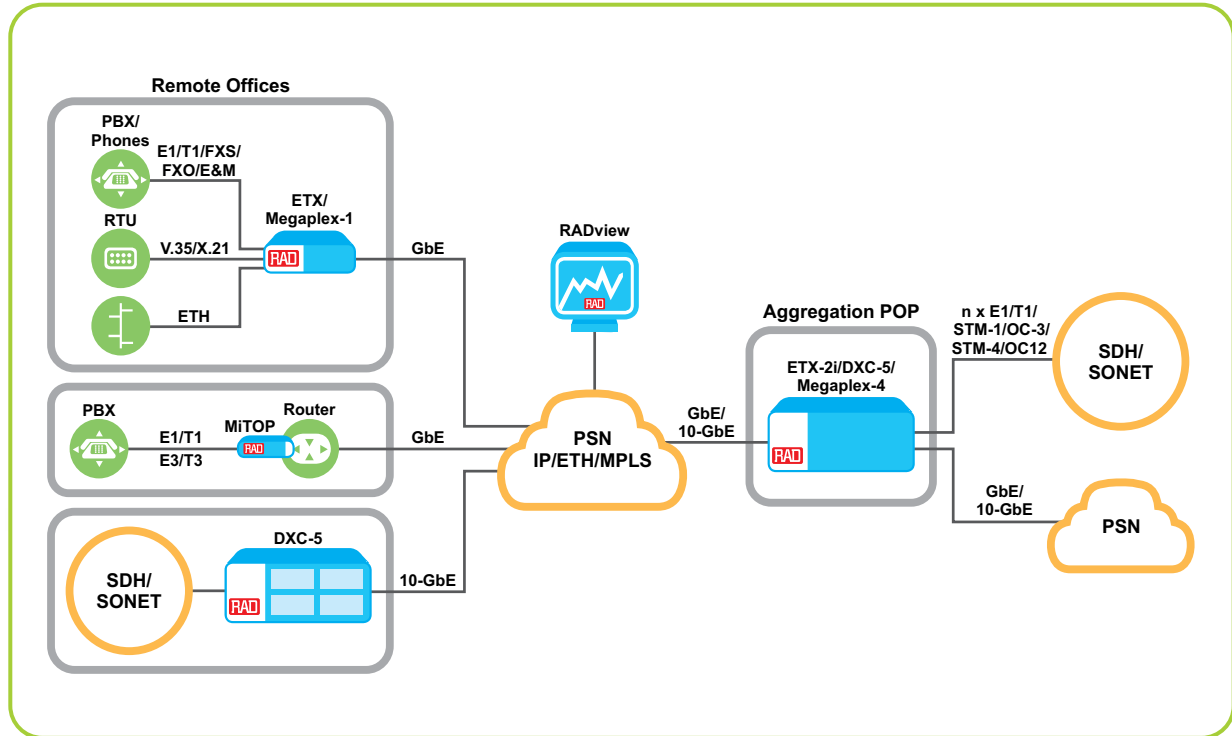
SecurityGateway
VPN Aggregator, Router
and Firewall



RADview
Management and Domain
Orchestration



TDM Migration



Your Benefits:

- Maintain legacy TDM services over new packet network to keep revenue flow and customer loyalty
- Enable alternative providers to add leased lines to their service portfolio to attract new customers
- Support heterogenic First Mile footprint requiring CPE support for DSL/EFM, Ethernet, GPON connections, and flexibility in PWE termination options: Customer site-to-customer site, customer site-to-POP/network, POP-to-POP
- Allow a single transport network for IP/Ethernet and TDM services to simplify operations and lower TCO



ETX-2/ETX-2i
IP and Carrier Ethernet
Demarcation



ETX-5
Ethernet Service
Aggregation Platform



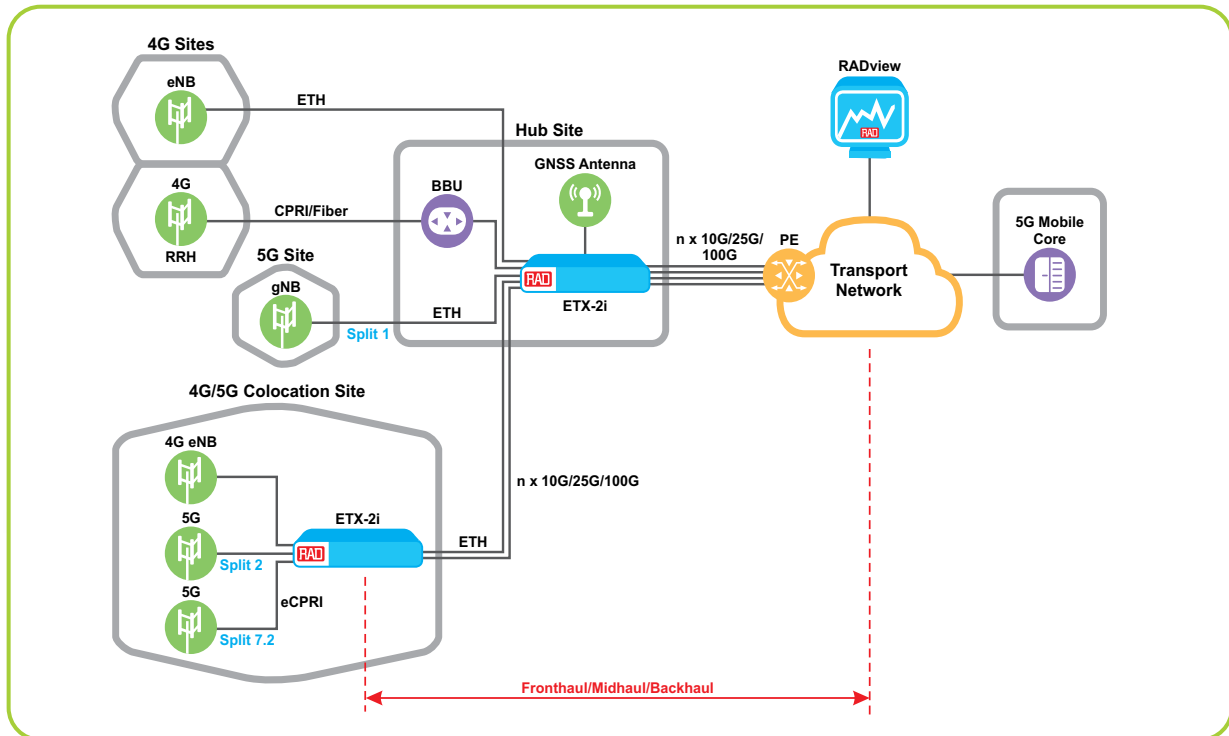
MiTOP-E1/T1, E3/T3
Smart SFP-Format TDM
Pseudowire Gateways



RADview
Management and Domain
Orchestration



4G/5G Mobile xHaul



Your Benefits:

- Fast rollouts of 5G deployments with in-field future upgrades to meet new requirements
- CSG for multiple 5G RAN splits and collocated 4G/5G sites
- Highly efficient 4G/5G aggregation: 10G, 25G and 100G
- Fixed-mobile convergence: Collocated mobile and fixed broadband sites
- Multi-CoS Carrier Ethernet/IP backhaul with service management and OAM-based diagnostics
- 1588 PTP (GM, BC, TC) with integrated GNSS receiver, Sync-E for timing synchronization
- L2, L3-based fronthaul/midhaul/backhaul performance monitoring for multiple network slices and for network sharing
- Small form factor to meet space and power supply restrictions



ETX-2/ETX-2i

IP and Carrier Ethernet
Cell Site Gateways up to 100G

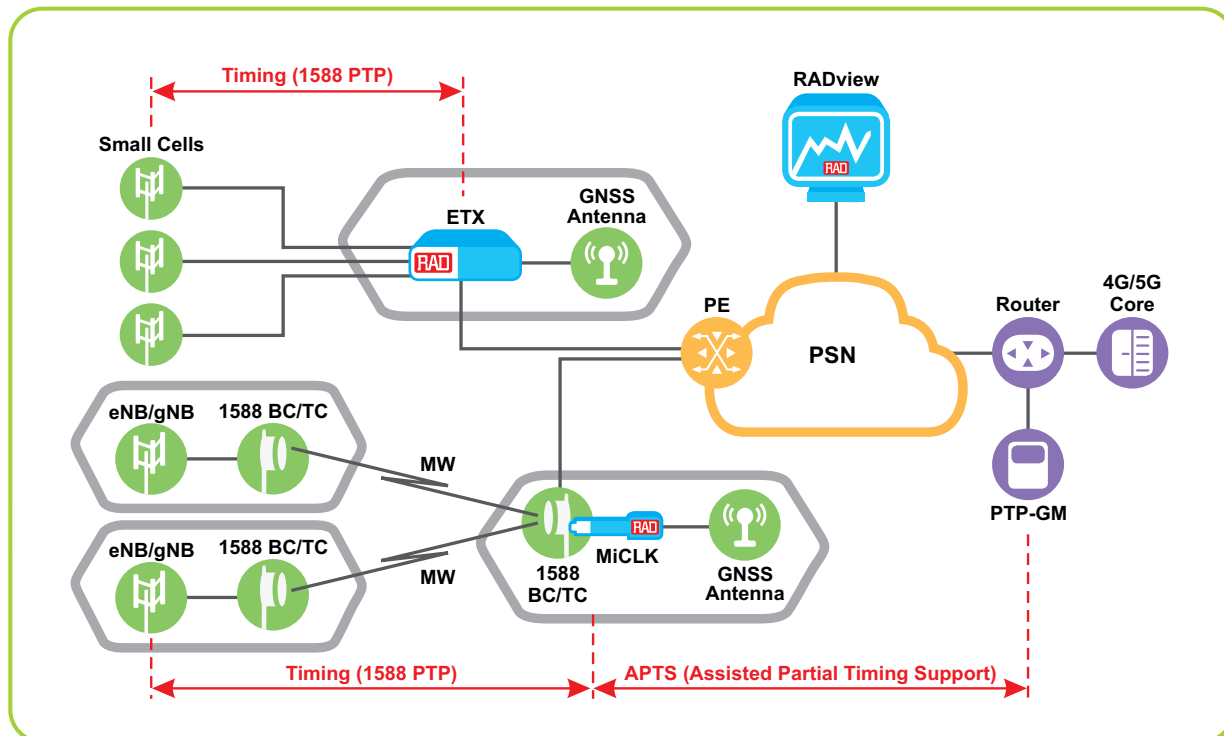


RADview

Management and
Domain Orchestration



Timing Synchronization for Mobile Networks



Your Benefits:

- Addressing stringent timing requirements (frequency/phase) for LTE/LTE-A/5G macro and small cells with a fully featured PTP Grandmaster:
 - ETX-2 in a local POP/hub
 - MiCLK unique SFP plugged into an aggregation switch
- Cost efficiency by bringing PTP Grandmaster closer to the cell site
- Built-in GNSS receiver
- Full network coverage, even in underground and indoor installations
- No need to install GNSS antenna on every cell site; avoid spoofing and jamming
- Fits existing installed base – no need for CapEx investments in retrofitting network with 1588 BC/TC support across the entire path
- Robust GNSS (GPS/GLONASS) backup – time holdover for 72 hours, using Sync-E or 1588 frequency references from the network (Assisted Partial Timing Support)



ETX-2/ETX-2i
IP and Carrier Ethernet
Demarcation



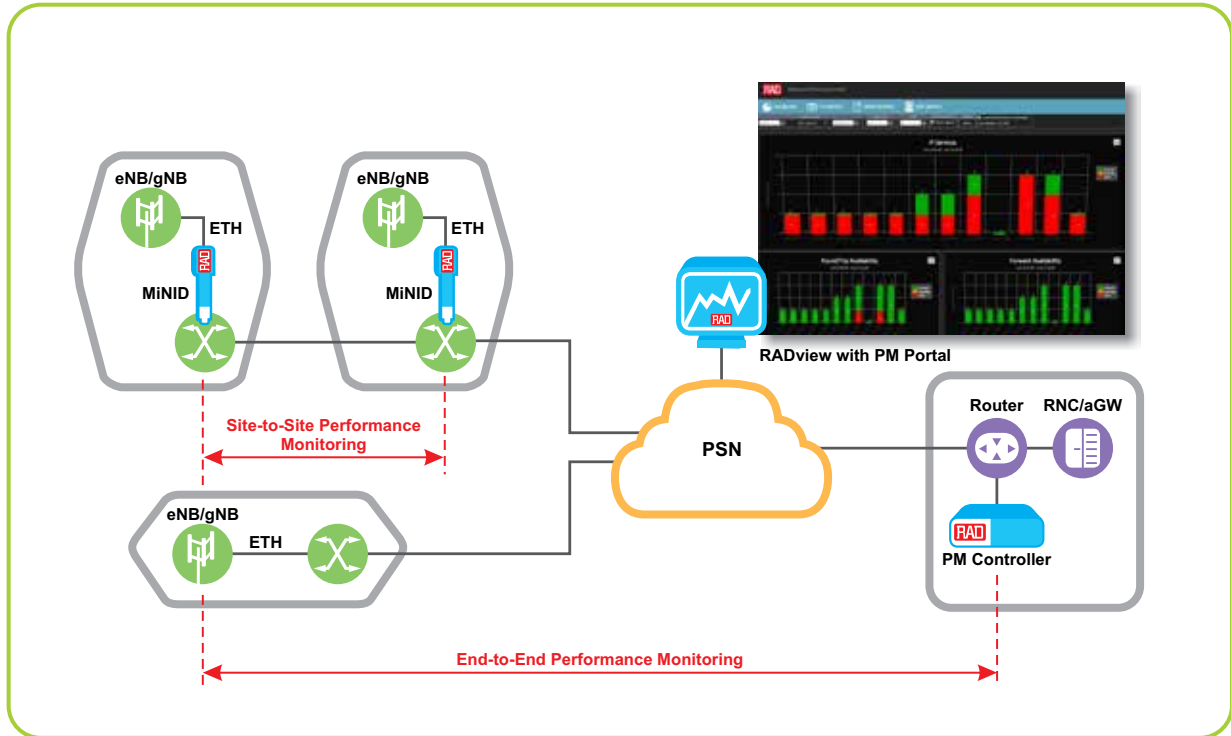
MiCLK
1588 Grandmaster on
an SFP



RADview
Management and Domain
Orchestration



Performance Monitoring for Mobile Networks



Your Benefits:

- Monitoring and troubleshooting backhaul performance
- Service activation tests (RFC-2544/Y.1564) and continuous performance monitoring
- PM controller functionality (appliance/VNF) supports Y.1731, TWAMP, ICMP Echo ("ping"), and UDP Echo opposite RAD devices or third-party responders
- High precision one-way measurements opposite any TWAMP responder
- RADview Performance Monitoring portal for SLA reporting
- Enhanced service assurance with MiNID:
 - Easy plug-and-play installation into existing backhaul networks
 - L2/L3 test generation and response capabilities
 - Remote packet capture for deep traffic analysis



MiNID
Miniature Programmable
Network Interface Device



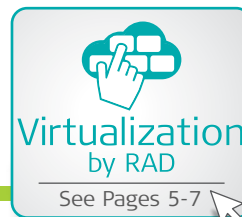
PM Controller
Performance Monitoring
Generator



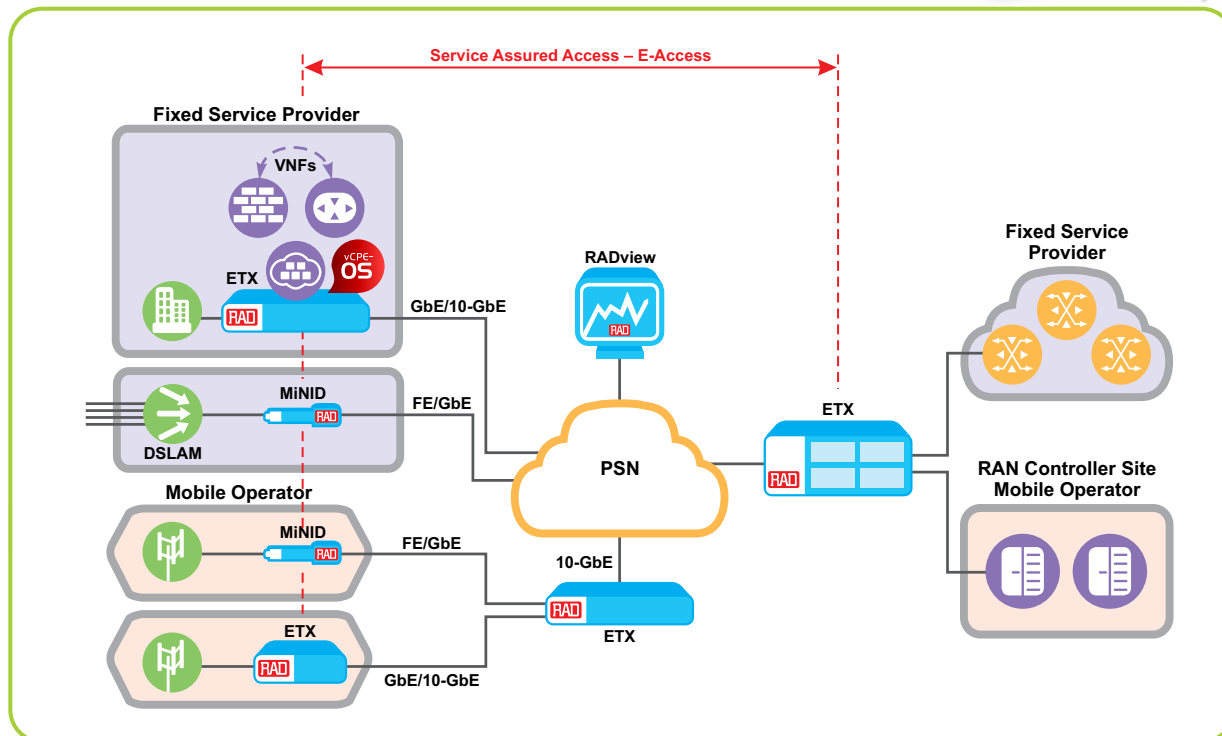
RADview
Management and Domain
Orchestration



Wholesale Networking



See Pages 5-7



Your Benefits:

- Provide wholesale Carrier Ethernet transport services to multiple service providers with complete visibility and controlled service hand-off between multiple networks
- Demarcation for business and mobile services, and broadband access node (e.g., DSLAM) backhaul over the same transport network
- Provide SLA-based backhaul all the way to the end-customer site, cell site or POP
- MEF-certified Carrier Ethernet 3.0 E-Access support with single-CoS and/or multiple-CoS EVC/OVC for standards-based carrier-to-carrier connectivity
- Seamless connection between networks with 1-GbE, 10-GbE and 100G E-NNI interfaces with optional redundancy
- Enhance wholesale offering with VNF-based, managed, value-added services



ETX-2
IP and Carrier Ethernet
Demarcation



ETX-2i-100G
100G EAD



MiNID
Miniature Programmable
Network Interface Device



RADview
Management and
Domain Orchestration

3-Time IoT Evolution Award Winner!



