

RAD's EtherAccess Carrier Ethernet Product Portfolio

for Business, Wholesale and
Mobile Backhaul Applications



data communications



Your Single Source for Carrier Ethernet Solutions

Take advantage of RAD's full end-to-edge platform:

- Complete Carrier Ethernet access ecosystem from a single source, including a choice of 1 Mbps to 10 GbE NTUs and high capacity aggregation
- Best-of-breed Carrier Ethernet capabilities to enable multi-CoS value added services with performance reporting
- Drive down OpEx with fault management and testing
- Reduce carrier TCO with cost-optimized design, multi-functional devices and service lifecycle management tools
- End-to-end visibility across wholesale and service provider networks
- Support network convergence with a common platform and management system
- Built-in pseudowire emulation capabilities allow continued support for TDM services
- Modular CPEs can be deployed for fiber, PDH and DSL access
- Timing synchronization expertise for LTE backhaul

Market Segments

Retail Business Services

- Inter-office connectivity, VPN, Internet access, storage, data centers
- Cloud connectivity

Wholesale Services

- Transport services for service providers
- E-NNI carrier-to-carrier services

Mobile Backhaul

- 2G, 3G, LTE backhaul
- CES, Timing over Packet synchronization



Addressing Carrier Ethernet Service Challenges

✦ Service Reach

RAD's solutions enable the connection of in- and out-of-region customer sites over fiber, DSL, PDH, SDH/SONET, and wireless with uniform service characteristics and end-to-end SLA assurance.

✦ Robust Service Management

RAD's EtherAccess product suite features built-in test-head functionalities with the full composite of service lifecycle management tools, including RFC 2544 testing, hardware-based Ethernet OAM, fault management, and L2 and L3 loopbacks, to cut down OpEx and minimize service turn up and performance monitoring challenges.

✦ End-to-End SLAs/QoS

RAD's Carrier Ethernet solutions enable operators to reap the most benefits from Carrier Ethernet's lowest cost-per-Megabit economics, by offering powerful traffic management capabilities as well as a full complement of performance monitoring and Ethernet OAM tools.

✦ Migration of Legacy Services

RAD's Carrier Ethernet devices support TDM pseudowire tunneling, facilitating a smooth transition from PDH, SDH/SONET and ATM to new networks while preserving equipment and infrastructure investments for as long as it is economically feasible.

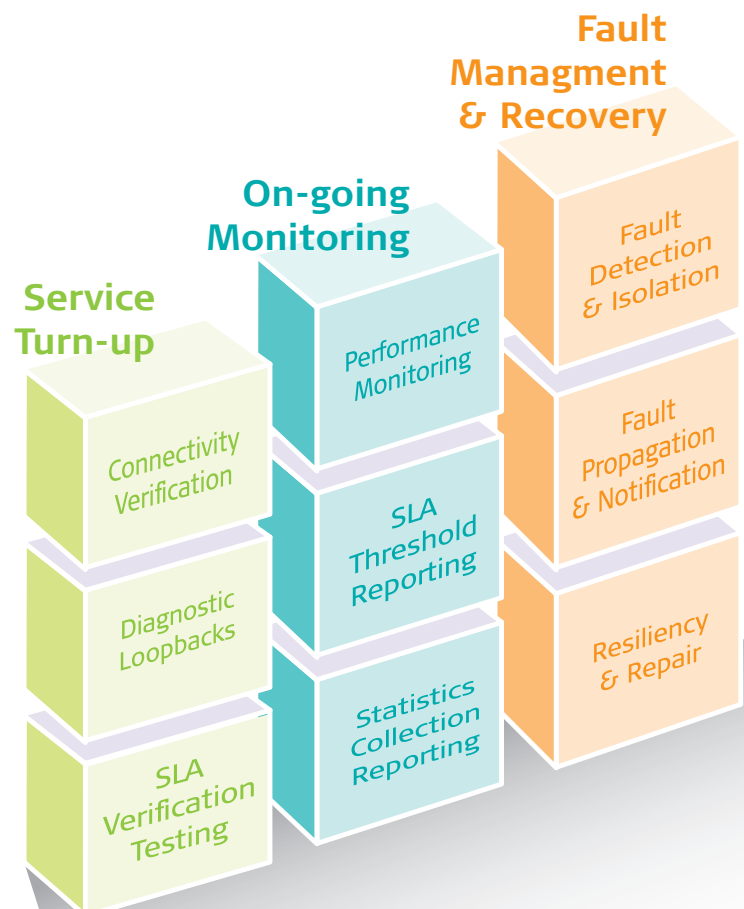
✦ Timing over Packet

RAD's Carrier Ethernet access solutions are equipped with the SyncToP platform of high performance clock recovery and distribution techniques, to enable highly accurate delivery of real-time traffic over packet networks by eliminating built-in delay and delay variation impairments. Supported capabilities include Synchronous Ethernet, IEEE 1588v2 PTP TC, BC and Grand Master functionalities, as well as NTR over SHDSL and adaptive clock recovery (ACR).

