

ETX-2i

IP and Carrier Ethernet Demarcation with D-NFV



- Feature-rich demarcation and aggregation suite, offering a complete Service Assured Access (SAA) solution, line rate Layer-3 services, and vCPE applications
- Ideal for service providers, wholesalers, and mobile operators, seeking to deliver and monitor SLA-based MEF-certified CE 2.0, Layer-3 VPN, and TDM over PSN
- Versatile offering of multirate Ethernet over fiber, SHDSL, VDSL, GPON, PDH, and TDM, assuring unified service delivery over any access technology
- TWAMP and Layer-2 OAM, diagnostics for scalable and accurate traffic monitoring, quick fault detection, and troubleshooting of Layer-2 and Layer-3 networks

The ETX-2i IP and Carrier Ethernet Demarcation with D-NFV device is the main component of RAD's Service Assured Access solution, providing:

- Ethernet service uniformity over multiple access technologies including GbE and 10GbE, SHDSL, VDSL, PDH, and SONET/SDH
- Operation in diverse topologies including ring, daisy chain, and hub and spoke
- PWE functionality for mobile backhauling and business services
- Synchronization for mobile 2G, 3G, LTE, and LTE-A backhauling networks
- Network Function Virtualization (NFV) for vCPE solutions

ETX-2i is offered in a variety of product options: ETX-2i, ETX-2i-B, ETX-2i-10G, and ETX-2i-100G. ETX-2i is a next-generation hybrid L2 and L3 demarcation device. The ETX-2i-B branch office device is an optimized access box adapted to the requirements of next-generation vCPE networks. ETX-2i-10G is an ETX-2i version supporting 10GbE ports. ETX-2i-100G is a high speed service aggregation platform addressing the ever increasing need for more high-bandwidth services at the network edge.

The tables below provide further information on the capabilities offered by each ETX-2i device.

MARKET SEGMENTS AND APPLICATIONS

ETX-2i is ideal for carriers, service providers, wholesale providers, and mobile operators seeking to offer unified SLA-based Ethernet business services, such as E-Line, E-LAN, E-Tree, and E-Access, as well as L3 VPNs and value-added services using virtualization at the customer edge.

INTEROPERABILITY

The ETX-2i family features and services are standard based and should work with any 3rd party equipment using standard based features and services.

NETWORK TOPOLOGIES

ETX-2i supports several network topologies such as linear, daisy chain, and self-healing rings (G.8032v2), working with ETX-5 or third-party Ethernet devices.

CARRIER ETHERNET 2.0 SERVICES

ETX-2i incorporates a complete set of CE 2.0-certified Ethernet service tools that allow the service provider to distinguish between high and low-priority traffic, and optimize TCP sessions.

ETX-2i provides MEF 10.3 color aware and unaware Policers, delivering high-scale multi-CoS services with hierarchical Quality of Service (HQoS).

It supports advanced scheduling, WRED per CoS, shaping per EVC and per port, with flexible classification rules and access lists.

DHCP Snooping

ETX-2i supports DHCP Snooping with Option 82 for protection of DHCP transactions.

Layer-2 Control Processing

ETX-2i can be configured to forward or discard Layer-2 control frames (including other vendors' L2CP frames).

MEF Services

ETX-2i delivers E-Line (EVL, EVPL), E-LAN (EPLAN, EVPLAN), E-Tree (EP-TREE, EVP-TREE), and E-Access services.

MLDv2 Snooping

With MLDv2 snooping, multicast data is selectively forwarded only to a list of self-learned ports (per multicast group membership), instead of being flooded to all ports in a VLAN.