SecFlow Industrial IoT Gateway with Edge Computing

Your all-in-one solution for large-scale automated networks: Smart cities, smart energy, connected industry, and more. The SecFlow provides remote visibility into all devices on the network, unified management and smart threat response.

Using agile Edge Computing capabilities, the customizable SecFlow hosts multiple software containers for rapid and secure delivery of new networking and non-networking IoT applications, such as LoRaWAN and PLC, based on open-source, homegrown or third-party software.

What's in it for you? With SecFlow IIoT Gateway you get:

- Full flexibility to meet your specific needs: Project size, deployment strategy and geographical spread
- Less devices to deploy using an all-in-one solution: Easier to manage, more secure and lower costs
- Support for any network connection available with a full suite of end-to-end security
- Advanced automation tools and connection to smart dashboards and analytics to make inform decisions on the spot

Need help in choosing the right IIoT gateway for your needs?

Contact us at market@rad.com



Your Network's Edge®



Critical Infrastructure

Industrial IoT with edge computing and cyber-secure operational WAN,
using RAD's Service Assured Networking solutions.

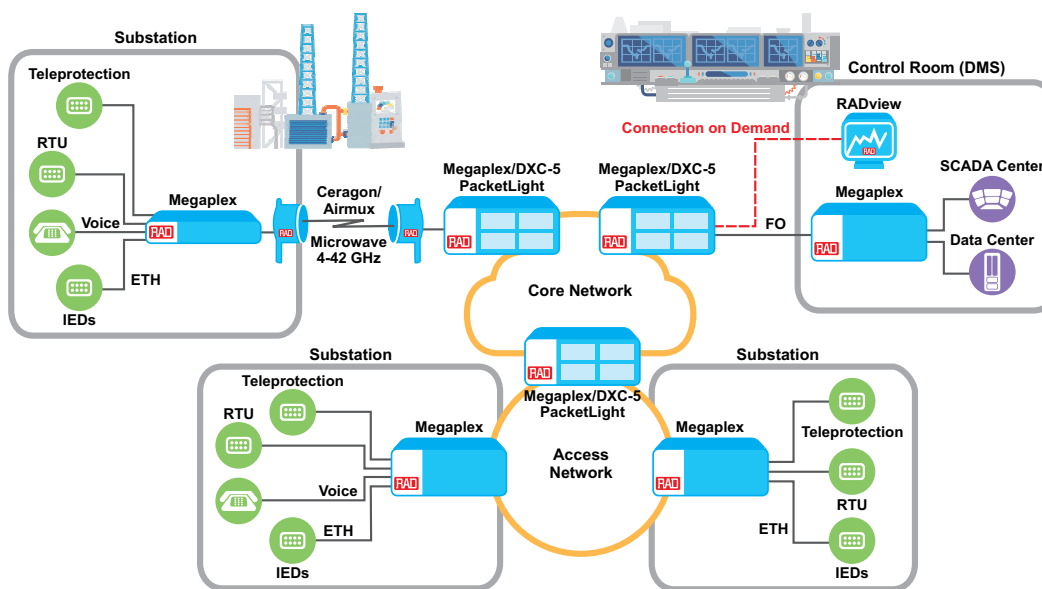
RAD provides Service Assured Networking (SAN) solutions that ensure seamless migration to packet switched communication networks and applications. We address all communication needs of the utilities, transportation and government sectors with always-on reliability and mission-critical protection. We offer best-of-breed reliability tools. Our SAN solutions are used for cyber-secure industrial IoT (IIoT) and operational WANs, fog/edge computing, TDM to packet migration, distance Teleprotection and distribution automation, as well as Smart/Safe City deployments.

Key SAN solutions include:

- Secure networking for digital transformation to allow fast, secure and economical deployment of thousands of new remote IIoT sites
- Multiservice, packet and PoE-intensive OT WANs, enabling easy migration from TDM to PSNs
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links, and leased lines
- Extensive security suite includes SCADA-aware firewall, intrusion prevention, man-in-the-middle attack prevention, encryption, device connection control, event logger, and anomaly detection

Power Utility Communications

1 Multiservice Operational WAN



Your Benefits:

- Powerful cross-generation TDM, MPLS and Ethernet capabilities, including TDM DS0 cross connect and SDH/SONET, Carrier Ethernet with OAM and assured QoS, TDM pseudowire, Ethernet over NGPDH/SDH/SONET
- Complete cyber suite, including encryption, authentication and authorization
- Easy connectivity of all services including Teleprotection over either SDH/SONET or a packet network
- Supports analog and digital data and voice devices, as well as Ethernet IEDs, with versatile rates from DS0 (time slot) up to STM-64/OC-192 or 10-GbE
- Guaranteed smooth migration to PSNs based on hybrid design for reduced latency and better resiliency
- Point-to-point and point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed bands



Megaplex
Next-Generation Multiservice
Networking Node



DXC-5
High Capacity Hybrid
Cross Connect



Ceragon/Airmux
Wireless Transport
Platform

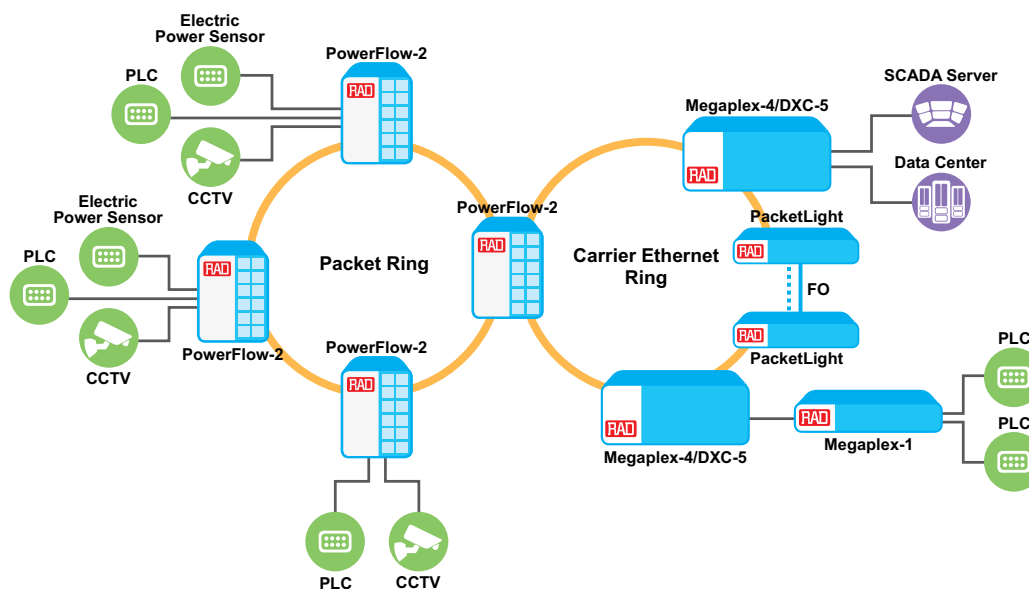


PacketLight
Complete Solutions for WDM/OTN
and Dark Fiber Applications



RADview
Management and
Domain Orchestration

2 Packet Operational WAN



Your Benefits:

- Supports Ethernet-based communications for mission-critical automation traffic within the substation and between SCADA control centers
- Multiple elements on each ring/sub-ring
- Complies with IEC 61850-3 and IEEE 1613 environmental standards
- Legacy communications using pseudowire emulation (PWE) with hitless PWE redundancy
- Optional PoE+
- Ring protection: Standard with G.8032 and proprietary with fast recovery time (< 10 ms for PF_Ring™)
- Supports installation in harsh environments, IEEE 1613 and/or IEC 61850-3 (optional for specific devices)



Megaplex-4
Next-Generation Multiservice
Networking Node



Megaplex-1
Multiservice Pseudowire
Access Gateway



DXC-5
High Capacity Hybrid
Cross Connect



PowerFlow
Managed Ruggedized Ethernet
Switch with Power over Ethernet



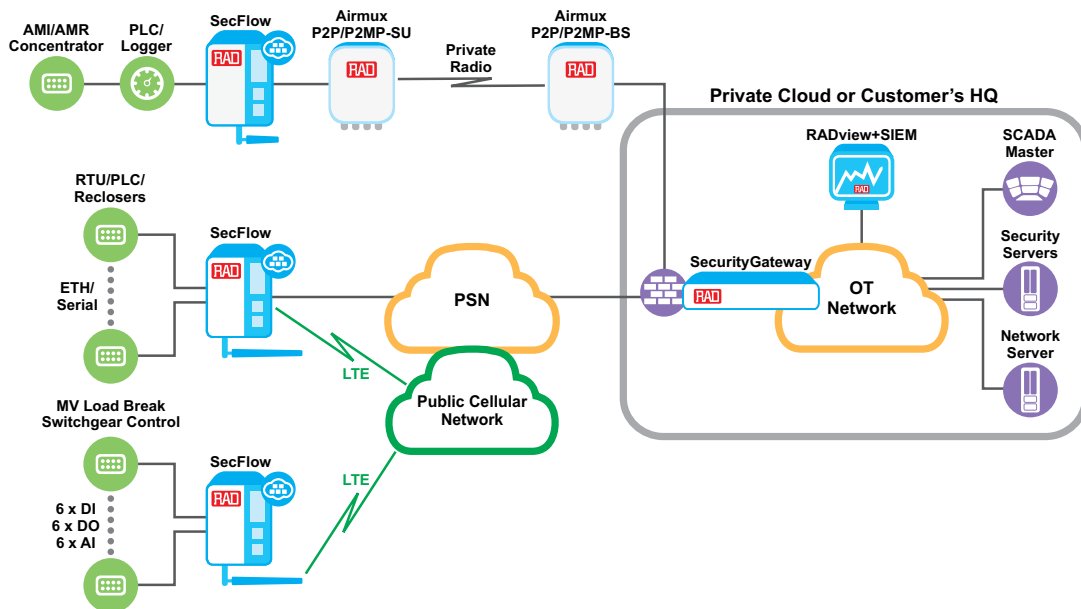
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and Dark Fiber Applications



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3 Industrial IoT Backhaul for Distribution Automation and Smart Metering



Your Benefits:

- A comprehensive and secure solution addressing communications to secondary substations, metering and distribution automation
- Integrated IEC 61131-3 RTU/PLC
- Integrated LoRaWAN gateway
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Zero-touch provisioning, enhanced cyber security (IPsec, PKI, FW, IDS/IPS, SIEM)
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links, and leased lines from a telecom service provider
- Secure remote access for end-user device management
- Transparent delivery of SCADA, protocol conversion and terminal server
- Complies with IEC 61850-3 and IEEE 1613 environmental standards
- Point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed sub-6 GHz bands



SecFlow
Industrial IoT Gateway with Programmable Logic Controller



SecurityGateway
VPN Aggregator, Router and Firewall

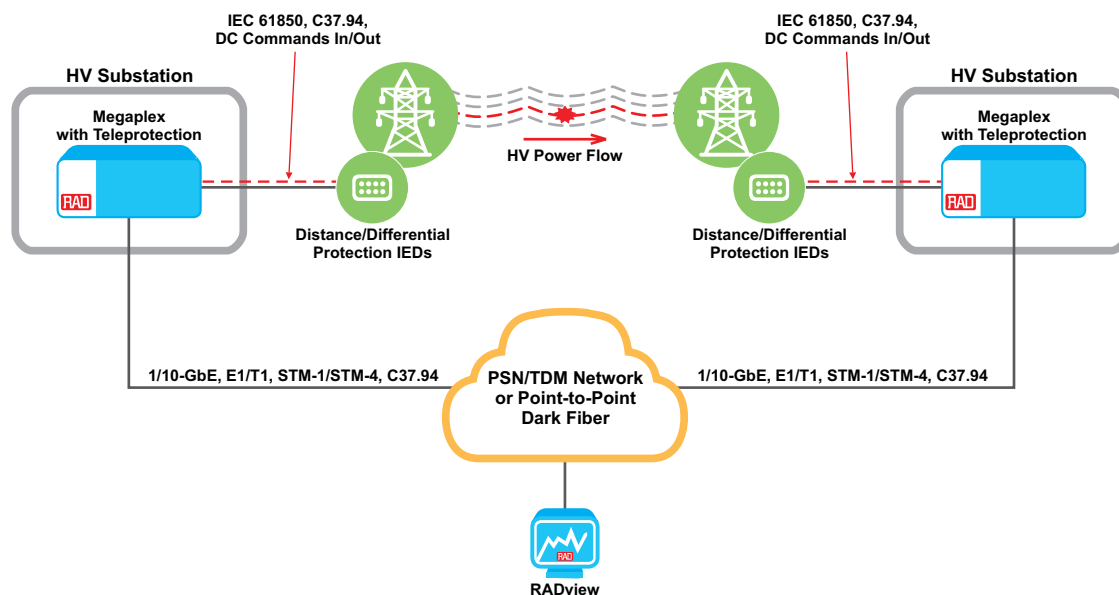


Ceragon/Airmux
Wireless Transport Platform



RADview
Management and Domain Orchestration

4 Distance and Differential Protection Communications



Your Benefits:

- Single product supports both distance trip command relays and differential Teleprotection delivery over TDM or IP network
- Wide range of Teleprotection interfaces — serial, G.703 co-directional, E&M, C37.94 — to extend differential Teleprotection
- relay communication over any infrastructure
- Reduce CapEx and OpEx by using a single-box solution for all substation communication services, including voice, data, automation, and Teleprotection signals
- Redundancy hierarchy from the Teleprotection interface up to the communication link ensures 0 (zero) msec hardware protection
- Sub-2 msec end-to-end delay over PSN
- Tested interoperability with most Teleprotection contact relays from leading vendors (such as Alstom, ABB, Siemens, SEL, Schneider)
- Distance protection complies with IEC 60834



Megaplex-4
Next-Generation Multiservice
Networking Node

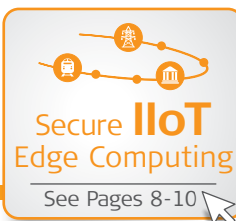


Megaplex-1
Multiservice Pseudowire
Access Gateway

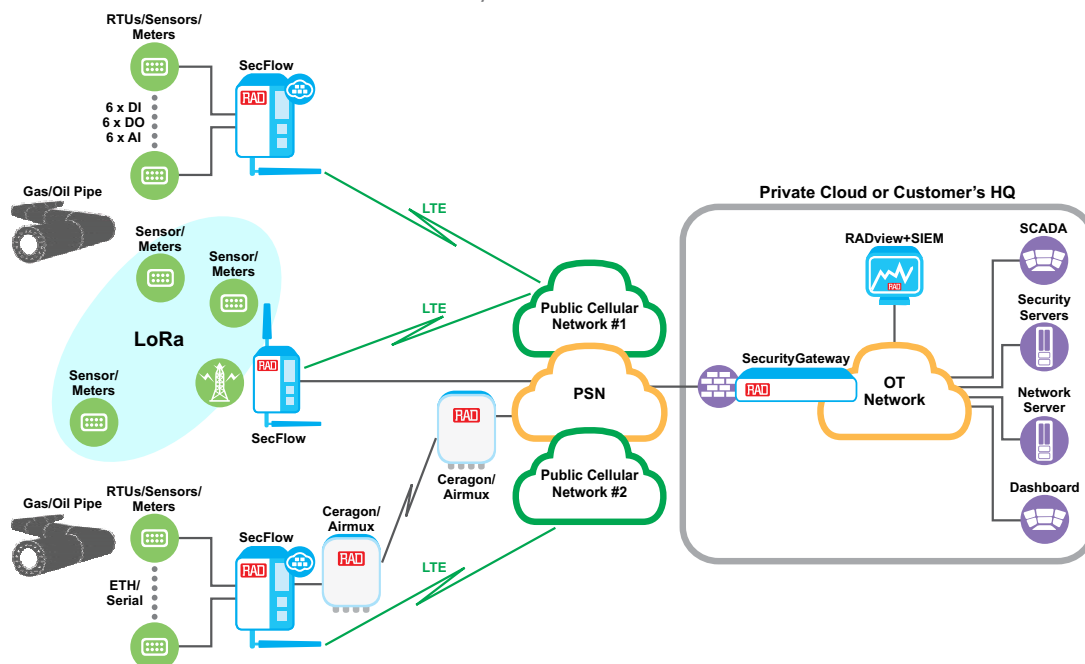


RADview
Management and Domain
Orchestration

Oil and Gas Utility Communications



Industrial IoT Backhaul for Oil & Gas Utility Communications



Your Benefits:

- A comprehensive and secure solution addressing communications for compressor stations, LACT and flow meters, etc.
- Integrated IEC 61131-3 RTU/PLC
- Integrated LoRaWAN gateway
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Zero-touch provisioning, enhanced cyber security (IPsec, PKI, FW, IDS/IPS, SIEM)
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links, and leased lines from a telecom service provider
- Secure remote access for end-user device management
- Transparent delivery of SCADA, protocol conversion and terminal server
- Complies with Class I div 2
- Point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed sub-6 GHz bands