✦ Service Resiliency

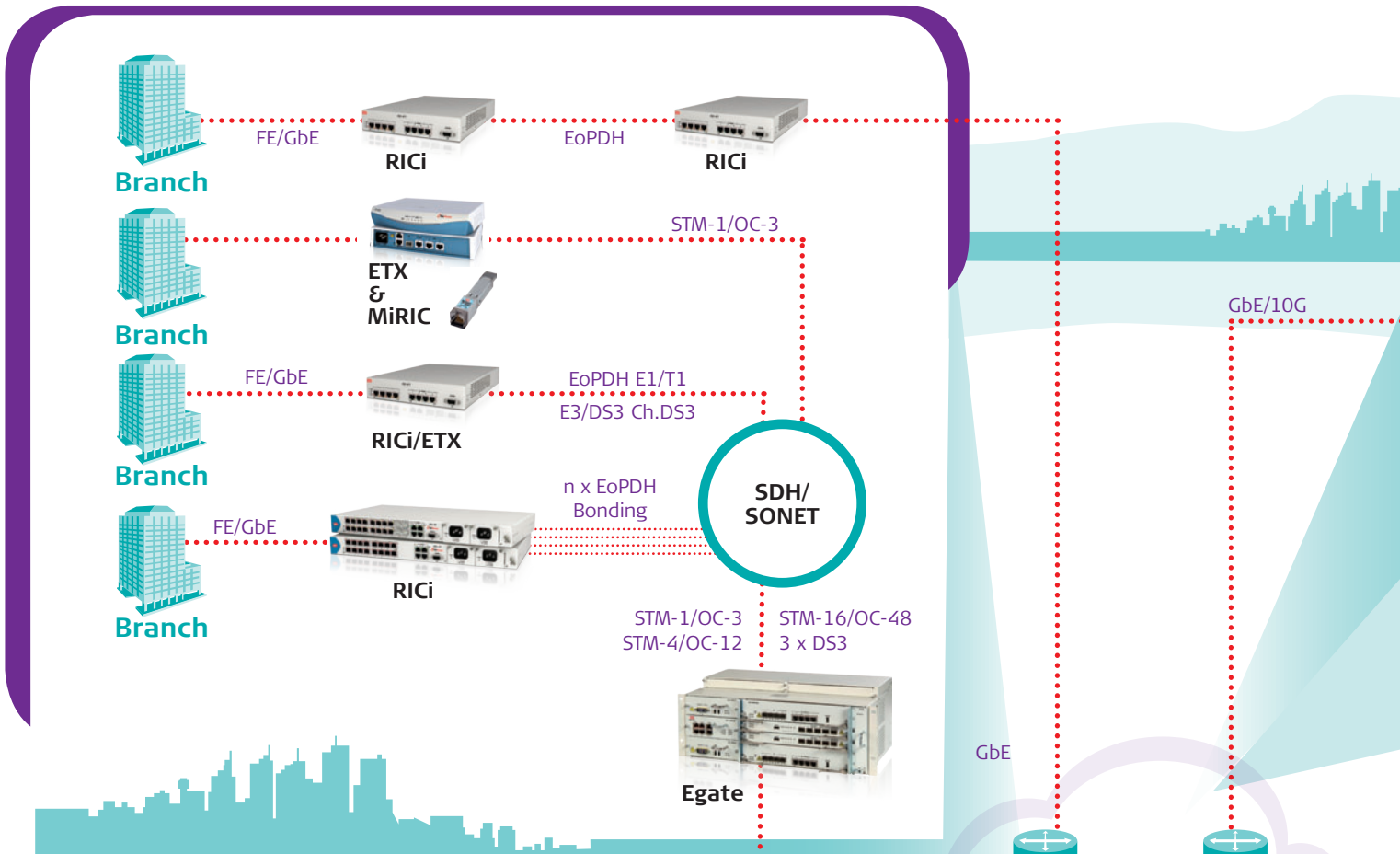
RAD's demarcation and aggregation devices enable SDH/SONET-like performance with 802.3ad link aggregation protection, G.8031 Ethernet Linear Protection (EVC protection) and G.8032 Ethernet Ring Protection Switching for under 50 ms detection and recovery of physical and virtual circuit disruptions.