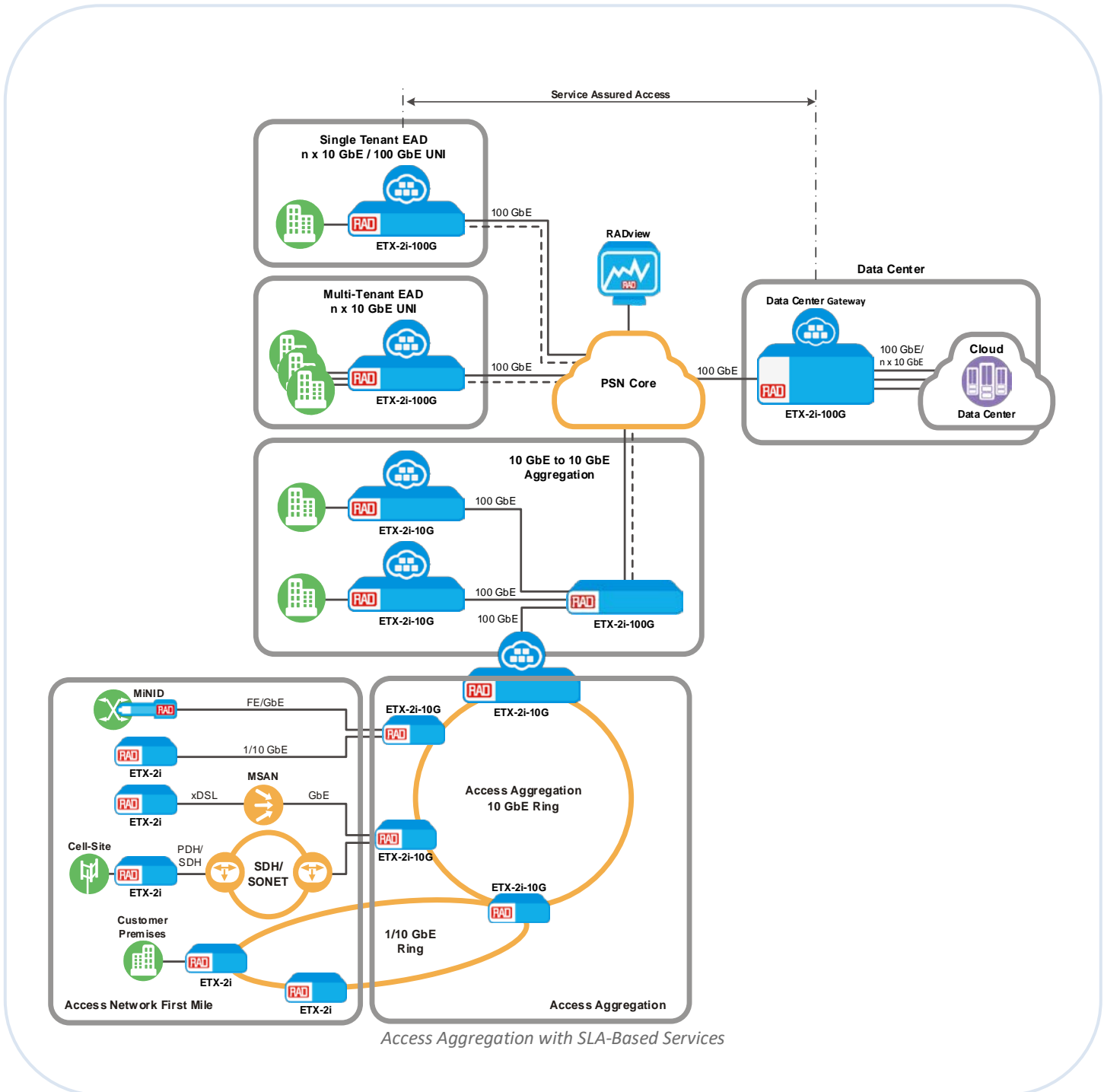
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VCPE

ETX-2i leverages Network Functions Virtualization (NFV), allowing carriers to provide a vCPE solution in various models, including Centralized and Decentralized architectures. This solution reduces CAPEX and OPEX by eliminating the physical appliance required for hosting network functions.

The D-NFV options allow for seamless insertion of Xeon D and Atom (Rangeley) based x86 cards as optional modules. The D-NFV module hosts virtual machines providing virtual network functions (VFs) or value-added service capabilities. This enables service providers to quickly and easily provide new services and implement new network capabilities, with the benefit of function localization at the customer premises.