SecFlow
Industrial IoT Gateway
with Programmable Logic
Controller



SecurityGateway
VPN Aggregator, Router
and Firewall



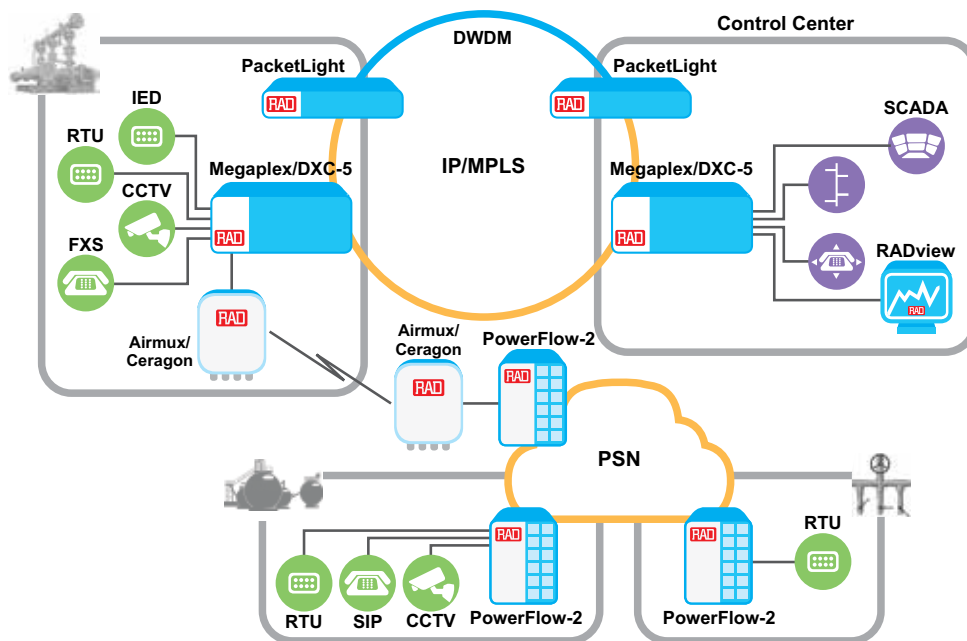
Ceragon/Airmux
Wireless Transport
Platform



RADview
Management and Domain
Orchestration

Water Utility Communications

1 Operational WAN for Water Utility Communications



Your Benefits:

- Cyber-secure SCADA connectivity for water monitoring and automation devices, sensors, pumps, surface and groundwater availability tracking devices, etc.
- Supports all communication needs, including SCADA protocols, voice and new packet services (CCTV, VoIP, etc.)
- Multiservice aggregation for any transport network, including SDH/SONET, IP/MPLS, MPLS-TP, CE and OTN/DWDM
- Point-to-point and point-to-multipoint radio system supports up to 750 Mbps over sub-6 GHz bands, with dedicated bandwidth allocation per site and service reach of up to 120 km (74.5 miles)
- Complies with environmental standards for outdoor installation in harsh conditions



Megaplex-4
Next-Generation Multiservice
Networking Node



Ceragon/Airmux
Wireless Transport
Platform



DXC-5
High Capacity Hybrid
Cross Connect



PowerFlow
Managed Ruggedized Ethernet
Switch with Power over Ethernet

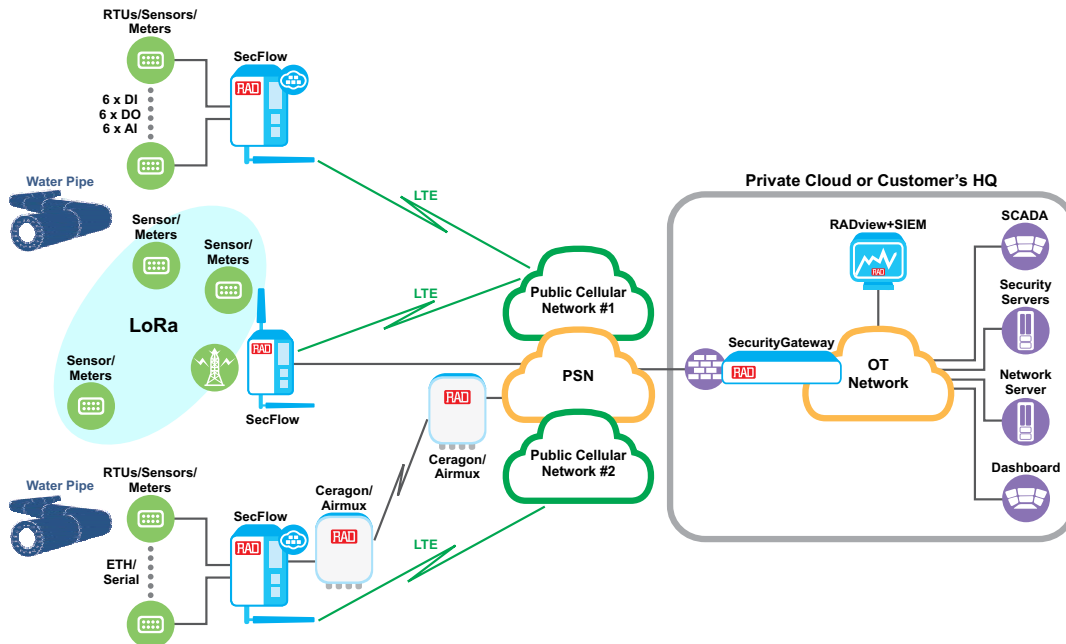


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Complete Solutions for WDM/OTN
and Dark Fiber Applications



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Management and
Domain Orchestration

2 Industrial IoT Backhaul for Water Utility Communications



Your Benefits:

- A comprehensive and secure solution addressing communications for water monitoring and automation devices, sensors, pumps, etc.
- Integrated IEC 61131-3 RTU/PLC
- Integrated LoRaWAN gateway
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Zero-touch provisioning, enhanced cyber security (IPsec, PKI, FW, IDS/IPS, SIEM)
- Seamless communications over fiber optics, radio links, 2G/3G/LTE, private cellular links, and leased lines from a telecom service provider
- Secure remote access for end-user device management
- Transparent delivery of SCADA, protocol conversion and terminal server
- Point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed sub-6 GHz bands



SecFlow
Industrial IoT Gateway
with Programmable Logic
Controller LoRaWAN Server



SecurityGateway
VPN Aggregator, Router
and Firewall



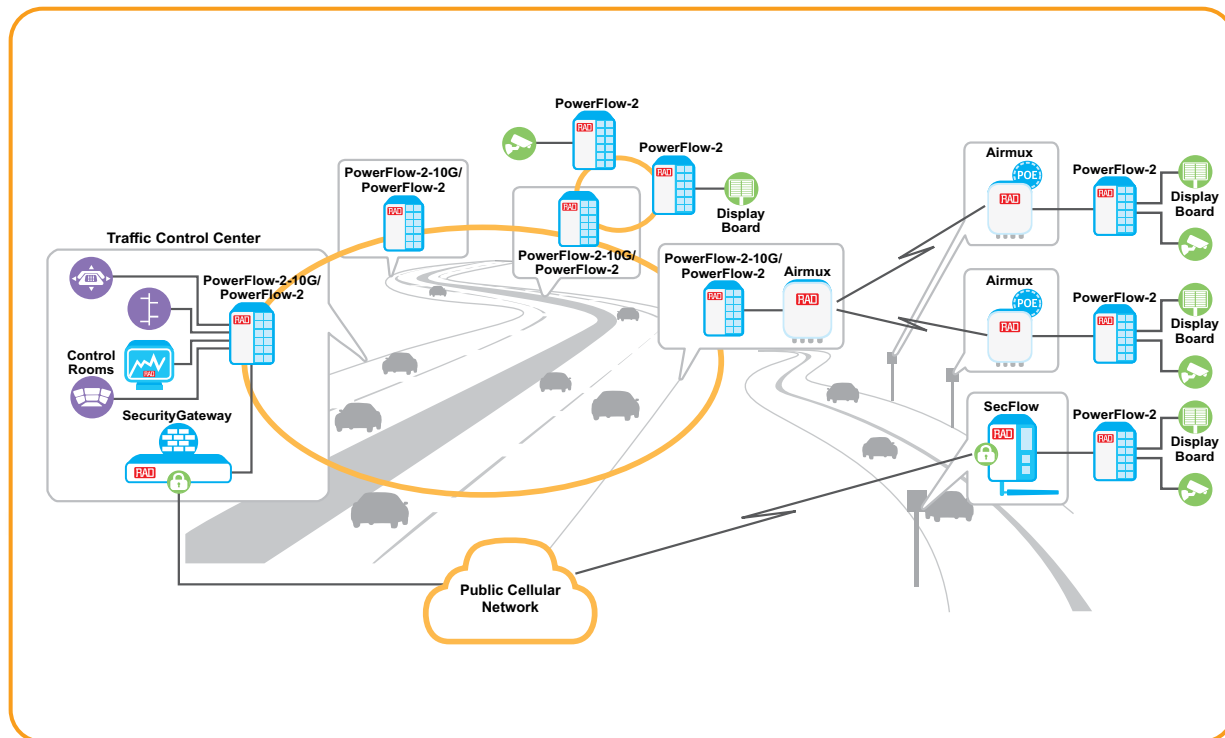
Ceragon/Airmux
Wireless Transport
Platform



RADview
Management and
Domain Orchestration



Highway Communications



Your Benefits:

- Backhaul high-definition video feeds, roadside display board and billing station data from remote facilities over fiber, high throughput microwave PtP and PtMP radio links, and 10-GbE rings
- Enable outdoor installations with industrial design and ruggedized enclosures
- Extensive PoE support including PoE++ and Airmux PoE
- 10-GbE carrier-grade Ethernet core rings with traffic management capabilities ensure reliable connectivity with appropriate quality of service for various applications



PowerFlow
Managed Ruggedized
Ethernet Switch with
Power over Ethernet



SecFlow
Ruggedized SCADA-Aware
Ethernet Switch/Router



Ceragon/Airmux
Wireless Transport
Platform

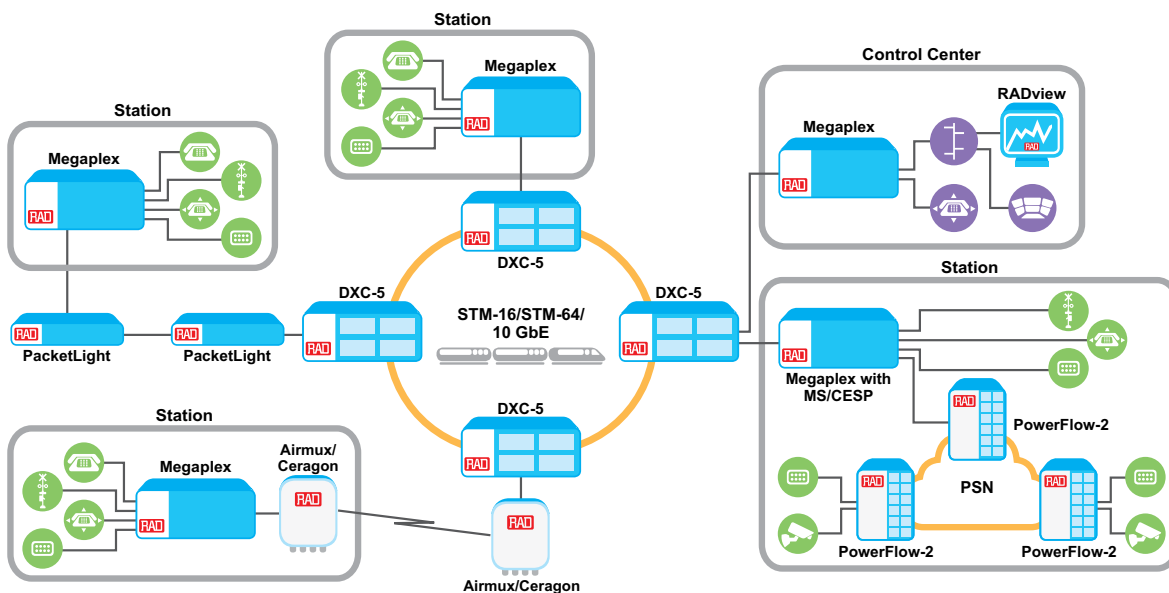


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Orchestration



Train and Metro Communications

1 Operational WAN for Trains and Metros



Your Benefits:

- Ensure protected connectivity between stations and control room using multidrop and ring topologies
- Ethernet extension over fiber or copper (SHDSL) to enable service reach to remote M2M and video devices
- Support mission-critical railway applications, including automatic train supervision (ATS), centralized traffic control (CTC), SCADA, and multiparty hotlines, as well as passenger information systems (PISs)
- Support legacy TDM and Ethernet traffic delivery over SDH/SONET/IP/MPLS/MPLS-TP/CE/DWDM/OTN and/or carrier-grade fiber optic rings
- Supports analog and digital data and voice devices, as well as Ethernet IEDs, with versatile rates from RS-232 up to STM-64/OC-192 or 10-GbE
- Point-to-point and point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed bands



Megaplex
Next-Generation Multiservice
Networking Node



DXC-5
High Capacity Hybrid
Cross Connect



ETX-203AX
Carrier Ethernet Demarcation Device



Ceragon/Airmux
Wireless Transport
Platform



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Complete Solutions for WDM/OTN
and Dark Fiber Applications



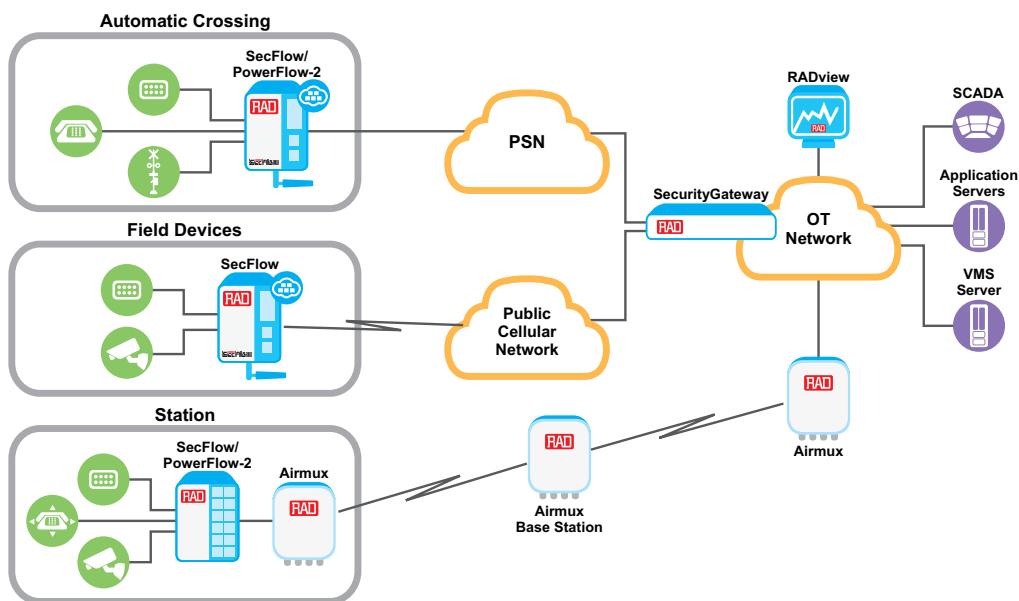
PowerFlow
Managed Ruggedized Ethernet
Switch with Power over Ethernet



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Domain Orchestration



2 Industrial IoT Backhaul for Trains and Metros



Your Benefits:

- A comprehensive and secure solution addressing communications along railway tracks, wayside signaling, interlocking, and safety systems
- Integrated IEC 61131-3 RTU/PLC
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Zero-touch provisioning, enhanced cyber security (IPsec, PKI, FW, IDS/IPS, SIEM)
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links, and leased lines from a telecom service provider
- Secure remote access for end-user device management
- Transparent delivery of SCADA, protocol conversion and terminal server
- Complies with EN 50121-4
- Point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed sub-6 GHz bands



SecFlow
Industrial IoT Gateway with
Edge Computing



SecurityGateway
VPN Aggregator, Router
and Firewall



Ceragon/Airmux
Wireless Transport
Platform

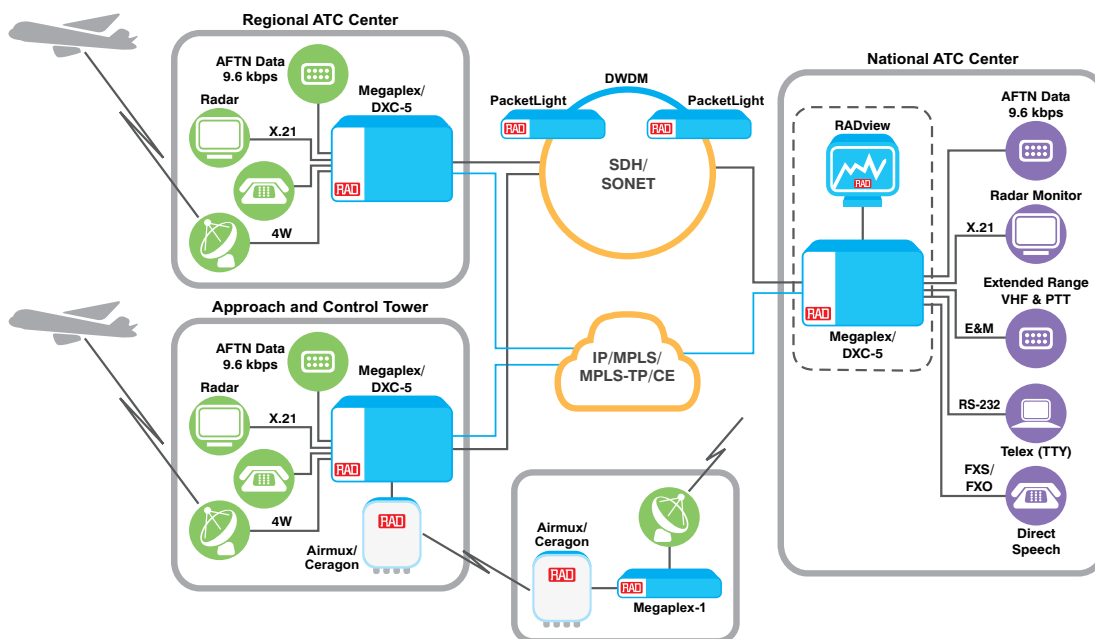


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Management and
Domain Orchestration