Managing the Service Lifecycle

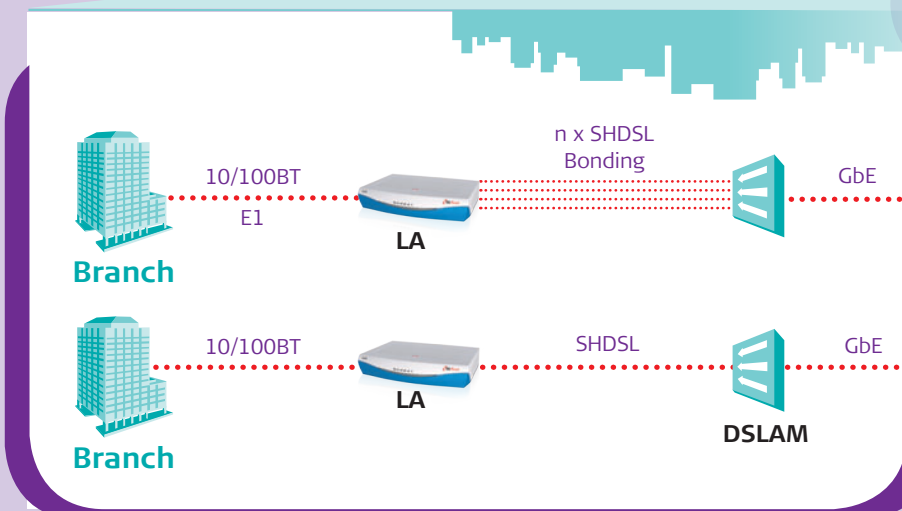


Variety of Ethernet Access Solutions

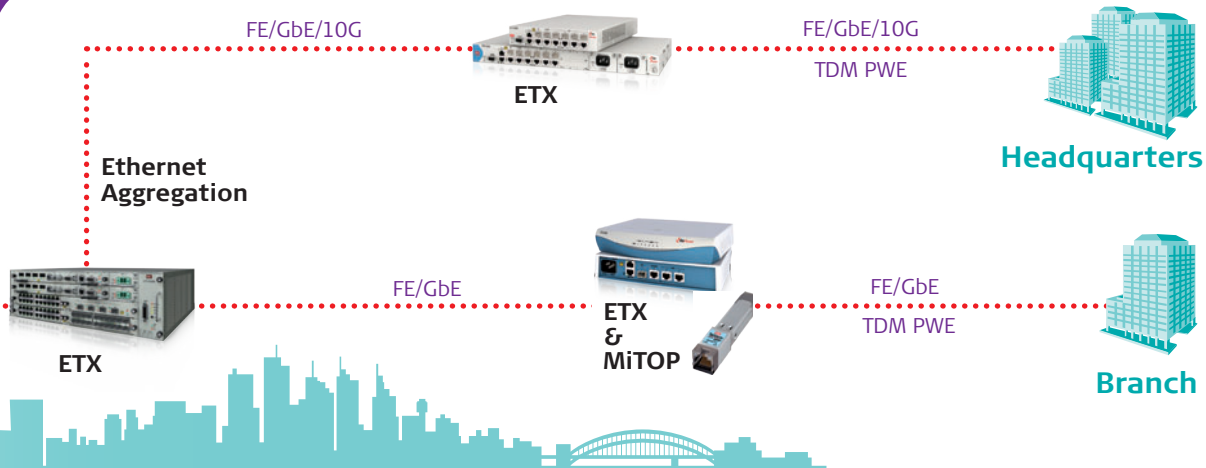
Ethernet Over PDH/SDH/SONET



Ethernet Over DSL



Ethernet Over Fiber



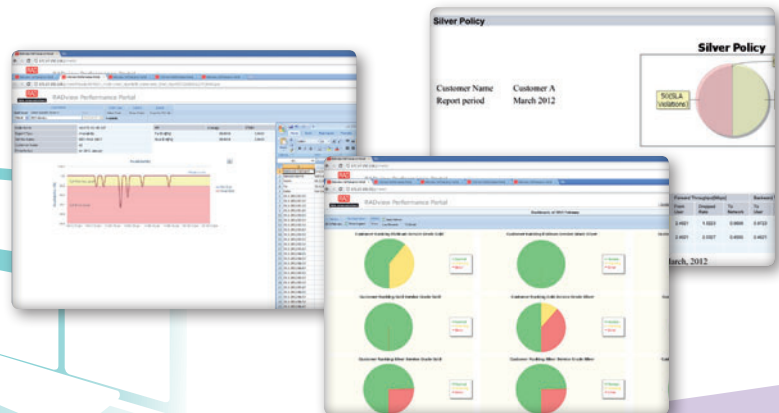
Network Operations Center

RADview-EMS Management

- Topology Map
- Network Inventory
- Real-Time Device Status
- Software and Configuration Management