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ROUTING

ETX-2i models with enabled routing offer Virtual Routing and Forwarding (VRF) instances, allowing service providers to deploy L2 and L3 VPNs. The forwarding engine capability ranges from 1 to 8 Gbps, allowing Carrier Ethernet and IP services to be offered in a single device providing high-capacity performance monitoring, network function virtualization (NFV), and more.

ETHERNET OVER IP/GRE

ETX-2i models with enabled routing offer Ethernet over IP/GRE tunneling, allowing service providers to extend Layer-2 services to out of footprint sites over IP transport.

Integrated management of MiRICi smart SFPs provides TDM (E1/T1/E3/T3/OC-3/STM-1) connectivity over PDH or SDH legacy networks.

Table 1. ETX-2i Interfaces

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
100 GbE	–	–	–	–	–	–	3 (QSFP28)
1/10GbE SFP+ (with 1G/10G multirate support)	–	–	–	–	–	4 (SFP+) 100BaseLx/Sx 110GBaseSR/LR/ER/ZR See Note A and B	10 (SFP+)
FE/GbE SFP (See Note A)	8 SFP/ copper RJ-45 combo	6 SFP/ copper RJ-45 combo	4 (2 additional with GbE module) SFP/ copper RJ-45 combo	4, 6 or 10 SFP/ copper RJ-45 combo Port 1 SFP only	6 SFP (Ports 1 and 2)/copper (Ports 3 to 6) RJ-45	8, 12 or 24 SFP, copper or SFP/copper RJ-45 combo	–
	100BaseFx, 100BaseLx/Sx, 10/10/100BaseT						
Extension slot for network interface module	–	–	+	–	–	–	–
Extension slot for D-NFV module	–	–	+	–	+	–	–
PDH (GFP mapping)	–	–	4/8 E1/T1, 1/2 T3	–	–	–	–
SHDSL	–	–	+	–	–	–	–
VDSL2	–	–	+	–	–	–	–
E1/T1/T3/STM-1/OC-3 via integrated Smart SFP (MiRIC)	+	–	+	+	+	+	–
E1/T1/T3 PWE services via integrated Smart SFP (MiTOP)	+	–	+	+	+	+	–
E1 PWE services via built-in E1 ports	–	64 E1	–	–	–	–	–
Optional timing (2 MHz, 2 Mbps, 1PPS, ToD)	+	–	+	–	–	+	–

Note A: It is strongly recommended to order this device with **original** RAD SFP/SFP+ transceivers. RAD cannot guarantee full compliance to product specifications for units using non-RAD transceivers. For full details on SFP/XFP/SFP+ transceivers, see the SFP/XFP/SFP+ Transceivers data sheet at www.rad.com.

Note B: ETX-2i-10G offers license based activation of the 10G/1G (SFP+) ports. ETX-2i-10G may be ordered with zero, two, or four 10G activated SFP+ ports. The 10G ports may be field-activated by purchasing 10G port activation license. Non activated SFP+ ports are limited to operate at 1Gbps. Activated SFP+ ports allow both 1G and 10G operation.

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ETHERNET OVER PDH

ETX-2i transports Ethernet over PDH (EoPDH) infrastructure via the following NG-PDH technologies:

- Generic Framing Procedure (GFP G.7041)
- GFP or PDH (G.8040)
- PDH Virtual Concatenation (VCAT G.7043)
- Link Capacity Adjustment Scheme (VCAT G.7042).

NG-PDH solutions improve overall network availability by reducing latency and optimizing line utilization and throughput.

TDM PSEUDOWIRE

ETX-2i 64E1 and ETX-2i with smart SFP (MiTOP) provide pseudowire (PWE) services.

The PWs can be encapsulated using CESoPSN per IETF RFC 5086 or SAToP per IETF RFC 4553.