Air-Traffic Control Communications

1 Multiservice Operational WAN for Air-Traffic Control



Your Benefits:

- Ensure reliable, uninterrupted communications between different traffic control centers with RAD's multiservice connectivity solutions over any transport network, including SDH/SONET, IP/MPLS, MPLS-TP, CE, OTN, DWDM
- Deliver direct speech (DS), Telex (TTY), radar data (RD), extended range VHF (ER), and VHF data link (VDL) traffic, together with other voice, fax and LAN services, using industry-standard interfaces
- Transport traffic over copper, fiber, microwave, or satellite links
- Distributed SCADA security suite with integrated firewall and encryption
- Optimized for subrate leased line transmission and backup to reduce OpEx
- Ruggedized platforms withstand the rigors of field operations
- Support fail-safe operations with ISDN, VSAT and Ethernet backup



Megaplex
Next-Generation Multiservice
Networking Node



DXC-5
High Capacity Hybrid
Cross Connect



Ceragon/Airmux
Wireless Transport
Platform



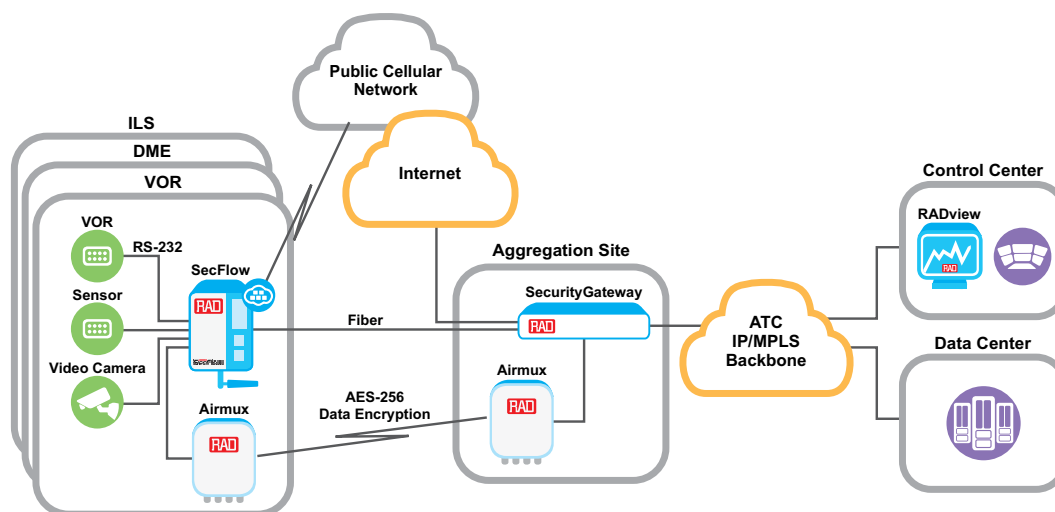
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2 Industrial IoT Backhaul for Remote Unmanned Sites



Your Benefits:

- Ensure management and monitoring for unmanned ATC sites (VOR, DME, ILS)
- Integrated IEC 61131-3 RTU/PLC
- SCADA capabilities, dry contacts and serial tunneling
- Extensive PoE support for CCTV camera applications
- Zero-touch provisioning, enhanced cyber security (stateful firewall, SCADA, IPS/IDS, SIEM)
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links and leased lines
- Integrated IPsec encryption with automated PKI support
- Transport traffic over copper, fiber, microwave, or satellite links
- Point-to-point and point-to-multipoint radio connectivity for high capacity mission-critical traffic over licensed and unlicensed bands
- Secure remote access for end-user device management



SecFlow
Industrial IoT Gateway with
Edge Computing



SecurityGateway
VPN Aggregator, Router
and Firewall



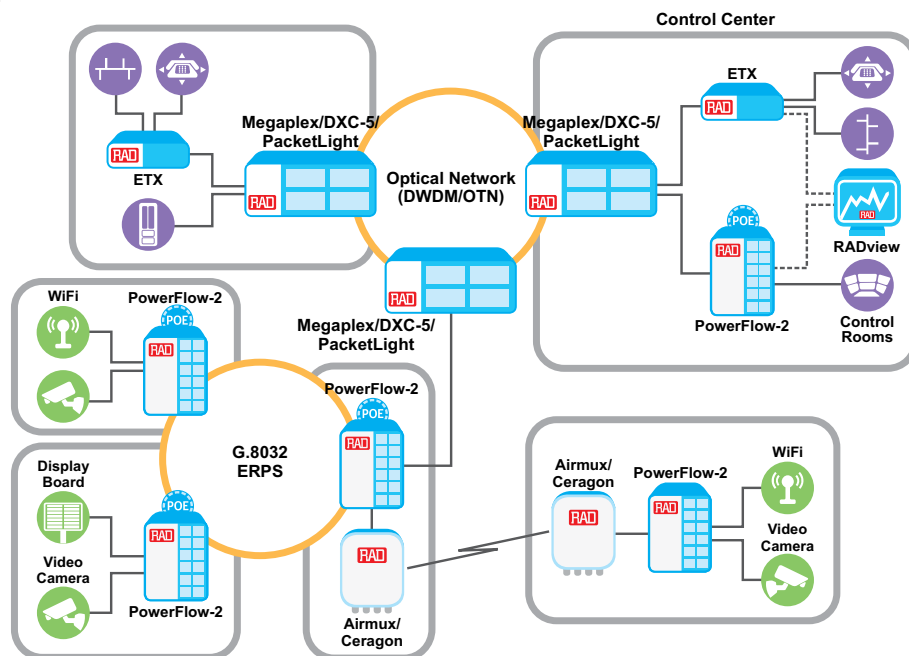
Ceragon/Airmux
Wireless Transport
Platform



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Domain Orchestration

Smart City Communications

1 Operational WAN for Smart Cities



Your Benefits:

- Provides a comprehensive solution for all Smart City communications
- Connect security cameras, WiFi access points, display boards, meter concentrators, and other sensors in urban and rural areas over fiber optics and wireless radios
- Central management to provision and control the communications network
- Long-distance fiber optic private network backbone with OTN/DWDM multi-tunneling at rates of up to 100G
- Secure connectivity over public/private networks
- Turnkey deployment solutions by RAD for Safe City and including communications, video surveillance and analytics systems, cameras, and sensors
- G.8032 Ethernet Ring Protection Switching (ERPS) and PoE support



Megaplex
Next-Generation Multiservice
Networking Node



DXC-5
High Capacity Hybrid
Cross Connect



PowerFlow
Managed Ruggedized Ethernet
Switch with Power over Ethernet



Ceragon/Airmux
Wireless Transport
Platform



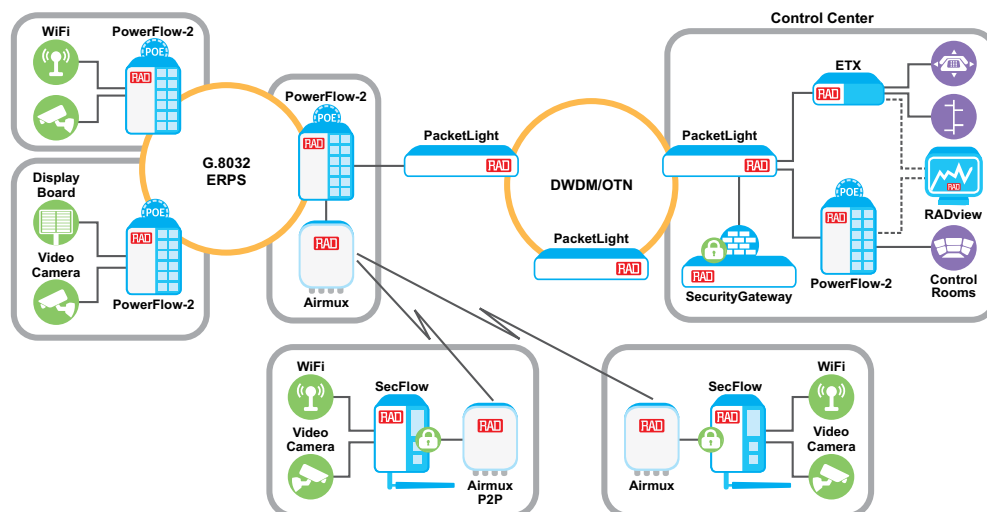
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and Dark Fiber Applications



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Domain Orchestration



2 Industrial IoT Backhaul for Smart Cities



Your Benefits:

- A comprehensive communications solution for CCTV cameras, WiFi access points, sensors, payment kiosks, etc.
- Integrated LoRaWAN gateway
- Ruggedized devices for outdoor installations
- Virtual environment for user-tailored applications allows customers to add new applications on top of SecFlow devices
- Seamless communications over fiber optics, radio links, 2G/3G/LTE cellular links, and leased lines
- Zero-touch provisioning with enhanced cyber security (Integrated IPsec, encryption, stateful firewall, SIEM)
- Secure remote access for end-user device management
- Transparent delivery of legacy traffic from serial-based devices
- Local video recording
- Point-to-multipoint radio connectivity supports high capacity mission-critical traffic over licensed and unlicensed sub-6 GHz bands



SecFlow-1v, SecFlow-1p
Industrial IoT Gateway with
Edge Computing



PowerFlow
Managed Ruggedized
Ethernet Switch with
Power over Ethernet



Ceragon/Airmux
Wireless Transport
Platform



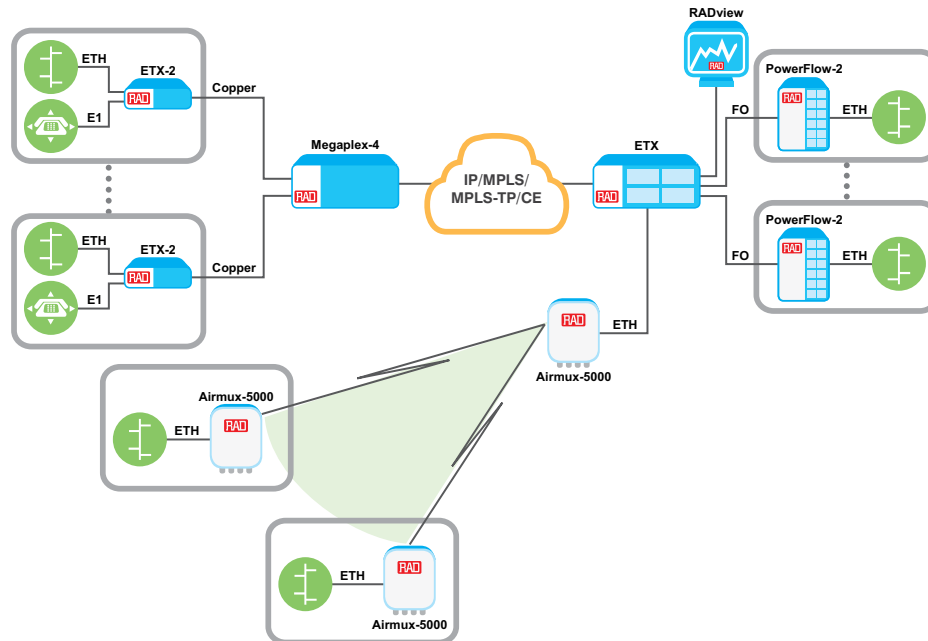
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Domain Orchestration



First Responders and Military Communications



Multiservice Operational Network for Police and Military



Your Benefits:

- Connect a privately owned government/military/public network to remote sites using diverse infrastructure
- Support multiple services, including Ethernet, TDM and low speed data, using the same device
- Utilize existing SDH/SONET network or build a state-of-the-art IP/MPLS, MPLS-TP, CE backbone



Airmux-5000
Point-to-Multipoint
Broadband Wireless
Access



ETX-2/ETX-2i
IP and Carrier Ethernet
Demarcation



PowerFlow
Managed Ruggedized
Ethernet Switch with
Power over Ethernet



RADview
Management and Domain
Orchestration



The RAD Catalog

journey throughout the years



Your Network's Edge®



• A

Airmux-400

Point-to-Point Broadband
Wireless Access



RAD's Airmux-400 series of point-to-point broadband wireless radios delivers native Ethernet and TDM services over a single wireless link in various sub-6 GHz frequencies. The high capacity Airmux-400 radio systems provide aggregated throughput of up to 750 Mbps and a range of up to 120 km (75 miles).

The Airmux-400 incorporates advanced features, such as MIMO and OFDM for optimal performance and unmatched robustness in all environments, making it ideal for:

- Utilities AMI/DA backhaul
- Public safety and government backhaul
- Transportation (highways and railways backhaul)

- **Multi-band operations over 2.4 GHz, 3.5 GHz, and 4.9 to 6 GHz in a single device**
- **5 MHz, 10 MHz, 20 MHz, 40 MHz, or 80 MHz channel bandwidth**
- **TDM over packet integration for TDM service support with other RAD TDMoIP products**
- **Net throughput (aggregated):**
 - Airmux-400H: up to 750 Mbps
 - Airmux-400P: up to 250 Mbps
 - Airmux-400A: up to 500 Mbps
 - Airmux-400SP: up to 25 Mbps
- **OFDM, MIMO and antenna diversity capabilities**
- **Extended range – up to 120 km (75 miles)**
- **Hub-site synchronization (HSS) supports simultaneous transmission from up to 16 colocated Airmux-400 and/or Airmux-5000 units**
- **Ring protection link (RPL) for Ethernet resiliency**
- **Spectral power measurement and RF survey tool – “Spectrum View” – for quick and easy installation**

**Airmux-5000/5000i/
Airmux-5000D**

Point-to-Multipoint Broadband
Wireless Access



RAD's Airmux-5000 point-to-multipoint broadband wireless radios are the ideal wireless solution for business users demanding high capacity throughput with dedicated traffic bandwidth allocation and service level agreement (SLA) per subscriber. Featuring up to 750 Mbps aggregated sector capacity and a range of up to 40 km (25 miles), a single Airmux-5000i base station supports up to 64 remote subscriber units (SUs) with multi-band operation, making it ideal for:

- Service providers and ISPs, offering IP backhaul and 4G/broadband access for remote, rural and underserved communities
- Private networks requiring high capacity inter-branch connectivity for university campuses, healthcare organizations, government institutions, large enterprises and public establishments
- Security and surveillance applications requiring aggregation and backhaul of traffic from multiple colocated HD cameras
- **Airmux-5000/5000i/5000D multi-band operations over 2.4 GHz, 3.3 – 3.8 GHz and 4.9 – 6.4 GHz in a single device**
- **Airmux-5000D includes two radios (3.x GHz and 5.x GHz) in a single unit**
- **Up to 750 Mbps aggregated throughput per sector/band**
- **Up to 64 remote subscriber units per sector with aggregated throughput of 5, 10, 20, 25, 50, and 100 Mbps**
- **Supports fixed and nomadic applications**
- **Airmux-5000i with beamforming antenna**
- **5 MHz, 10 MHz, 20 MHz, or 40 MHz channel bandwidth**
- **OFDM, MIMO and antenna diversity capabilities**
- **Range up to 40 km (25 miles)**
- **Intra- and inter-site TDD synchronization using hub-site synchronization (HSS) and GPS**
- **Low constant latency – typically 4 to 10 msec in full sector load**

ASMi-54 Family

SHDSL.bis Modems



The ASMi-54 line includes the multi-port ASMi-54 advanced SHDSL.bis modem and the cost-effective ASMi-54L SHDSL.bis modem. The devices support point-to-point and hub-and-spoke connectivity as well as drop-and-insert (daisy chain) and ring topologies over copper and fiber.

The managed SHDSL.bis modems extend E1 and mid-band Ethernet services over multipair-bonded copper links. Ensuring reliable performance over poor quality or noisy lines, the devices employ next-generation SHDSL technology and EFM bonding to achieve variable data rates of up to 22.8 Mbps. The ASMi-54 family is ideal for service providers, mobile operators, enterprises, utilities, and transportation companies. The devices feature a compact, half 19-inch enclosure, with optional rail-mountable metal enclosure for deployment in extreme temperature environments.

- Up to four Fast Ethernet ports with an integrated switch; optional one (ASMi-54L) or four (ASMi-54) E1 interfaces
- ITU-T G.991.2, ETSI 101524; TC-PAM 16 or TC-PAM 32
- ASMi-54: up to 22.8 Mbps over 8-wire (4 pairs)
- ASMi-54L: up to 11.4 Mbps over 4-wire (2 pairs), 5.7 Mbps over 2-wire (1 pair), or up to 30 Mbps over 4-wire using RAD's high performance SHDSL technology
- EFM bonding per IEEE 802.3-2005; M-Pair bonding for HDLC
- VLAN prioritization, rate limitation per port and Ethernet QoS support; Ethernet OAM per IEEE 802.3-2005 (formerly 802.3ah)
- Managed via SNMP, Telnet and ASCII terminal

Ceragon FibeAir IP-20

Wireless Transport Platform



CERAGON

Ceragon's wireless transport platform accommodates various needs in different scenarios while maintaining availability and security at the highest standards.

The FibeAir IP-20 platform meets any critical infrastructure wireless transport need, of any scale, in any topology and at any frequency, combined with an advanced security feature set and low-latency performance.

The FibeAir IP-20 comes in all-outdoor, split-mount and all-indoor configurations supporting 6.86 GHz frequency range.

FibeAir IP-20C:

- Double wireless backhaul capacity via remote activation of another radio carrier with no site visits required
- Provides the highest radio capacity and spectral efficiency in any condition and any frequency channel size (up to 80/112 MHz)
- Field-proven LoS MIMO 4x4 technology – enabling 1-Gbps radio capacity over a single 30-MHz channel or 2 Gbps over a single 60 MHz

FibeAir IP-20E:

- Provides ultra-high radio capacity and spectral efficiency of up to 2.5 Gbps over a 500-MHz channel
- Minimizes your sites' physical footprint with an integrated flat panel antenna

FibeAir IP-20S:

- Compact, all-outdoor wireless backhaul node that is optimized for simple installation and operation
- Operates within the entire microwave spectrum (6 – 42 GHz)

• C/D

Ceragon IP-50

Disaggregated Wireless Transport Platform



Ceragon's IP-50 series resolves modern wireless transport challenges via disaggregation that is implemented in three independent innovation paths: Radio, networking hardware and networking software.