- Troubleshooting Tools
- Business Continuity (Hot Standby)

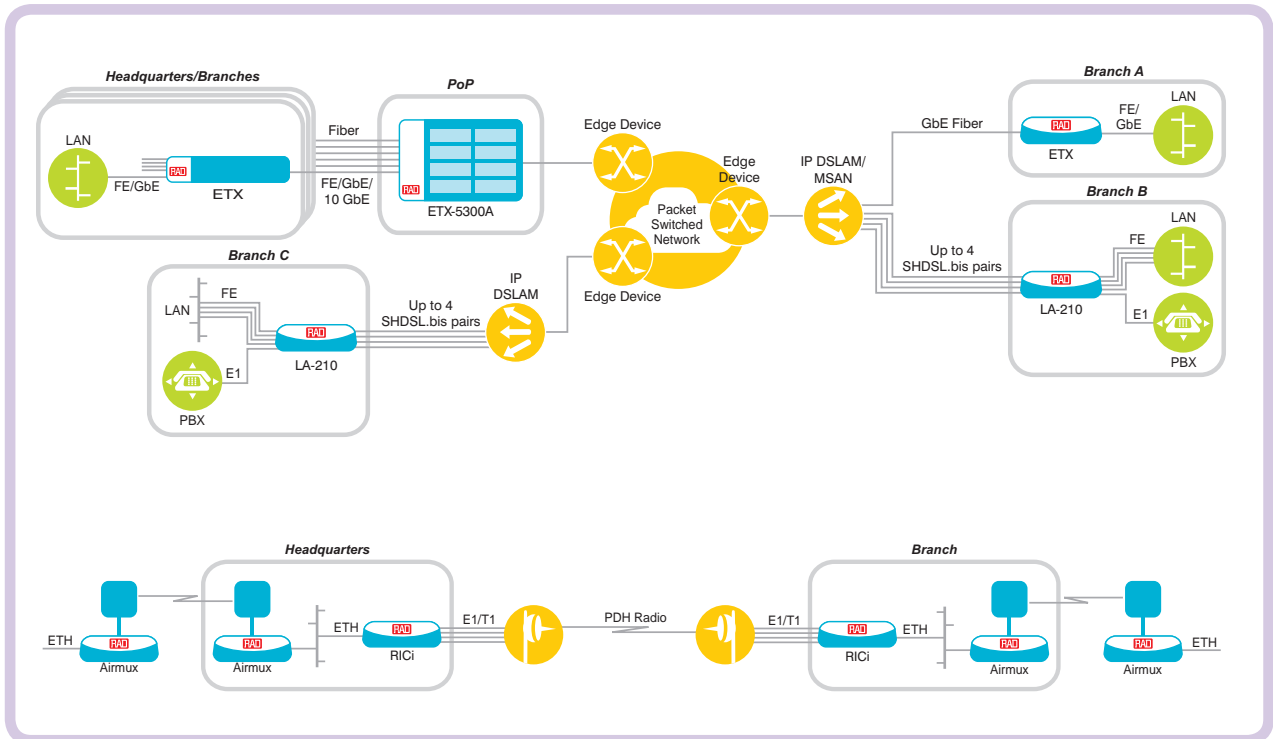
RADview-PM Performance Monitoring Portal

- Actual Performance Metrics based on ITU-T Y.1731:
 - Frame delay (Latency)
 - Frame delay variation (Jitter)
 - Packet delivery ratio
 - Availability
- Threshold Management
- Report Generation
- Immediate Detection of Service Degradation



Applications

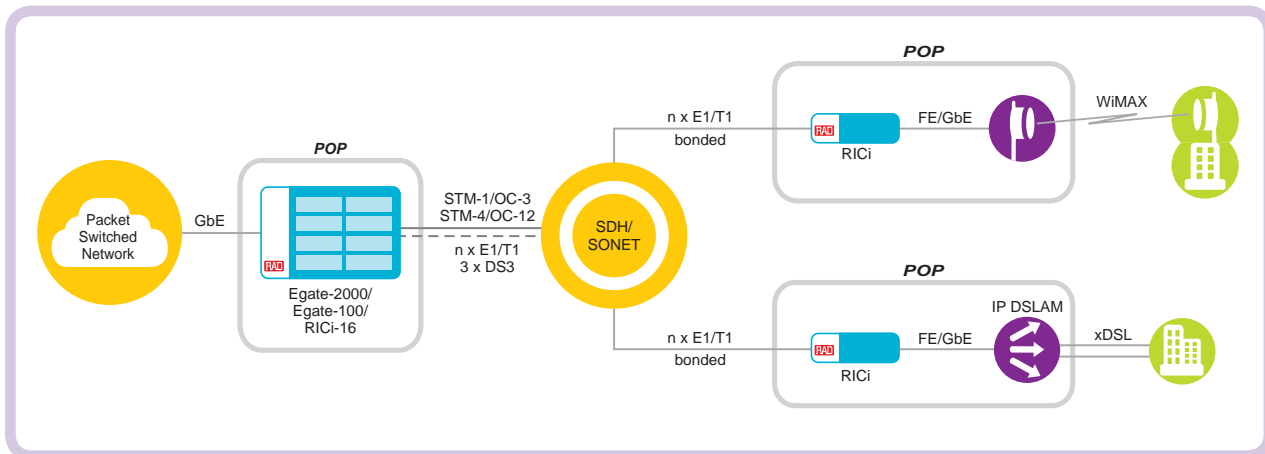
Mid-Band and High Speed Ethernet Services Using Fiber, DSL and Wireless



- Provide Layer 2 VPN (virtual private network) services to business users with consistent service attributes over fiber, SHDSL.bis and Wireless
- Up to 22.8 Mbps over EFM-bonded SHDSL.bis pairs and 10 Gbps over Ethernet fiber
- Deliver SLA-based Ethernet Private Line (EPL), Ethernet Virtual Private Line (EVPL) and Ethernet LAN (E-LAN) services
- Provision differentiated services across diverse access links with Ethernet OAM, performance monitoring and advanced traffic management capabilities
- Extend reach of Ethernet-based access to end users with cost-effective Ethernet radio



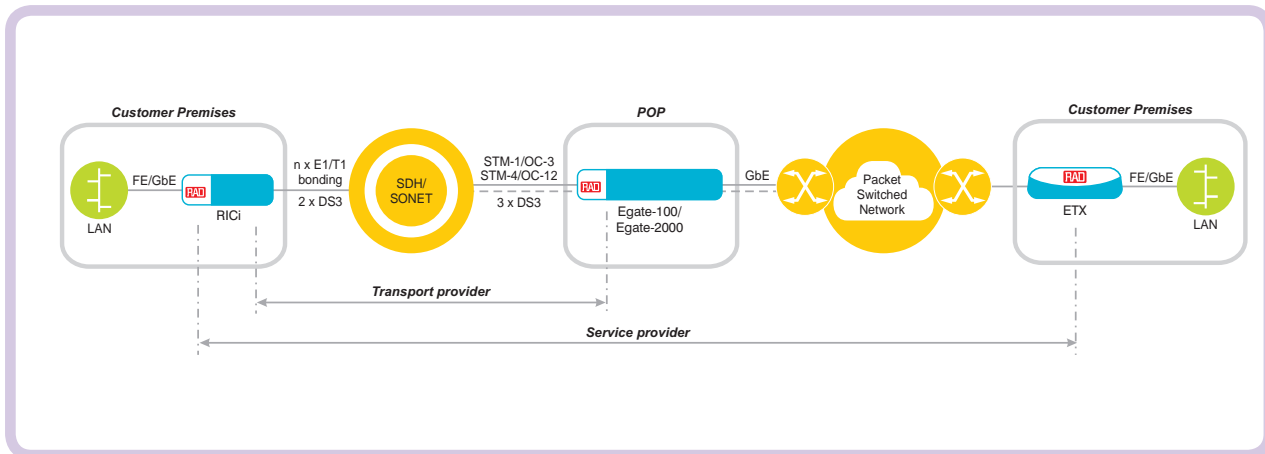
IP DSLAM and WiMAX Backhaul over SDH/SONET