- **IP-50E: 20 Gps/link universal E-Band radio**
 - Radio capacity: 20 Gps (2+0 XPIC configuration, utilizing two units)
 - Simple upgrade – utilize existing link in conjunction with the IP-50E with Layer 1 carrier bonding
- **IP-50C: Universal quad-carrier microwave solution – up to 8 Gbps**
 - Save tower load and shelter space with 4+0 configuration in all-outdoor
 - The capacity you need, in any range, with 224-MHz channel support – up to 8 Gbps
 - 4x4 LoS MIMO
 - Advanced frequency reuse
 - Advanced space diversity
- **IP-50S: Universal microwave radio**
 - Simple upgrade – utilize existing link in conjunction with the IP-50S with layer 1 carrier bonding
- **IP-50FX: Disaggregated wireless hauling router**
 - White box, merchant-silicon based hardware, with Ceragon Radio Aware Open Networking software for zero-compromise open-platform migration

DXC-5, DXC-5P

High Capacity Hybrid Cross Connect

Hot Product



RAD's DXC-5 enables a seamless migration to next-generation operational networks. It provides multiservice, high capacity core and edge aggregation over TDM, hybrid and all-packet transport. The DXC-5 reduces operational costs by using a single platform for all service requirements. Critical infrastructure network operators choose the DXC-5 as it coexists with legacy cross connects, then seamlessly replaces them when they reach end-of-life status, allowing the addition of new services and bandwidth capacity. DXC-5's transport flexibility ensures that services are matched to the best technology to meet their requirements. By performing multiplexing over packet, DS1-level TDM switching and DWDM in the same device, it reduces the transport cost per bit and ensures mission-critical reliability with minimal latency.

- **High density MPLS-TP/Carrier Ethernet/SDH/SONET platform available in 1U-, 2U- and 5U-high form factors**
- **High capacity: From E1/T1 to STM-64/OC-192, 10 GbE with a variety of connectivity options including MPLS-TP, Carrier Ethernet, PDH, SDH/SONET, OTN, DWDM, and 1G-10G**
- **Non-blocking SDH/SONET switch capabilities**
- **TDM circuit emulation**
- **MPLS-TP with traffic-engineered pseudowire**
- **Carrier Ethernet 2.0-certified including Ethernet OAM, QoS**
- **Sub-50 ms protection: 1:1, 1+1, APS, BLSR, PW, ERPS, LAG**
- **Synchronization: BITS, Sync-E, ACR**

Egate-100

Gigabit Ethernet over TDM
Aggregation Gateway



RAD's Egate-100 Gigabit Ethernet over TDM gateway transports Gigabit Ethernet traffic over channelized STM-1/OC-3 or over three DS3 lines. It leverages widely available PDH/SDH/SONET networks to deliver carrier-class Ethernet Private Line (EPL) services at granular rates, from a fractional E1/T1 to bonded n x E1/T1 channels. The Egate-100 supports NG-PDH encapsulation and bonding standards, such as generic framing procedure (GFP), virtual concatenation (VCAT) and link capacity adjustment scheme (LCAS).

The Egate-100 Gigabit Ethernet over TDM gateway is typically deployed in a central location to aggregate Ethernet user traffic received from a large number of remote units, such as RAD's RICI Ethernet demarcation devices, providing a complete access solution from the service provider's central site to the customer premises.

- Supports MLPPP, as well as GFP (G.8040, G.7041/Y.1303), VCAT (G.7043) and LCAS (G.7042) standards
- MEF-certified for EPL services per MEF-9 specifications
- Ethernet OAM per IEEE 802.3-2005 (formerly 802.3ah)
- Four priority queues per VLAN priority (802.1p), DSCP and IP Precedence; traffic policing per flow and per EVC.CoS
- Gigabit Ethernet and STM-1/OC-3 port protection
- Secure Telnet and web applications, SNMPv3 and RADIUS
- NEBS-compliant
- Optimized for IP DSLAMs and WiMAX base station backhaul applications

ETX-2i

IP and Carrier Ethernet
Demarcation with D-NFV

Hot Product

Part of RAD's Service Assured Access solutions, the ETX-2i line of next-generation NID/NTUs offers advanced demarcation for SLA-based, L2 and L3 business services, wholesale services and mobile backhaul. The ETX-2i offers a complete service life-cycle toolset, as per MEF 3.0 specifications.

The ETX-2i also serves as a Universal CPE (uCPE) Whitebox+, which enhances a pluggable x86 server module with physical network functions (PNFs) to enable superior performance for vCPE applications. It is supported by RADview management and orchestration.

- ETX-2i: IP and Carrier Ethernet Demarcation Device with D-NFV



Available as a modular demarcation device, the ETX-2i enables operators to deliver the most advanced Carrier Ethernet services, IP VPNs and vCPE functionalities over any network connection. In addition, the ETX-2i combines advanced timing functionalities for LTE/LTE-A.

- Up to eight GbE combo ports
- Integrated wire-speed switch/router
- Modular network interfaces: FE/GbE (combo), E1/T1, T3, VDSL2, or SHDSL
- Flexible synchronization offering Sync-E, IEEE 1588v2 slave, BC and TC for frequency and phase synchronization in mobile networks
- Hot-pluggable x86 D-NFV server module for hosting virtual functions
- NEBS-compliant and environmentally hardened enclosure options
- 3U device with six GbE combo ports and 64 x E1/T1, offering high scale, cost-effective TDM over packet services



• E >>>

- **ETX-2i-B: IP and Carrier Ethernet Demarcation Device with D-NFV for SMBs**

Hot Product



ETX-2i-B is a demarcation device optimized for remote branches and SMBs over native Ethernet access. It is ideal for carriers, service providers, and wholesale operators requiring advanced Ethernet L2/L3 functionality at customer premises and multi-tenant units (MTUs).

- 1U device with up to ten GbE ports
- Fan-less 2U device with ten GbE ports, ideal for cost-effective small-cell aggregation
- Integrated 6-Gbps switch/router
- Pluggable x86 D-NFV server module for hosting virtual functions (1U device)

- **ETX-2i-10G: 10G Carrier Ethernet Demarcation/Aggregation Device**



The ETX-2i-10G combines intelligent, high bandwidth demarcation and aggregation capabilities for enterprise headquarters and mobile backhaul operators. As an aggregation solution at the concentration point, a single unit can support numerous services and concurrent OAM sessions.

- 19" unit with up to four 10-GbE and up to 24 GbE ports in various combinations
- Half and full 19" unit with up to eight 10-GbE ports or four 10-GbE and up to eight GbE ports in various combinations
- Flexible synchronization offering Sync-E, IEEE 1588v2 slave, BC and TC for frequency and phase synchronization in mobile networks
- ITU-T G.8032 Ethernet Ring Protection Switching
- NEBS-compliant and environmentally hardened enclosure options

- **ETX-2i-100G: 100-GbE Carrier Ethernet Demarcation Device**

Hot Product



ETX-2i-100G delivers the full suite of Carrier Ethernet demarcation and aggregation capabilities, at 100-GbE rates. MEF 3.0-certified, the ETX-2i-100G addresses the increasing demand for high bandwidth access to data centers, while maintaining SLA guarantees, service monitoring, flexibility, and management.

- 19", 1U device with redundant power supply
- Two 100G platforms:
 - Three 100-GbE (QSFP28) and 10 x 1/10-GbE SFP+ interfaces
 - Four 100-GbE (QSFP28) and 16 x 1/10-GbE SFP+ interfaces
- Advanced QoS with hierarchical policing and bandwidth shaping per EVC and EVC.CoS
- Accurate and scalable hardware-based OAM and performance monitoring per ITU-T Y.1731 and TWAMP
- Y.1564 service activation testing of up to 100G at wire speed

ETX-2

Carrier Ethernet Demarcation

Hot Product

The ETX-2 line of Carrier Ethernet NID/NTUs offers demarcation for SLA-based business services, wholesale services and mobile backhaul. The ETX-2 is MEF Carrier Ethernet 2.0-certified for E-Line, E-LAN, E-Tree, and E-Access services, as well as delivering TDM pseudowire over packet networks. Supporting high capacity service provisioning per EVC/EVC.CoS, flexible classification and H-QoS traffic management, it also performs accurate and scalable service testing and performance monitoring. The ETX-2 is supported by RADview management and enables a variety of protection mechanisms. It also offers NEBS-compliant and environmentally hardened enclosure options.

• ETX-203AX: Carrier Ethernet Demarcation Device



ETX-203AX is ideal for carriers, service providers, and wholesale operators requiring advanced Ethernet functionality at customer premises and multi-tenant units (MTUs).

- Four and six FE/GbE ports; flexible selection of SFP and copper interfaces
- Optional SHDSL network port for cost-effective Ethernet over SHDSL service
- Optional E1/T1 PDH user port to be encapsulated and transported over Ethernet
- Wide-range AC/DC power supply

• ETX-203AX-T: Carrier Ethernet Device with LTE/Broadband Connectivity



ETX-203AX-T extends Ethernet VPN services to new, out-of-reach locations, allowing rapid site commissioning by using readily available LTE or broadband networks. The ETX-203AX-T enables cost-effective Ethernet VPN services backup using LTE or broadband. Additional cost optimization can be achieved by splitting traffic between a service-assured VPN and best-effort LTE or broadband access.

- Five FE/GbE ports with flexible selection of SFP and copper interfaces
- Full suite of MEF CE-2.0 capabilities for SLA monitoring, diagnostics and fault detection
- Optional built-in LTE modem with global service coverage
- Data and management protection using LTE or broadband
- Secure EVC tunneling over private IP/LTE networks or over the internet using L2oGRE or L2TPv3 protocols
- Integrated wide-range AC/DC power supply
- Fragmentation and IPsec support

• ETX-203AM: Universal Carrier Ethernet Demarcation Device



Available as a modular demarcation device, the ETX-203AM enables operators to deliver Carrier Ethernet services and L2 VPNs over any network connection.

- Four FE/GbE user ports
- Modular network interfaces: FE/GbE (combo), E1/T1, T3, VDSL, or SHDSL



• E >>>

• ETX-205A Carrier Ethernet/Mobile Demarcation Device



The ETX-205A provides advanced Carrier Ethernet demarcation and offers combo interfaces and power supply redundancy. For LTE/LTE-A mobile backhaul, the ETX-205A is installed at cellular tower and controller sites to guarantee differentiated SLAs.

- L2 VPN service demarcation with superior traffic management and monitoring capabilities
- Flexible synchronization offering Sync-E, IEEE 1588v2 slave, BC and TC for frequency and phase synchronization in mobile networks
- Distributed Grandmaster architecture integrating built-in GPS receiver with IEEE 1588v2 Grandmaster functionality for cost-optimized LTE deployments
- E1/T1 pseudowire services per MEF-8, UDP/IP, MPLS static labeling in SAToP and CESoP modes, and with CAS

ETX-1p Physical CPE for Branch Routing and Edge Access to Cloud

Hot Product



ETX-1p is an economical thin CPE enabling business customers' transition to the cloud. As a disaggregated CPE it hosts virtualized function containers. By combining powerful networking capabilities with flexible connectivity options, rich management interfaces and embedded security functions, the ETX-1p enables service providers to deliver advanced IP-VPN services, as well as value-added virtual services from the data center to the customer branch. The all-in-one device includes an embedded router and a next-generation firewall, together with switching capabilities and LTE and WiFi support, making it easy to connect branches to private and public clouds over mobile or fixed broadband or over MPLS, without the need for extra hardware or complicated configurations.

ETX-1p is bundled with pCPE-OS, RAD's carrier-grade, Linux-based operating system. Designed to run on various ARM- and x86-based CPE platforms, vCPE-OS is security hardened and optimized to provide maximum performance at a low footprint.

- vCPE-OS operating system
- Hosting of third-party software using Linux LXD container technology
- Multiservice support: GbE copper and fiber
- Single or dual cellular modem for a 2G/3G/HSPA+/HSDPA/LTE uplink; dual SIM for always-on connectivity
- WiFi access point
- Dynamic routing with OSPF, BGP, VRF and secure VPN using IPsec, DMVPN and NAT for flexible connectivity
- Cyber security suite: 802.1X, IPsec encryption with automated PKI, stateful firewall
- Zero-touch provisioning, firewall configuration, fault management and reporting, bulk software upgrade, and database management using RADview

ETX-2v

Open vCPE White Box Platform

Hot Product



The ETX-2v includes a line of carrier-grade white boxes installed at the customer premises – either at headquarters or in remote branch sites. The ETX-2v products support a wide range of business customers and user scenarios, from small offices to large sites, using a variety of bandwidth, processing power and LAN/WAN options.

- White box appliances for virtual CPE, SD-WAN and NFV featuring powerful x86 processors
- Hardware-based security featuring a Trusted Platform Module (TPM)
- Flexible SFP/UTP connectivity with optional interfaces including: LTE, WiFi, VDSL, GPON, ETHoPDH, PWE, and more
- Supports a range of x86 CPU technologies (Rangeley, Denverton and Xeon D), with flexible multi-core options
- Various memory (RAM, SSD) size options
- Intel QuickAssist technology – authentication, encryption, etc.
- SR-IOV capable ports to enhance throughput
- Fan-less, low power (~7W) options reduce carbon footprint
- Rack-mount and desktop options

ETS-1

Ethernet Access Switches



The ETS-1 line of next-generation Ethernet access switches provide 1G/10G end-user connectivity to large-scale corporate networks, small and medium businesses and service providers. Offering a rich set of L2 and L3 features and highly effective cost-performance ratio, they are ideal for upgrading old infrastructure and for Smart City communications.

- Stacking support
- Multicast support: IGMP snooping, MVR
- Advanced security: Multilayer ACLs, IP Source Guard, and Dynamic ARP Inspection
- High port density, up to 48 10G ports (ETS-1-10G)
- PoE/PoE+ support (ETS-1-10G)
- Ethernet OAM, QoS and rate limiting

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ETX-5

Ethernet Service
Aggregation Platform



The ETX-5 is a leading CE-2.0 access aggregation switch, successfully deployed worldwide in many large networks. It delivers aggregated Ethernet and TDM pseudowire traffic from the access network to the PE (provider edge) over 10-GbE links. Part of RAD's Service Assured solutions for service providers and critical infrastructure, the ETX-5 is ideal for first-level aggregation at the POP, E-NNI inter-carrier demarcation and as a pseudowire gateway for seamless migration to packet networks.

For an enhanced user experience, the ETX-5 is supported by the new RADview management and orchestration system, featuring an intuitive UI/UX to simplify configuration and enable zero-touch service provisioning end-to-end. The ETX-5 is Carrier Ethernet 2.0-certified and includes an extensive toolset to deliver and manage SLA-based services.

- **MEF Carrier Ethernet 2.0-certified:**
E-Line, E-LAN, E-Tree services,
E-Access; MEF-8;
MEF-22: Mobile backhaul;
MEF-26: E-NNI
- **Ethernet Ring Protection
Switching:** ITU-T G.8032v2;
supports 40-GbE ring over LAG,
virtual rings
- **Extensive TDM pseudowire
support:** CESoPSN, SAToP,
CESoETH (MEF-8), UDP/IP
encapsulation
- **Ethernet OAM termination and
grooming;** ITU-T Y.1564 generator/
responder
- **16 x 10-GbE network/user ports;
80 x 1-GbE ports; 16 channelized
STM-1/OC-3 user/network
ports; four channelized STM-4/
OC-12 user/network ports with
redundancy**
- **Fully redundant, modular system
designed for high availability**
- **Supported by RADview
Service Manager and RADview
Performance Monitoring portal**
- **AC or DC power feed redundancy;
NEBS-compliant industrial-grade
enclosure withstands extended
temperature range**

IPmux-2L

TDM Pseudowire Access
Gateway



The IPmux-2L is a cost-effective TDM pseudowire access gateway, extending TDM, HDLC and LAN traffic over dark fiber, IP, MPLS, or Ethernet. The device provides an ideal solution for circuit emulation and legacy leased line services, as well as for PBX backhaul, PSTN access, TDM trunking over packet transport, and cellular backhaul. Incorporating a multi-standard pseudowire ASIC, it enables transparent delivery of legacy user traffic over next-generation transport with minimal processing delay.

IPmux-2L supports point-to-point and hub-and-spoke network topologies, offering a complete migration solution when combined with other TDM pseudowire CPEs (such as IPmux-24 and IPmux-216) and aggregation gateways supporting TDM pseudowire (such as ETX-5 and Megaplex-4).

- **Up to two E1 user ports**
- **Optional n x 64 serial user data
port**
- **Multi-standard TDM pseudowire
ASIC:** TDMoIP, CESoPSN, SAToP,
CESoETH, HDLCoPSN
- **QoS support with four priority
queues**
- **Pseudowire OAM**
- **High precision clock recovery
for 2G/3G cellular traffic over
PSN; optional Sync-E support**
- **Centralized SNMP-based remote
management with RADview**

IPmux-24, IPmux-216

TDM Pseudowire
Access Gateways



The IPmux-24 and IPmux-216 extend TDM, HDLC and Ethernet services over packet transport using standard pseudowire encapsulation over Fast Ethernet or Gigabit Ethernet access. The devices' compact design, ease of installation, and advanced traffic management capabilities enable carriers to extend their services from legacy backbones over greenfield packet networks, without affecting customer experience or replacing existing end-user equipment. They also allow service providers to add traditional leased line services to their Layer 2 portfolio and permit enterprises to reduce their IT expenses on PSTN connectivity and branch-to-branch communications. In addition, they support cellular operators in migrating their services to economical packet switched backhaul while maintaining the mobile network's stringent synchronization requirements.