- Provide broadband access by backhauling traffic from IP DSLAMs and WiMAX base stations over PDH and SDH/SONET transport with seamless hand-off to a packet switched network
- Seamless extension and aggregation of Ethernet/IP-based broadband services over TDM infrastructure

- Fast deployment of broadband services
- Reduce OpEx and CapEx by leveraging existing transport Infrastructure

Ethernet Access over TDM Leased Lines

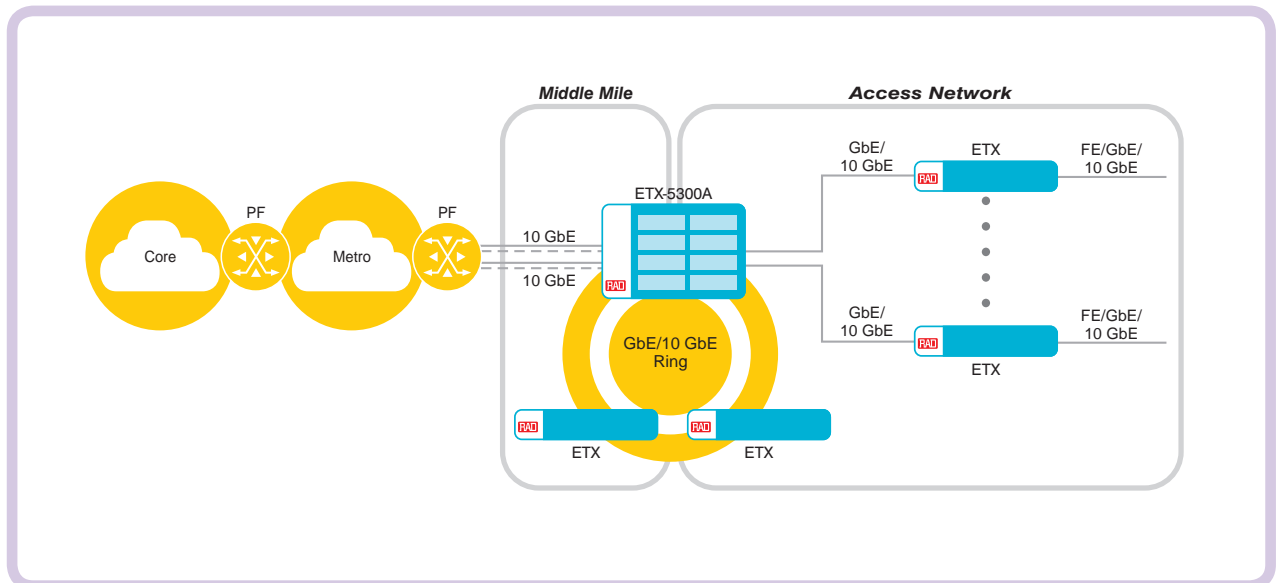


- Utilize leased TDM lines to reach out-of-footprint customers for Ethernet services, while ensuring consistent service attributes and end-to-end SLA control across different networks and provider domains
- Extend Ethernet service reach over third-party networks without affecting user experience or service quality
- End-to-end service control and performance measurements using Ethernet service OAM to allow SLA verification across the access provider's network

- Provide same service definition for on-net and off-net customers
- Higher bandwidth rates with Ethernet over NG-PDH/SDH encapsulation and bonding standards (GFP, VCAT, LCAS) ensures service quality with hitless restoration, flexible access, rate granularity, and multi-vendor interoperability

Applications

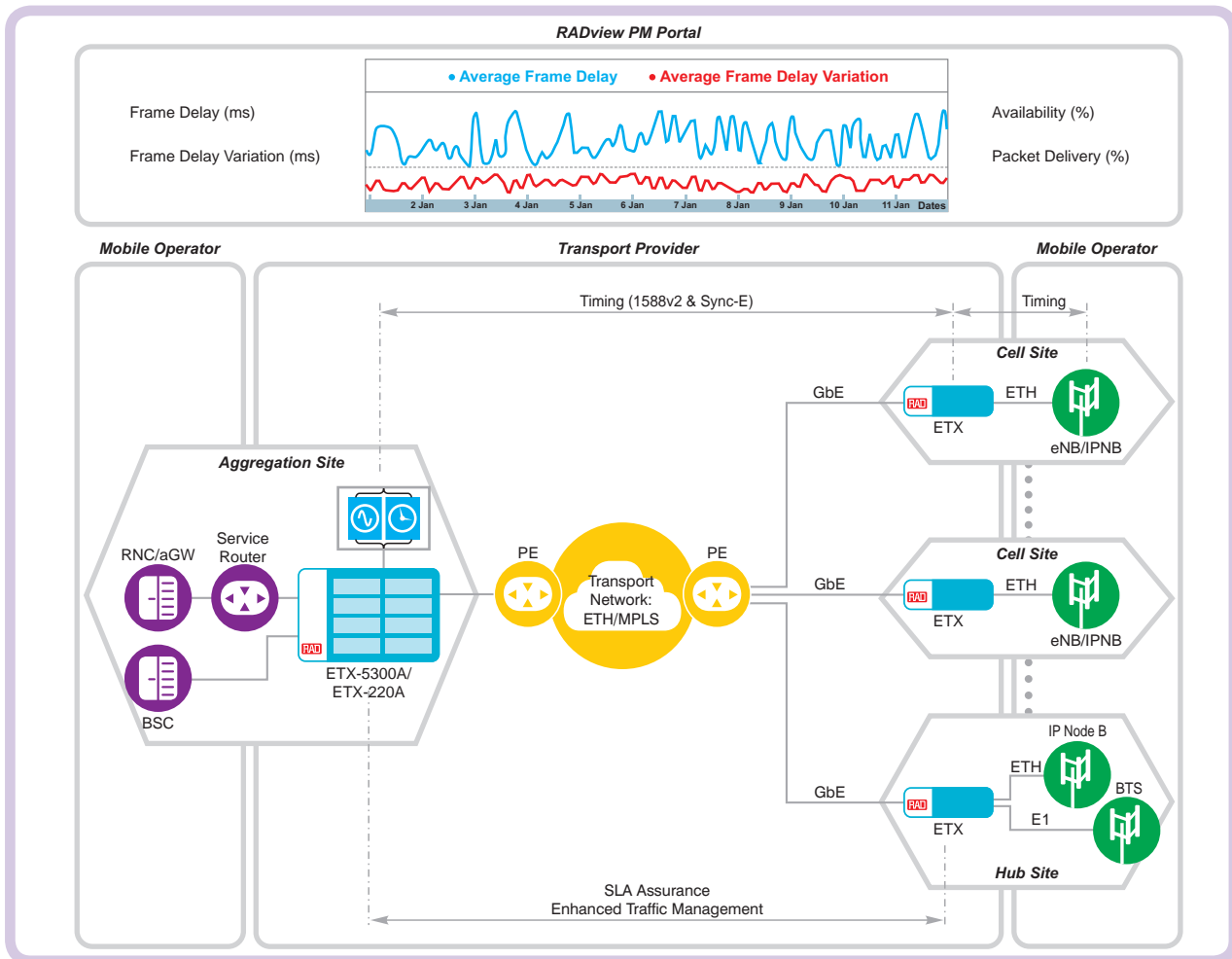
Ethernet Access Aggregation



- Aggregate SLA-backed, QoS-differentiated Carrier Ethernet services in access and metro networks, while ensuring high level of resiliency and reliability for effective network and service control
- Intelligent Ethernet demarcation and aggregation devices in hub-and-spoke or ring deployments
- Scalable 1-Gigabit and 10-Gigabit Carrier Ethernet fiber rings with sub-50 ms switchover protection for high availability and service continuity
- End-to-end management of EPL, EVPL, E-LAN, and E-Tree services
- True SDH/SONET replacement with hard QoS, Ethernet OAM and performance monitoring



Mobile Demarcation



- Backhaul eNode B traffic over Ethernet/IP/MPLS networks with end-to-end SLA assurance, performance monitoring and easy fault localization – right off the base station.
- Combine Ethernet demarcation functionalities with powerful clock transfer support to ensure service quality over packet transport
- MEF-defined Ethernet service features with hierarchical QoS per flow/service
- Five Nines (99.999%) availability and resiliency with Ethernet linear and ring protection switching

- Fast and reliable diagnostics with hardware-based OAM
- Extensive 1588v2, Synchronous Ethernet support for frequency, phase and ToD synchronization
- Terminate thousands of EVC flows using powerful high capacity aggregation device
- TDM capabilities for 2G support over the same network connection