- Up to four (IPmux-24), eight or 16 (IPmux-216) E1 or T1 TDM user ports
- Three SFP-based fiber or copper Fast Ethernet or Gigabit Ethernet interfaces
- Multi-standard hardware-based TDM pseudowire: TDMoIP, CESoPSN, SAToP, HDLCoPSN, CESoETH
- ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) for sub-50 ms restoration; Ethernet link and TDM pseudowire redundancy
- Ethernet OAM: IEEE 802.3-2005 (formerly 802.3ah), 802.1ag/ITU-T Y.1731 (CFM)
- High precision clock recovery for 2G/3G cellular traffic over PSN
- QoS per 802.1p, ToS/DSCP, EXP
- MEF-9, MEF-14 certified for EPL, EVPL services

LA-210

EFM DSL Network
Termination Unit



The LA-210 enables service providers to deliver mid-band Ethernet and high speed Ethernet where fiber is not present, by offering Ethernet access rates of up to 22 Mbps over bonded SHDSL bis copper lines based on standard EFM (Ethernet in the First Mile) technology. Installed at the customer premises, it delivers Ethernet services, such as inter-office LAN connectivity, internet access and virtual private networks (VPNs), as well as legacy TDM service, using pseudowire emulation. The LA-210 features Carrier Ethernet attributes, including Ethernet OAM for proactive SLA monitoring, quality of service (QoS) per Ethernet flow and advanced traffic management capabilities – all starting at the service hand-off points. The LA-210 is certified by the Metro Ethernet Forum to deliver Ethernet Private Line (EPL) and Ethernet Virtual Private Line (EVPL) services per MEF-9 and MEF-14 specifications.

- Mid-band Ethernet access up to 22 Mbps using EFM bonding
- Up to four pairs of EFM bonded SHDSL bis uplink lines
- Up to four Fast Ethernet user ports
- Pseudowire support for E1, V.35 or X.21 traffic
- MEF CE 2.0-certified
- Advanced QoS mechanism per EVC/EVC.CoS
- Ethernet link and service OAM with performance monitoring for end-to-end SLA control
- Multi-standard pseudowire support for legacy services over PSN

• M

Megaplex-1

Multiservice Pseudowire Access Gateway

Hot Product



RAD's Megaplex-1 is a compact, highly reliable multiservice access node that transports analog and TDM traffic originating from legacy circuit-switched devices over packet switched networks (PSNs). It is specifically designed to address the needs of critical infrastructure network operators who are migrating to next-generation Ethernet, IP or MPLS communications. This includes utilities, transportation operators and government agencies. It enables seamless service migration with a scalable TDM over packet pseudowire engine and comprehensive multiservice support for PDH, high and low speed data, analog voice, and Teleprotection devices.

- Grooming and transmitting analog voice and TDM-based services over packet using standard pseudowire technology
- Wide range of services: E1/T1, FXO/FXS/E&M, IEEE C37.94, programmable serial ports and more
- PWE redundancy per tunnel for ultra-fast hitless restoration ensures maximum service uptime
- Bridge functionality with two optical/copper GbE uplinks and up to four FE user interface ports
- 1U 19-inch fan-less enclosure with redundant, wide-range power supply (AC/DC)

Megaplex-2100, Megaplex-2104

Multiservice Access Multiplexers



The Megaplex-2100 and Megaplex-2104 are designed to groom, aggregate and transport multiple broadband and narrowband data and voice services over copper, fiber, wireless, or satellite circuits – all in a single-box solution. They are especially suitable for use as economical, compact remote multiservice nodes for utilities and transportation. In addition, the Megaplex-2100 and Megaplex-2104 are ideal for small to mid-size business entities, providing mixed data and voice services for both business and residential customers. They can be deployed at the carrier's point-of-presence in the exchange, as well as at a remote distribution node, such as in an office building's basement.

- Multiple E1/T1 links, IP main link with TDMoIP support
- Delivers PSTN, ISDN and data services via:
 - Multiple analog and compressed voice channels (FXS, FXO, E&M)
 - Low speed data (V.24/RS-232, n x 64 kbps, G.703)
- RFER – Resilient Fast Ethernet Ring or E1/T1 ring protection
- Multiple alternative routing schemes in the event of trunk failure
- IEEE C37.94 interface for Teleprotection
- OMNIbus for teleconferencing

Megaplex-4

Next-Generation
Multiservice Access
Node

Hot Product



RAD's Megaplex-4 is a carrier-class, high capacity multiservice access concentrator for delivering legacy and next-generation services over PDH/SDH/SONET and packet switched transport networks (PSN). Its ability to handle a broad range of Ethernet, data and voice services, as well as a large variety of network technologies, in a single compact managed node, makes it an ideal aggregation solution for carriers and service providers.

The device also provides a perfect fit for large enterprises, utilities and transportation companies who require an efficient way to transport and provision multiple legacy and next-generation services over their high capacity pipes. Megaplex-4 can be used as a central aggregation unit for CPEs carrying TDM and Ethernet services over various access link technologies, e.g., SHDSL and SDH/SONET.

The Megaplex-4 is available with a cable management solution to reduce storage space and handling, and eliminate cable waste.

- **Modular 4U or 2U 19-inch units housing multiple I/O modules**
- **Carrier-class reliability with hardware, service and system redundancy**
- **Hardened and certified for IEEE 1613, including fan-less operation for power utilities and EN 50121-4 for railways**
- **Integrated MPLS switch and IP router**
- **MEF Carrier Ethernet 2.0-certified with traffic management, performance monitoring and Ethernet OAM**
- **Hybrid Ethernet and TDM architecture supporting various services up to STM-4/OC-12 and multi-GbE**
- **Three-tier built-in cyber security, including 802.1x and MACsec**
- **Non-blocking cross connect for a high volume of DS0 channels**
- **Built-in support for distance and differential Teleprotection for power utility applications**
- **Integral xDSL copper modems and fiber multiplexer cards**
- **Voice compression, terminal server, serial multiplexer and OMNibus voice conferencing modules**
- **Pluggable x86 D-NFV server module for hosting virtual functions and applications**
- **Interoperability with existing TDM equipment (Nokia, Newbridge)**

MiCLK

1588 Grandmaster on an
SFP with Built-In GNSS



RAD's MiCLK® is the world's first Grandmaster on an SFP, allowing easy upgrades for existing base stations and backhaul equipment to support IEEE 1588 for LTE/LTE-A. Easily plugged into service routers to simultaneously distribute frequency and time, the patented MiCLK eliminates the need to install GPS/GNSS antennas at every cell site while providing highly accurate timing distribution with full network coverage – even in underground and in-building installations. It is also ideal for 4G small-cell deployments.

The field-proven MiCLK allows service providers to avoid spoofing and jamming risks, and dramatically reduces installation and engineering costs by eliminating the need for additional space or power requirements.

- **Fully-featured standard IEEE 1588 Grandmaster including phase/Time of Day (ToD) to meet stringent LTE-Advanced requirements**
- **Built-in GNSS receiver**
- **Robust GNSS backup – time holdover when GNSS reception is lost, using Sync-E or 1588 frequency reference from the network (Assisted Partial Timing Support) to deliver continuous and accurate synchronization to the base station**
- **Miniature pluggable device fits in any standard SFP port**
- **Scalable solution supports up to 64 slaves**
- **Part of RAD's vCPE offering**

• M

MiNIDMiniature Programmable
Network Interface Device

Hot Product



MiNID® is a field-programmable miniature L2/L3 network interface device (NID), available in a variety of form factors. Part of RAD's vCPE and white box solution portfolio, it enriches the Service Assured Access offering with software-defined functionalities for enhanced demarcation, remote monitoring and fault isolation, as well as remote packet capture and micro-burst measurement capabilities.

MiNID also provides instant upgrades for legacy switches and routers, as well as for vCPE platforms and COTS servers to help service providers, mobile operators and wholesale carriers introduce new services quickly and with better quality of experience (QoE) while increasing operational efficiency and lowering costs. Remotely managed via CLI, web interface and SNMP, it features zero-touch provisioning for fast and simple installation and does not require dedicated training.

• MiNID SFP



The MiNID SFP is easily pluggable into SFP ports of switches and routers and eliminates the need for standalone demarcation devices. It delivers substantial OpEx savings by eliminating additional power, space and cabling expenses.

- Plug-and-play installation
- Fits small cells, macro cells, switches, routers, DSLAMs, COTS servers and more
- Variety of optical options
- LC connectors
- Extended temperature range

• MiNID Sleeve



The MiNID Sleeve is easily pluggable into SFP ports of switches and routers and seamlessly hosts standard FE and GbE SFP modules.

- Compatible with standard fiber and copper SFPs in a variety of ranges
- Reduces inventory by reusing existing SFPs

• MiNID Standalone



The MiNID is also available in a miniature standalone enclosure, with a variety of user and network port options for maximum interface flexibility. Optional bypass-relay functionality ensures fail-safe operation and Power over Ethernet (PoE) support eliminates the need for an additional power supply.

- Two ports with flexible user or network functionalities
- Combo ports automatically select between fiber and copper/RJ-45
- Internal bypass relay for copper interfaces offers service continuity in the event of power failure
- Bypass PoE enables powering both the MiNID and the end device

MiRiCi-E1/T1, MiRiCi-E3/T3, MiRiC-ML/E1,T1

Smart SFP Ethernet to E1/T1 or
E3/T3 Remote Bridges



RAD's MiRiCi-E1/T1, MiRiCi-E3/T3 and MiRiC-ML/E1,T1 connect Fast Ethernet or Gigabit Ethernet LANs over framed or unframed E1 or T1 circuits, or over framed T3 links. The smart SFP miniature remote bridges provide TDM connectivity to any Ethernet device with an SFP (small form-factor pluggable) compatible Fast Ethernet or GbE port. Hot-swappable and software-configurable, the intelligent SFPs are fully managed devices supporting standard GFP encapsulation, as well as HDLC and cHDLC. MiRiC-ML supports PPP and ML-PPP. They deliver a complete Ethernet over PDH solution in finger-sized SFP enclosures and enable a quick rollout of new Ethernet services over legacy TDM infrastructure. The MiRiCi-E1/T1, MiRiCi-E3/T3 and MiRiC-ML are part of RAD's vCPE Toolbox. They provide simple and cost-effective alternatives to external, standalone bridge units or conversion cards for user devices, saving on space, cabling and power consumption, and simplifying management.

- Supports framed and unframed E1/T1, E3/T3
- Supports standard GFP, HDLC-like, and cHDLC encapsulation
- Supports PPP and ML-PPP
- Hot-insertion SFP-format plug, MSA-compliant
- User-configurable
- Enhanced management of control, status and monitoring
- Out-of-band management through I²C
- Supports full duplex flow control
- Fault propagation from WAN to LAN link
- Software download via TFTP
- Supports Ethernet OAM per 802.3-2005 (formerly 802.3ah)
- Part of RAD's vCPE offering

MiTOP-E1/T1, MiTOP-E3/T3

Smart SFP-Format TDM
Pseudowire Gateways



RAD's MiTOP-E1/T1 and MiTOP-E3/T3 transport framed or unframed E1/T1 or E3/T3 traffic, respectively, over Ethernet, IP and MPLS networks. Featuring multi-standard pseudowire support and Synchronous Ethernet (Sync-E) in a finger-sized enclosure, the smart SFP devices provide an ideal solution for service providers, utility companies and enterprises wishing to ensure highly accurate timing synchronization for their legacy services while migrating to packet switched transport.

Part of RAD's "System on an SFP" portfolio, the MiTOP-E1/T1 and MiTOP-E3/T3 are designed for quick and simple insertion into any Fast Ethernet or Gigabit Ethernet port with an MSA-compatible socket.

- Transmits TDM-based services over Ethernet, IP or MPLS networks
- Standard pseudowire encapsulation: CESoPSN, SAToP
- Single E1/T1 or E3/T3 TDM user port
- Transparent to all signaling protocols
- Hot-insertion SFP-format plug, MSA-compliant
- Selectable clock source
- Basic management of control, status and monitoring
- Supports Synchronous Ethernet (Sync-E)
- Part of RAD's vCPE offering
- Supports fractional E1/T1
- Supports CESoPSN CAS
- Up to eight pseudowire tunnels per E1/T1

• O

Optical Bypass Switch

Fiber Protection Switching System

The Optical Bypass Switch is capable of automatically bypassing faulty network nodes in the event of a power outage. It is used in optical fiber communications and fits ring or linear fiber network architectures. Featuring AC or DC power supply, the Optical Bypass Switch automatically identifies the power supply status at the network node and helps avoid network outages caused by node failures.



- Small in size
- Easy installation and operation
- Low insertion loss – minimum impact on existing optical budget
- Non-latching type – automatic recovery
- LED indicators for power and optical switch status

Optimux-106, Optimux-108

Fiber Multiplexers for 4 E1/T1 and Ethernet or Serial Data

The Optimux-106 and Optimux-108 fiber multiplexers deliver TDM and Fast Ethernet or serial data traffic over a fiber optic link, providing a simple, low-cost solution for point-to-point and point-to-multipoint connectivity up to 120 km (75 miles).



- Up to four E1 or T1 ports and a Fast Ethernet user interface; optional V.35 user port
- Full 100 Mbps Ethernet data rate (user)
- Simple plug-and-play installation
- Range extension up to 120 km (75 miles)
- Redundant uplink interfaces and power supplies
- Card versions for the Megaplex-4
- Management via ASCII terminal, web server, Telnet or RADview
- Temperature-hardened enclosures
- Dedicated 10/100BaseT Ethernet management port

Optimux-1025

Fiber Multiplexer for 16 T1 and Gigabit Ethernet



The Optimux-1025 provide a cost-effective solution for transparently delivering Gigabit Ethernet traffic, as well as multiple T1 links, over a fiber optic link for distances up to 120 km (75 miles). The single-box solution for fiber TDM and Ethernet connectivity offers CapEx and OpEx savings with "pay-as-you-grow" flexibility by supporting initial deployments at partial capacity, with license-based upgrades when needed. The plug-and-play functionality allows carriers, service providers, mobile operators, and large organizations to extend their service reach at lower costs.

- Up to 16 T1 ports; up to three Gigabit Ethernet user ports
- Total fiber uplink capacity of 1,000 Mbps
- Simple plug-and-play installation
- Range extension up to 120 km (75 miles)
- Redundant hot-swappable uplink interfaces and power supplies
- Management via RADview, CLI, ASCII terminal, SNMPv3
- RADIUS, SSH
- Temperature-hardened enclosure

PacketLight

Complete Solutions for WDM/OTN and Dark Fiber Applications Layer 1 Encryption



PacketLight's product suite offers the flexibility to build a cost-effective, highly efficient optical network infrastructure for CWDM/DWDM, OTN and dark fiber connectivity, while addressing challenges faced by service providers and organizations.

PacketLight solutions are ideal for a variety of vertical markets, such as carriers, ISPs, dark fiber providers, data centers, storage facilities, utility companies (railway and power companies), and financial institutions.

The wide range of PacketLight xWDM and dark fiber solutions includes multi-rate sub-10G CWDM/DWDM platforms, 10G CWDM/DWDM and 100G solutions with built-in OTN options, amplification and booster solutions, WSS-based ROADMs, ten 1-GbE muxponders, and passive multiplexing solutions.

- Multi-rate transponders, 2 Mbps to 200 Gbps
- Muxponder for high wavelength utilization; scales to 96 wavelengths
- Layer-1 encryption for GbE, 10-GbE, 4G FC, 8G FC, and 16G FC
- Long-distance solutions by amplification and DCM
- Performance monitoring
- Supports single or dual fiber
- Low latency connectivity
- Hot-swappable PSU (AC/DC) and fan
- Integrated management
- Compact 1U integrated devices, multi-chassis scalability
- Simple to install, maintain and configure
- Cost-effective CPE device
- Integrated OTN layer (with FEC)



.P

PM Controller Performance Monitoring Generator



The PM Controller is a high capacity, central generator for always-on performance monitoring (PM), on-demand testing, diagnostics and troubleshooting of mobile backhaul networks, as well as for premium Carrier Ethernet and IP business services. It uses a wide variety of standard tools to provide deep visibility into network and service performance and to ensure optimal quality of experience in LTE/LTE-A networks, typically characterized by rapid small-cell deployment. Part of RAD's Service Assured Access offering, the PM Controller works opposite routers, switches, mobile base stations, or third-party responders, as well as opposite RAD's ETX and MiNID NIDs. As a non-disruptive add-on, the PM Controller is an ideal solution for existing heterogeneous networks. It enables top-line PM and testing in a dynamic environment regardless of the capabilities of the underlying installed base.

- Four FE/GbE combo ports
- Monitors and troubleshoots backhaul performance
- Service activation tests (Y.1564) over L2/L3, opposite RAD devices or third-party responders
- Continuous connectivity and service performance monitoring sessions using TWAMP, ICMP and UDP Echo
- Connects to the RADview Performance Monitoring portal for SLA and quality of experience (VoLTE mean opinion score) reporting with aggregated and drill-down views per PM session



Ethernet VPNs over LTE/Broadband Reach Your Customers Wherever They Are. Fast.

Use **ETX-203AX-T** to roll out L2 services much faster over readily available LTE or broadband networks, and ensure SLAs with carrier-grade capabilities.

For more information, see page 45.

Visit **www.rad.com** to learn more

PowerFlow

Managed Ruggedized Ethernet Switches with Power over Ethernet

Hot Product

RAD's PowerFlow consists of managed and unmanaged industrial-grade Gigabit Ethernet switches, designed to build packet-based, PoE-intensive operational networks for critical infrastructure.

PowerFlow is ideal for OT WANs of power utilities, railways, traffic controllers, and Safe City applications requiring advanced Ethernet functionality and Power over Ethernet (PoE) support.

• PowerFlow-2: Managed Ruggedized Ethernet Switches with Multiple Options



RAD's PowerFlow-2 is a series of industrial-grade, managed Fast Ethernet and Gigabit Ethernet switches, with or without PoE support, which provide stable and reliable Ethernet transmission. Housed in ruggedized DIN rail or wall-mountable enclosures, these switches are specifically designed for harsh environments, such as industrial networking and intelligent transportation systems (ITS), as well as military and utility market applications where environmental conditions exceed commercial product specifications.

- Compact Ethernet switches with up to 16 x 10/100/1000BaseT ports, and eight x 100/1000BaseFX SFP ports
- Variety of input voltage from 12–48V DC to HVDC of 110/220V DC and support of 110/220V AC
- Variety of PoE feeding options including PoE (802.3af), PoE+ (802.3at) and POE++ (60W)
- Flexible deployment scenarios using xSTP, ERPS (ITU-T G.8032) and ultra-fast recovery with PF-ring/chain
- Certified for EN 50121-4, IEC 61850-3, IEEE 1613 and NEMA TS2
- Wide range of operating temperatures from -40°C to 75°C (-40°F to 167°F)

• PowerFlow-2-10G: Industrial 10G Core Switch Demarcation/Aggregation Device



RAD's PowerFlow-2-10G managed industrial-grade core switches provide a wide variety of reliable mechanisms for mission-critical network communications. These mechanisms include redundant and isolated power supplies, STP/RSTP/MSTP and ITU-T G.8032 Ethernet Ring Protection Switching. The PowerFlow-2-10G is a fan-less unit with IP30 ruggedized metal housing to meet demands of industrial-grade and core layer applications.

- Industrial-grade Ethernet switches equipped with four 10G SFP+ ports
- Variety of input voltage and PoE feeding options including PoE+ with up to 400W per unit
- 19" unit with up to four 10-GbE and up to 24 GbE ports in various combinations
- Supports STP, RSTP, MSTP, ITU-T G.8032v1, G.8032v2 Ethernet Ring Protection Switching (ERPS), and PF-Ring for redundant cabling
- Environmentally hardened enclosure options

• R

RADviewNetwork Management
and Orchestration

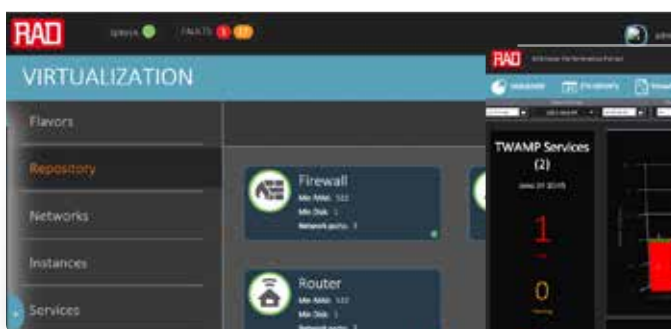
RADview is a modular network management and edge domain orchestration suite for RAD's Service Assured Access and Service Assured Networking solutions. It enables configuration, provisioning, monitoring, and management of networks and services, and includes the following management tools:

- Network element manager
- Performance monitoring portal for ongoing monitoring of Ethernet and IP services
- D-NFV orchestrator for virtual machines and application services at the customer edge
- End-to-end service manager for planning and activation of Carrier Ethernet services
- Service center for managing TDM services

RADview is fully compliant with the ITU-T Telecommunications Management Network (TMN) standards, and features advanced fault, configuration, administration, performance, security (FCAPS) capabilities. Using an SNMP southbound interface, it also includes third-party device monitoring capabilities. RADview's northbound interface enables integration into a third-party umbrella system (OSS).

RADview's security information and event management (SIEM) enables collection of all security events detected in the network. The system collects cyber security events from all RAD gateway devices in the network and displays them visually on customizable dashboards, with configurable dynamic updates and a searchable database.

- Monitors device health, optimizes network operations and minimizes mean time to repair (MTTR)
- Client/server architecture with multi-user support and seamless handover of user privileges
- Zero-touch and auto-discovery capabilities
- Wide range of northbound application programming interfaces (APIs)
- Firewall configurator for remote clusters and devices
- Syslog server with optional manual message filtering
- Interoperable with third-party NMS and leading OSS/umbrella systems
- Multi-platform Java-based solution supporting Windows and Linux
- IBM Tivoli's Netcool®/OMNIBUS™

Intuitive, HTML5 UI/UX:

RADview Domain Orchestrator



RADview Performance Monitoring



RADview Service Manager





• RADview Performance Monitoring



The RADview Performance Monitoring module enables ongoing monitoring of Ethernet and IP service performance by collecting KPI (key performance indicator) data from RAD devices. Part of RAD's Service Assured solutions, it allows service providers and network operators to easily monitor and manage actual network and service performance over time and compare it to service requirements and SLA (service level agreement) guarantees.

The RADview Performance Monitoring module enables immediate detection of service degradation, so that remedial actions are taken to quickly restore guaranteed performance levels. The system retrieves data lost due to connection failures and exports standard CSV ASCII files to OSS or third-party management systems.

- Collects, stores, analyzes and presents KPIs from RAD devices
- In-service bandwidth utilization measurements
- Actual performance metrics based on ITU-T Y.1731:
 - Frame delay (latency)
 - Frame delay variation (jitter)
 - Packet delivery ratio
 - Availability
- TWAMP-based L3 performance monitoring for IP services
- SLA threshold policy management
- Performance dashboard with aggregated and drill-down views
- Monthly and real-time SLA statistics reporting

• RADview Domain Orchestrator



The RADview Domain Orchestrator manages the physical and virtual resources required for effectively running vCPE services and for delivering service agility at the customer edge.

The Domain Orchestrator installs, configures and manages RAD's vCPE portfolio, as well as any x86 white box running the vCPE-OS

In addition, it manages the VNF life-cycle from onboarding new VNFs to configuring services, chaining VNFs, deploying service function chains and ongoing monitoring of live services.

Featuring a web client with state-of-the-art user interface (UI), the RADview Domain Orchestrator enables fast and easy service creation and management of value-added applications and provides a holistic view of the vCPE services.

- NFVI management (VIM)
- VNF and network service onboarding
- Service function chain design and deployment using point-and-click UI
- Service maintenance (SFC backup, resource adjustment)
- Ongoing fault management and performance monitoring



• R >>>

• RADview Service Manager



The RADview Service Manager module is part of the RADview management suite and provides end-to-end management of MEF-based Carrier Ethernet services for Service Assured Access. An intuitive GUI, point-and-click functionality and easy-to-follow wizards facilitate planning, provisioning, monitoring, diagnostics, and SLA assurance, so that network operators can add new service offerings, as well as minimize overall operating costs, reduce provisioning times and maximize the efficiency of the entire network.

- Offline resource optimization and capacity planning simplifies pre-deployment stages
- Point-and-click end-to-end service provisioning and OAM settings
- Automatic correlation of network faults with impacted services and customers
- Security management supporting user access profiles and allowing network partitioning
- Graphic representation of network clouds, links, nodes, end-to-end services, and network status indication
- Standard northbound interfaces to third-party OSS systems
- GUI designed for management of very large networks

• RADview Service Center



The RADview Service Center path management system enables end-to-end management of RAD's TDM access products, while easy-to-follow wizards facilitate provisioning and monitoring over SDH/SONET and PDH networks. Supported capabilities include automatic path routing, automatic re-routing of protected paths, physical and logical representation of the network links, and more. The system allows network operators to add new service offerings while minimizing overall operating costs, reducing provisioning times and maximizing the efficiency of the entire network.

- Point-and-click provisioning from a central workstation for networks of RAD products
- Automatic periodic self-healing of faulty services
- Service security management, supporting user network access profiles and allowing network partitioning
- Service availability report
- Dynamic filter displays service and network link-related alarms
- Windows-based client and Linux-based server

RADWIN Fiber In Motion

Mobile Wireless Access for Transportation Communications



RADWIN

RADWIN's mobile wireless radios for transportation communications ensure continuous high speed wireless connectivity between trains or metros and network control and data centers. They deliver the highest throughput for on-board communications with guaranteed bandwidth to each railway vehicle, even on subways and monorail lines. RADWIN's radios offer bi-directional and asymmetrical train-to-track bandwidth with per-train quality of service (QoS) guarantees. This allows always-on communications between trains and control and operations centers for critical services such as information displays, panic buttons, PTT (push-to-talk), telemetry, ticketing machines, and video streaming. They are fully compliant with railway environmental standards, which are a prerequisite for all equipment installed on railways and metros. RADWIN's field-proven mobile wireless access devices are deployed worldwide, powering applications such as broadband WiFi for passengers, real-time high-definition CCTV, PIS, CBTC and more. Operating in challenging outdoor conditions and in underground tunnels, they deliver unmatched capacity and long-range coverage.

- Coverage range of 11 km (6.8 miles)
- Integrated WiFi access point (802.11b/g/n) for video transmissions
- Built-in GPS for vehicle tracking
- Direct DC power from the vehicle (10–36V DC), power consumption <25W
- Up to 750 Mbps total available throughput from the base station
- Up to 250 Mbps total available throughput for vehicle/vessel subscriber units
- SNMPv3
- AES 128
- IP67 rating for severe outdoor conditions

RIC-LC

Ethernet Converter for Multiple PDH Circuits



RAD's RIC-LC is a Fast Ethernet over E1 converter that provides simple, efficient and cost-effective Ethernet connectivity over up to 16 bonded E1 links. As an Ethernet converter for multiple PDH circuits, the RIC-LC enables service providers to supply high capacity Ethernet services to remote locations over existing TDM infrastructure. Deployed in point-to-point or hub-and-spoke topologies, it operates opposite Ethernet over TDM demarcation devices and aggregators, such as RAD's RICi-16 and Egate-100 as well as opposite third-party gateways that support Ethernet over NG-PDH encapsulation and bonding techniques.

The RIC-LC is an ideal solution for Ethernet Private Line and Ethernet Private LAN services, inter-office connectivity, and IP DSLAM, IP Node B and WiMAX base station backhaul over PDH access networks.

- Up to 16 E1 network interfaces
- Four Fast Ethernet UTP/SFP user ports
- GFP (G.8040), VCAT (G.7043), LCAS (G.7042)
- VLAN-aware and VLAN-unaware bridging; VLAN stacking
- Four QoS levels; SP and WFQ scheduling; CIR (committed information rate) support
- Remote and local, inband and out-of-band management
- Dual in-line package (DIP) switches for activating diagnostic loopback tests
- TDM to Ethernet fault propagation

• R

RiCi-4E1, RiCi-4T1, RiCi-8E1, RiCi-8T1

Ethernet over Four or Eight E1 or T1 NTUs



RAD's RiCi-4E1, RiCi-4T1, RiCi-8E1 and RiCi-8T1 deliver mid-band and Fast Ethernet services over up to eight bonded E1 or T1 circuits. Employing various standard bonding technologies to create a scalable, virtual channel from individual E1 or T1 circuits, these devices improve overall network availability by reducing latency and optimizing line utilization and throughput. RAD's RiCi NTUs support a large variety of applications, including transparent inter-LAN connectivity, direct internet access and Ethernet Private Line, as well as IP DSLAM and WiMAX base station backhaul.

The devices are deployed in point-to-point or hub-and-spoke topologies, providing a cost-effective, high performance solution for mid-band and Fast Ethernet services over legacy PDH/SDH/SONET backbones.

- Four or eight E1/T1 ports
- Up to four 10/100BaseT user ports
- Circuit bonding using MLPPP
- Metro Ethernet Forum certified for MEF-9 EPL services
- Four QoS levels according to VLAN priority (802.1p), DSCP, and per-port priority schemes, per application requirements
- Ethernet OAM per 802.1ag and performance monitoring per ITU Y.1731 for end-to-end SLA control
- Secure Telnet and web applications; SNMP and RADIUS

RiCi-16

Ethernet over Bonded PDH NTU



The RiCi-16 connects Fast Ethernet LANs over multiple bonded PDH links, enabling service providers to extend high capacity Ethernet-based services to remote locations. It is also ideal for backhauling Ethernet traffic from IP Node Bs, IP DSLAMs and WiMAX base stations over copper-based or microwave PDH connections. Employing standard Ethernet over NG-PDH technology, the RiCi-16 improves overall network availability by reducing latency and optimizing line utilization and throughput.

The RiCi-16 is MEF-certified for Ethernet Private Line and Ethernet Virtual Private Line services. It is equipped with advanced Ethernet SLA capabilities for handling multi-priority traffic, ensuring latency, jitter and packet delivery performance on a per-flow basis. The RiCi-16 features a "pay-as-you-grow" license model, allowing the addition of E1/T1 links according to evolving bandwidth requirements.

- Up to 16 E1/T1 ports; two bonded clear channel T3 ports or a single channelized T3 port
- Up to four 10/100BaseT user ports
- Circuit bonding using standard GFP, VCAT and LCAS with multi-VCG support
- Metro Ethernet Forum certified (MEF-9, MEF-14) for EPL, EVPL services
- Hierarchical QoS with configurable Strict Priority and WFQ (weighted fair queuing) scheduling, EVC shaping
- Color-sensitive P-bit re-marking
- Ethernet OAM per 802.3-2005 (formerly 802.3ah), 802.1ag and performance monitoring per ITU Y.1731 for end-to-end SLA control
- Secure Telnet and web applications; SNMPv3 and RADIUS

RICi-E1, RICi-T1

Fast Ethernet over E1/T1



The RICi-E1 and RICi-T1 are network termination units (NTUs) connecting Fast Ethernet over framed or unframed E1/T1 circuits.

The devices are deployed in point-to-point or hub-and-spoke topologies, working opposite RAD's RICi-16 and Egate-100 Ethernet over TDM gateways. This enables carriers and service providers to extend their customer reach and utilize legacy PDH infrastructure in delivering new Ethernet services. Typical applications include Ethernet access, backhauling network management traffic and connecting inter-office or enterprise LAN segments.

- 10/100BaseT user port
- Single E1, T1 network port
- PDH to Ethernet fault propagation and TDM loop detection
- Interoperable with third-party devices:
 - RICi-E1/T1 supports standard GFP (ITU-T G.8040) and HDLC
- QoS priority queues
- Plug-and-play functionality using DHCP client
- Remote diagnostic tools on TDM and Ethernet ports
- Managed via SNMP, web server or Telnet

ROC-19/19L

Outdoor Cabinets



ROC-19/19L is a self-contained outdoor cabinet for housing a single 19"-wide RAD unit and a cabling system for various telecom services. Constructed for outdoor use, the enclosure is powered from a DC power source and is ideal for service providers that require efficient environmental isolation for their equipment.

The ruggedized IP56 (ROC-19) and IP66 (ROC-19L) NEMA-4-rated construction includes a rain hood, offering full shielding and protection against dust, rain and ice. Efficient ventilation is assured by an intake fan with replaceable air filters (ROC-19) or passive convection (ROC-19L). Secure, efficient maintenance and access are offered by a 2-point (ROC-19L) or 3-point (ROC-19) door locking mechanism, as well as an integrated fiber cable splicer/guide system, intrusion detection and over-current protection.

- Outdoor cabinet for one 19"-wide RAD unit, with integrated fiber splicer and guides
- IP56-66 NEMA-4-rated metal enclosure
- 24V DC or 48V DC powered
- Effective grounding and over-current protection
- 2- or 3-point door locking
- Intake fan with replaceable filters, or passive cooling
- Wall or pole mounting options

SD-CloudAccessIntelligent Multi-Link
Cloud Access

Hot Product



SD-CloudAccess is a book-ended, economical SD-WAN solution for “cloud-first” businesses or such that are transforming to the cloud. It comprises a client that is either embedded in vCPE-OS or available as a uCPE-hosted VNF, and cloud gateway software, typically deployed at the service provider’s edge. SD-CloudAccess enables application-aware traffic steering across multiple links with SLA-guaranteed access to public, private and telco cloud services.

RADview is used as the SD-CloudAccess controller and domain management system.

- Available on pCPE, uCPE and IoT Gateway
- Transport agnostic, using secure overlay tunnels over any transport link
- Zero-touch installation launches automatic setup of secure tunnels that are terminated at a cloud gateway
- A redundant overlay connection to a backup cloud gateway ensures high availability in the event of failure of the primary cloud gateway
- Local internet breakout functionality for predefined application traffic
- Advances distribution policies including:
 - Traffic bonding – packet-by-packet load balancing
 - Top-up – meeting throughput targets by augmenting the primary link with traffic bursting into a secondary link
 - Application-aware traffic steering – traffic is distributed based on pre-defined application policies and network health
 - Failover – in case of link failure, traffic is switched over to another link

SecFlow-1Ruggedized SCADA-Aware
Gateway

The compact SecFlow-1 is a ruggedized multiservice gateway, featuring built-in security mechanisms designed for applications controlling mission-critical operations. It is ideal for industrial IoT backhaul, enabling fast, secure and economical deployment of new IoT sites. Allowing secure connectivity over wireless or fiber networks – either public (e.g., cellular) or private, it connects all types of industrial devices, including RTUs, smart meter aggregation devices, IoT base stations or concentrators, CCTV cameras, point-of-sale devices, WiFi base stations, and more.

SecFlow-1 is also used for operational WANs, providing reliable and secure Layer 3 communications for power utilities, water and gas utilities, public safety and homeland security agencies, as well as intelligent transportation operators.

- Multiservice support: Fast Ethernet/GbE, serial RS-232/485
- Connectivity to remote and isolated sites using a dual SIM cellular modem for 2G/3G/HSPA+/HSDPA/LTE uplink supporting flexible connectivity methods such as encrypted L3 DMVPN, IPsec VPN, NAT
- Advanced Ethernet and IP feature-set
- Cyber security suite: IPsec encryption with automated PKI, ACL, stateful firewall
- Serial protocol handling with transparent tunneling/protocol conversion/terminal server feature-set for IEC 60870-5-101, IEC 60870-5-104, Modbus RTU to Modbus TCP, and DNP3.0 RTU to TCP
- Complies with IEC 61850-3 and IEEE 1613
- Form factor and functionalities address various installation needs for small stations and data collection sites
- Fault management and reporting, bulk software upgrade, and database management using RADview
- Web interface
- Zero-touch provisioning
- IPsec VPN redundancy
- Certified for PTCRB and VZN

SecFlow-1p

Ruggedized IIoT Gateway

Hot Product



The compact SecFlow-1p is an entry-level multiservice gateway, for cost-effective industrial IoT backhaul. Housed in a ruggedized enclosure it runs the advanced vCPE-OS operating system. The SecFlow-1p allows secure connectivity over wireless or fiber networks for all types of industrial devices, including RTUs, smart meter aggregation devices, IoT base stations or concentrators, CCTV cameras, point-of-sale devices, and more. RADview's security information and event management (SIEM) enables collection of all security events detected in the network. The system collects events from SecFlow devices and displays them visually on customizable dashboards.