RAD's Carrier Ethernet Ecosystem: Products & Capabilities

* Designed as MEF machines to deliver standardized E-Line, E-LAN and E-Tree services per MEF-9 and MEF-14 specifications, as well as MEF-22-based mobile backhaul applications and E-NNI support per MEF-26 for carrier to carrier connectivity; conforms to emerging CE 2.0 specifications

* The most sophisticated traffic management capabilities available, including multi-level hierarchical scheduling with policers and shapers per UNI, EVC and EVC.CoS to optimize bandwidth utilization while providing differentiated QoS to meet committed SLAs and predictable performance for multi-priority traffic

* Comprehensive set of hardware-based Ethernet OAM, fault management and performance monitoring tools per IEEE 802.3-2005, 802.1ag and ITU-T Y.1731. Built-in RFC-2544 tester capabilities and L2/L3 diagnostic loopbacks

* Full suite of standards-based timing and synchronization over packet attributes, including:

- Synchronous Ethernet (Sync-E)
- 1588v2 Precision Time Protocol master, transparent and slave clock with hardware-based timestamping as well as ToD (time of day, 1PPS) synchronization

* Extensive TDM pseudowire support: CESoPSN, SAToP, CESoETH (MEF-8), UDP/ IP encapsulation

* Carrier-grade service resiliency with LAG, Ethernet Linear and Ring Protection Switching: ITU-T G.8031, G.8032

EtherAccess

Ethernet over Fiber

CPEs



ETX-203AX/AM
Fixed/ Modular Carrier Ethernet Demarcation Devices

Cost-optimized for today's business Ethernet services over fiber. Modular version fits any media for greater flexibility



ETX-205A, ETX-204A
Advanced Carrier Ethernet Demarcation Device + Timing

Supports business, wholesale and mobile backhaul applications, incorporating Timing over Packet technologies and TDM pseudowire



ETX-220A
10G Carrier Ethernet Demarcation Device

High capacity demarcation device with carrier grade redundancy for 10 GbE services



MiTOP-E1/T1/E3/T3
SFP TDM Pseudowire Gateways

System on an SFP providing TDM connectivity for **ANY** Ethernet switch

Aggregation



ETX-1002
10 Gigabit Carrier Ethernet Aggregation Switch

Grooms up to 24 GbE connections into four 10 GbE links



ETX-5300A
Ethernet Service Aggregation Platform

Highest capacity-to-size ratio. Aggregates GbE and 10 GbE traffic plus TDM pseudowire for business, wholesale and mobile backhaul services

Ethernet over TDM

CPEs



ETX-203AX/AM
Fixed/Modular Carrier Ethernet
Demarcation Devices

Cost-optimized for today's business Ethernet services over fiber. Modular version fits any media for greater flexibility



RiCi-16/8/4
Ethernet over Bonded PDH
NTUs

For carrier-grade business services, backhaul and out-of-region connectivity over legacy infrastructure



RiCi-E1/T1/E3/T3
Fast Ethernet over PDH NTUs

Managed Fast Ethernet over TDM converters with QoS and diagnostics



MiRiCi-E1/T1/E3/T3
Miniature Ethernet to PDH
Remote Bridges

Managed SFP Ethernet bridges with QoS, OAM, VLAN stacking

Aggregation



Egate-100
Gigabit Ethernet over TDM
Aggregation Gateway

Aggregation of Ethernet services over channelized STM-1/OC-3 or 3 x DS3



Egate-2000
Gigabit Ethernet Aggregator
over PDH, SDH/SONET

High capacity Ethernet over TDM aggregation up to STM-16/OC-48 for MEF-certified services

Ethernet over DSL



ETX-203AX/AM
Fixed/Modular Carrier Ethernet
Demarcation Devices

Cost-optimized for today's business Ethernet services over fiber. Modular version fits any media for greater flexibility



LA-210
EFM DSL Network Termination
Unit

For business Ethernet services over bonded DSL copper

Management and Performance Monitoring

RADview-EMS Management

RADview-PM Performance Monitoring Portal





www.rad.com



data communications
The Access Company

Specifications are subject to change without prior notification. This document contains trademarks registered by their respective companies. The RAD name, logo and logotype, are registered trademarks of RAD Data Communications Ltd. EtherAccess is a registered trademark of RAD Data Communications Ltd. RAD product names are trademarks of RAD Data Communications Ltd. ©2012 RAD Data Communications. All rights reserved. Catalog number 802477, Version 4/12