- **vCPE-OS operating system hosting of third-party software using Linux LXN container technology**
- **Multiservice support: GbE copper and fiber, serial RS-232/485**
- **Connectivity to remote and isolated sites using a dual SIM**
- **Single cellular modem for a 2G/3G/HSPA+/HSDPA/LTE uplink; dual SIM for always-on connectivity**
- **WiFi connectivity as access point**
- **Dynamic routing with OSPF, BGP, VRF and secure VPN using IPsec, DMVPN and NAT for flexible connectivity**
- **Cyber security suite: 802.1X, IPsec encryption with automated PKI, stateful firewall**
- **Serial protocol handling with transparent tunneling/protocol conversion/terminal server for IEC 60870-5-101, IEC 60870-5-104, Modbus RTU to Modbus TCP, and DNP3.0 RTU to TCP**
- **Zero-touch provisioning, firewall configuration, fault management and reporting, bulk software upgrade, and database management using RADview**
- **SD-CloudAccess agent support**

SecFlow-1v

Ruggedized Multiservice IIoT Gateway

Hot Product



The compact SecFlow-1v is a ruggedized multiservice gateway, featuring built-in security mechanisms designed for applications controlling mission-critical operations. It is ideal for industrial IoT backhaul, enabling fast, secure and economical deployment of new IoT sites. Allowing secure connectivity over wireless or fiber networks – either public (e.g., cellular) or private, it connects all types of industrial devices, including RTUs, smart meter aggregation devices, IoT base stations or concentrators, CCTV cameras, point-of-sale devices, WiFi base stations, and more. RADview's security information and event management (SIEM) enables collection of all security events detected in the network. The system collects events from SecFlow devices and displays them visually on customizable dashboards.

SecFlow-1v provides reliable and secure Layer 3 communications for power utilities, water and gas utilities, public safety and homeland security agencies, as well as intelligent transportation operators.

- **Hosting of third-party software using container technology**
- **Multiservice support: GbE copper and fiber, serial RS-232/485, Power over Ethernet (PoE)**
- **Single or dual cellular modem for a 2G/3G/HSPA+/HSDPA/LTE uplink, dual SIM**
- **WiFi connectivity as access point**
- **Dynamic routing with OSPF, BGP, VRF and secure VPN using IPsec, DMVPN and OpenVPN for flexible connectivity**
- **Cyber security suite: 802.1X, IPsec encryption with automated PKI, stateful firewall**
- **Serial protocol handling with transparent tunneling/protocol conversion/terminal server for IEC 60870-5-101, IEC 60870-5-104, Modbus RTU to Modbus TCP, and DNP3.0 RTU to TCP**
- **Zero-touch provisioning, firewall configuration, fault management and reporting, bulk software upgrade, and database management using RADview**
- **Digital and analog IOs with integrated RTU/PLC functionality**
- **LoRaWAN gateway for remote sensors aggregation**
- **Complies with IEC 61850-3 and IEEE 1613 and EN 50121-4**

• S

SecFlow-1vp

Ruggedized Multiservice
IIoT Gateway

Hot Product



The compact SecFlow-1vp is a ruggedized multiservice gateway, running the advanced vCPE-OS operating system and featuring built-in security mechanisms designed for applications controlling mission-critical operations. It is ideal for industrial IoT backhaul, enabling fast, secure and economical deployment of new IoT sites. Allowing secure connectivity over wireless or fiber networks – either public (e.g., cellular) or private, it connects all types of industrial devices, including RTUs, smart meter aggregation devices, IoT base stations or concentrators, CCTV cameras, point-of-sale devices, WiFi base stations, and more.

SecFlow-1vp provides reliable and secure Layer 3 communications for power utilities, water and gas utilities, public safety and homeland security agencies, as well as intelligent transportation operators. Optional support for SD-CloudAccess enables link bonding and application-aware traffic steering across multiple links with SLA-guaranteed access to public, private and telco cloud services.

- **Hosting of third-party software using container technology**
- **Multiservice support: GbE copper and fiber, serial RS-232/485, Power over Ethernet (PoE)**
- **Single or dual cellular modem for a 2G/3G/LTE uplink, dual SIM**
- **WiFi connectivity as access point**
- **Dynamic routing with OSPF, BGP, VRF and secure VPN using IPsec, DMVPN and OpenVPN for flexible connectivity**
- **Cyber security suite: 802.1X, IPsec encryption with automated PKI, stateful firewall**
- **Serial protocol handling with transparent tunneling/protocol conversion/terminal server for IEC 60870-5-101, IEC 60870-5-104, Modbus RTU to Modbus TCP, and DNP3.0 RTU to TCP**
- **Zero-touch provisioning using RADview**
- **Digital and analog IOs with integrated RTU/PLC functionality**
- **LoRaWAN gateway for remote sensors aggregation**
- **Complies with IEC 61850-3 and IEEE 1613 and EN 50121-4**
- **SD-CloudAccess agent support**

SecFlow-2

Ruggedized SCADA-Aware
Ethernet Switch/Router



The compact SecFlow-2 is a ruggedized Ethernet switch/router with built-in security mechanisms designed for applications controlling mission-critical operations. It is ideal for industrial IoT backhaul, enabling fast, secure and economical deployment of new IoT sites. Allowing secure connectivity over wireless or fiber networks – either public (e.g., cellular) or private, it connects all types of industrial devices, including RTUs, smart meter aggregation devices, IoT base stations or concentrators, CCTV cameras, point-of-sale devices, WiFi base stations, and more.

SecFlow-2 is also used for operational WANs, providing reliable secure Layer 2 and Layer 3 communications for power utilities, water and gas utilities, public safety and homeland security agencies, as well as intelligent transportation operators.

- **Multiservice support: Fast Ethernet/GbE, serial RS-232, Power over Ethernet (PoE)**
- **Connectivity to remote and isolated sites using a dual SIM cellular modem for 2G/3G uplink supporting flexible connectivity methods such as encrypted L3 DMVPN, IPsec VPN, L2 VPN, NAT**
- **Advanced Ethernet and IP feature-set**
- **Cyber security suite: 802.1X, IPsec encryption with automated PKI, ACL, stateful firewall**
- **Serial protocol handling with transparent tunneling/protocol conversion/terminal server feature-set for IEC 60870-5-101, IEC 60870-5-104, Modbus RTU to Modbus TCP, and DNP3.0 RTU to TCP**
- **Complies with IEC 61850-3 and IEEE 1613**
- **Form factor and functionalities address various installation needs for small stations and data collection sites**
- **Fault management and reporting, bulk software upgrade, and database management using RADview**

SecurityGateway

VPN Aggregator, Router and Firewall

Hot Product



SecurityGateway is a major building block of RAD's industrial IoT solution, serving as a state-of-the-art VPN aggregation appliance. In the fast growing market of IIoT and the need for secure communications, SecurityGateway provides a small form-factor yet powerful and cost-effective solution for aggregating traffic from multiple remote IIoT sites.

SecurityGateway aggregates multiple VPNs from remote SecFlow devices and addresses industrial IoT applications, for example:

- Distributed automation in secondary substations
- Smart meter concentration
- Water resources management
- Smart retail

Typically located behind the organizational firewall, SecurityGateway may also serve as a WAN gateway, depending on customer needs. RADview's security information and event management (SIEM) enables collection of all security events detected in the network. The system collects events from SecFlow devices and displays them visually on customizable dashboards

- **Compact 19" 1U VPN aggregation device supporting L2/L3 VPNs**
- **Optional high availability**
- **Feature-rich, dual stack IPv4/IPv6, including static and dynamic routing and NAT**
- **Stateful firewall, IKE1 and IKE2, automated PKI (X.509) with integrated DNS resolver**
- **Supports flexible connectivity methods such as encrypted IPsec VPN, OpenVPN and L2TP**
- **User authentication using RADIUS**
- **L2 functionality**
- **User-friendly, easy-to-use web-based GUI**
- **Fault management and reporting using RADview**

SFP/XFP/SFP+ Transceivers

Small Form-Factor Pluggable Transceivers



RAD's SFP/XFP/SFP+ small form-factor pluggable transceivers are hot-swappable, input/output transceiver units converting optical and electrical media. Providing a wide range of detachable interfaces to multimode/single-mode optic fibers and UTP/coaxial electrical cables, RAD's miniature transceiver units enable significant savings in system maintenance and upgrade costs, as well as facilitate efficient design of host devices and flexible network planning.

It is strongly recommended to order RAD devices with original RAD SFP/XFP/SFP+ transceivers installed, to ensure that the entire assembled unit has undergone comprehensive functional quality tests. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFP/XFP/SFP+ pluggable transceivers.

Optical SFPs

- **MSA (multi-source agreement) compliant**
- **Built-in DDM (digital diagnostic monitoring) function**

Smart SFPs

- **GPON OLT in an SFP**
- **VDLS2 SFP**

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vCPE-OS

Open Carrier-Class Operating System for Network Edge Virtualization

Hot Product



Part of RAD's vCPE Toolbox, the Linux-based, carrier-class vCPE-OS runs on any white box server and is pre-loaded in RAD's virtual CPE (vCPE) platforms. It combines powerful networking capabilities with virtualization for hosting and accelerating SD-WAN and any other value-added virtual network function (VNF) applications from any vendor.

- **Slim, high performance operating system for optimized vCPE**
- **Open solution, compatible with any VNF (networking, security and IT), orchestrator and SDN controller**
- **Any access with advanced transport/networking capabilities: LTE, WiFi, Carrier Ethernet, xDSL, PON, and TDM**
- **High availability: Performance monitoring, troubleshooting and self healing – TWAMP, ICMP Echo, UDP Echo**
- **Any hardware: RAD's white box, gray box platforms, third-party servers, and RAD's pluggable PNFs**
- **Comprehensive management and security suite**
 - NETCONF/YANG, CLI, Syslog, alarms, and more
 - SNMPv3, SSH, SFTP, Access Control, TACAS+, RADIUS
 - Zero-touch and call-home provisioning
- **SD-CloudAccess agent support**

vSD-WAN

Virtualized Networking Function for SD-WAN-Based Business Services by Versa Networks



The vSD-WAN by Versa Networks is a virtualized network function (VNF) that applies software-defined networking (SDN) to WAN connections. Featuring both networking and security functions in a single software, it is used to connect enterprise branch offices and data centers at a lower cost compared to IP VPNs. vSD-WAN offers multi-tenancy and high availability to optimize cost/performance of end-customer services. It features distributed network service functions to provide the flexibility and elasticity for easy, highly scalable and secure deployments. In addition, self-provision and self-care capabilities transform the customer experience. vSD-WAN is part of RAD's vCPE Toolbox. It can be hosted as a VNF on RAD's vCPE-OS and deployed with any ETX platform, as well as any supporting white box. This allows service providers to expand their managed services portfolio with a simplified and unified architecture.

- **Zero-touch provisioning**
- **Multi-tenant support**
- **Application awareness, QoS**
- **Flexible deployment options: bare metal, gray box and VNF**
- **Advanced routing: VRRP, IPAM, OSPF/BGP/MP-BGP/PBR, segment routing, MPLS L3 VPN and L2 VPN, QoS**
- **Security capabilities with UTM: Stateful firewall, DDoS prevention, malware protection, IPS-IDS, IPsec, antivirus, user and group authentication, URL and file filtering**
- **Visibility and analytics**
- **WAN optimization**



RAD Services



RAD Global Services

Peace of Mind, Where and When You Need It

RAD's Service Assured Access (SAA) and Service Assured Networking (SAN) solutions are all about enabling service providers and network operators to deliver the best possible service experience and seamlessly migrate to next-generation networks – all while increasing operational efficiency and reducing TCO.

Complementing these offerings are RAD Global Services, a great resource developed specifically to help our customers receive the full benefits of our solutions with real-time service guidance, planning and preventive maintenance.

RAD Global Services provide expert consulting and troubleshooting assistance, online tools, regular training programs, and various equipment coverage options – all designed to enable seamless installations and faster service rollouts. Moreover, our RAD programs help service providers to meet their SLAs and avoid penalties, while private network operators can rely on full support for their mission-critical applications.

These vital services are available from authorized RAD Partners and backed by highly dedicated and professional teams at regional technical assistance centers, together with project management staff and international training professionals.



RADcare Technical Support

Partner Benefits

- Strict service level agreements (SLAs): Receive response, restore service and resolve issues within a known and guaranteed time frame
- Move to the head of the queue with priority handling by RAD support centers and round-the-clock access to RAD's experts
- Free access to RADcare Online, including regular software updates and patches, online/remote configuration assistance and RAD's FAQ knowledge base

Customer Benefits

- Ensure optimal quality of experience for your customers by maintaining a high quality network
- Meet your SLAs and avoid penalties by minimizing service outages and enabling fast recovery
- Plan ahead to limit your spending on support and eliminate hardware repair costs related to old equipment
- Shorten time to market (TTM): Rely on RADcare to support your operations so you can turn up new services faster

RAD Global Services



RADpro

Project Assured Services



- Guidance throughout design and rollout
- High- and low-level network design
- Support service migration and network upgrades
- On-site services
- Consulting services



RADpro

Project Management



- Project coordination
- Single point of contact
- Periodic meetings and progress reports
- Project-specific documentation



RADpro

Training



- Training-on-demand
- Regional sales, pre-sales and technical seminars
- RAD certification



RADcare

Technical Support



- Strict SLA commitments on response, service restore and resolution times
- 24x7 support, priority handling and escalation procedures
- RADcare Online portal for software updates and upgrades
- Optional multi-year blanket coverage



RADpro

Project Assured Services

Project Assured Services

RADpro Project Assured services encompass all relevant aspects of the pre-installation design and rollout stages to get the new network up and running as quickly and as seamlessly as possible while providing additional vital benefits.

RADpro Project Assured services include the following valuable elements:

Planning • Staging • Site Survey • Equipment and Management Installation
• Acceptance Testing and Commissioning • Resident Engineer



Project Assured Services

Enjoy full Project Assured service led by certified RAD engineers who are committed to your project's success from start to finish. RAD offers different Project Assured packages which include:

- High-level design (HLD): Thorough review of the physical topology, required hardware and software, and network management
- Low-level design (LLD): A definitive reference for system and network implementation, including detailed configuration instructions for devices, network management system and interfaces
- Configuration and testing performed by RAD experts to ensure ideal turn-up time
- Full documentation of your system's installation requirements for easier maintenance and future changes
- Commissioning design and execution so that the entire network can be certified before sign-off



Project Management

RAD's professional Project Management staff ensures that your project will have a timely and smooth implementation from the planning stage through completion.

- A single point of contact (Project Manager) within RAD supervises all logistical, technical and commercial aspects of the implementation of all network solutions under your contract
- Periodic status meetings
- Detailed project plan procedures and documentation, regular progress reports, and management of all project aspects



Training Center

RAD's training programs are designed to keep your team up-to-date with the latest RAD solutions.

- Technical seminars, web-based training and project-based training: A variety of on-site and remote interactive training options to ensure your engineers master your RAD equipment
- Course materials include a carefully balanced mix of lecture, demonstration and hands-on experience
- Topics include theory, configuration and troubleshooting



Welcome to the RADadvantage Partners Program

Commitment. Trust. Respect. Partnership. These are just some of the values that comprise the essence of RADadvantage, RAD's channel partner program. Ultimately, the success of a partnership is measured by the benefits that are enjoyed by all parties:

The vendor, its partners, and their respective end-users. That's why RAD places immense importance on its network of channel partners and invests significantly in partner enablement, engagement and support.

Shared Interests and Commitments

RAD and its channel partners embrace a set of fundamental guiding principles:

- Delivering the highest quality products, solutions and services that create loyal end-users
- Maximizing customer satisfaction
- Conducting business in an atmosphere of trust and mutual respect
- Resolving problems with candor and good judgment
- Cooperating to win new business and improve existing opportunities

RADadvantage Program Highlights

The RADadvantage Partners Program is designed to incrementally reward partners based on achievements in annual revenues, service level accreditation and commitment. Designated partnership levels are reviewed and adjusted annually.

RADadvantage Partners enjoy benefits such as:

- Joint business development efforts
- Online and face-to-face sales and technical training programs
- Discounted demo gear
- Support for co-branded marketing activities
- Official acknowledgement of Partner relationship



Welcome to RADacademy



RADacademy equips RAD Partners with the knowledge they need in order to sell, demonstrate, install, and support RAD's solutions for service providers and critical infrastructure.

»Our Goals

- Present the unique value of our solutions, using the latest presentations and sales tools
- Deliver the know-how to sell, install and support our solutions
- Ensure that knowledge transfers from RAD to Partners globally, on a quick and consistent basis

»Sales Training and Certification

This program is based on remote and face-to-face training for new Partners/new personnel, followed by ongoing Web-Based Training (WBT). Solution Partners must attend the majority of the relevant WBT sessions.

»Technical Training and Certification

This program begins with the technical seminars, where RAD's trainers introduce the latest features and functions. Some WBT sessions serve this purpose as well.

»Web-Based Training (WBT)

RADacademy's WBT is a popular, long-running program of weekly update WBT classes for RAD Partners, covering everything from product updates to the latest technology developments. During these live sessions, the participants are encouraged to ask questions, engage with our subject matter experts and share their success stories. There is also access to RAD's WBT archive where previous sessions are available for viewing.

»End-User Project-Based Training

One of the main ingredients for a successful installation is the transfer of knowledge to the user.

RAD offers direct training to end-users, arranged via RAD Partners, on-site or at RAD headquarters. Our trainers' expertise will ensure that the implementation of RAD's solutions will be as smooth as possible.

In addition to classroom training (either on-site or at a RAD office), we also offer training via WBT.

» For more information, please contact training@rad.com

www.rad.com

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RAD Group

RAD is the anchor of the \$1.5 billion RAD Group of companies, a world leader in communications solutions. A unique business philosophy distinguishes the RAD Group, which has incubated hundreds of Israeli start-ups since its inception. Each company in the RAD Group operates autonomously under a common strategic umbrella. This decentralized approach maximizes the advantages inherent in small business units, such as flexibility, entrepreneurial spirit and management focus. The companies coordinate strategy, sales channels and R&D efforts. Four RAD Group companies are currently traded on the Nasdaq Stock Market in the US, while the others are privately held by the group's founders and various venture capital firms.

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