Table 2. ETX-2i Networking Capabilities

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Ethernet E-LAN, E-Tree, and E-Access services	+	+	+	+	+	+	+
Layer-2 forwarding	+	+	+	+	+	+	+
Embedded router supporting VRFs, static routing, BGPv4, OSPFv2, BFD, and VRRP	+(8G)	+(8G)	+(8G)	+(4G)	+(4G)	–	–
NAT	+	+	+	+	+	–	–
DHCP server	+	+	+	+	+	–	+
Ethernet over IP/GRE	+	+	+	+	+	–	–
Flow classification rules	+	+	+	+	+	+	+
ACL classification rules	+	+	+	+	+	+	+
Available bandwidth measurements for Layer-2 services	+	+	+	+	+	+	+
2-rate/3-color policing per EVC.CoS	+	+	+	+	+	+	+
Shaping per EVC and EVC.CoS	+	+	+	+	+	+	+
MultiCoS EVCs per MEF 10.3 policing	+	+	+	+	+	+	+
Strict priority and weighted fair queuing (WFQ) scheduling	+	+	+	+	+	+	+
G.8031 linear protection	+	+	+	+	+	+	+
G.8032v2 ring protection	+	+	+	+	+	+	–
1:1 link protection with 1:1 LAG/LACP	+	+	+	+	+	+	+
1:1 link protection with dual homing	+	+	+	+	+	+	+
LAG with load balancing	+	+	+	+	+	+	+
Jumbo frame support	+	+	+	+	+	+	+

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TIMING AND SYNCHRONIZATION

ETX-2i incorporates RAD's advanced SyncTop synchronization and timing over the packet feature set to support mobile heterogeneous network topology.

The device combines Synchronous Ethernet (SyncE) with IEEE 1588v2 Precision Time Protocol per ITU-T G.8265.1 and G.8275.1 Telecom profiles for cost-effective synchronization of frequency and phase, with ordinary clock (OC), boundary clock (BC), and transparent clock (TC), as well as a dual master operating simultaneously in G.8265.1 and G.8275.1 modes. ETX-2i utilizes the best master clock algorithm (BMCA) to select the best clock from the ports that are provisioned as slave.

MONITORING AND DIAGNOSTICS

Featuring multi-layer OAM and PM tools, ETX-2i performs hardware-based monitoring and diagnostics at high scale and precision. End-to-end connectivity OAM (IEEE 802.1ag), as well as single-segment OAM (IEEE 802.3-2005), ensure flow-level fault management and performance monitoring over Layer-2 networks and also quickly detect connectivity failures for robust protection. Layer-2 and 3 wirespeed loopbacks offer flexible diagnostic tools. RFC-5357 TWAMP Light delivers the same functionality over Layer-3 networks, as well as one-way TWAMP and two-way ICMP Echo, with counters for loss, delay, fragmented packets, reorders, and duplication, in addition to configurable test packet size. Multiple VRF support the robust TWAMP setup.

The Performance Management Portal is an SLA assurance system that is part of the RADview management system, enabling real-time monitoring of service performance.

Digital Diagnostics Monitoring

ETX-2i supports digital diagnostics monitoring (DDM) SFP functions according to SFF-8472, excluding external DDM calibration.

Service Activation Tests

The ETX-2i family offers service activation tools with multiple RFC-2544, Y.1564, and L3 SAT testers.

RESILIENCY

ETX-2i offers fast protection for virtually any kind of failure, in any linear, ring, or dual-homed topology. The device employs IEEE 802.3ad link aggregation (1:1 LAG), ITU-T G.8032v2 Ethernet ring protection, and ITU-T G.8031 Ethernet linear protection, to ensure continuous availability and sub-50ms restoration in the event of network outages.

It also provides MSTP and RSTP (IEEE 802.1Q) to support loop-free Bridge forwarding over a mesh/ring physical topology.

MANAGEMENT AND SECURITY

ETX-2i can be managed via RADview, RAD's carrier-class NMS, or any SNMP-based management system. The device supports a variety of access protocols, including CLI over Telnet, SNMPv3, and TFTP.

Security features include SNMPv3, RADIUS (client authentication), TACACS+ (client authentication, authorization, and accounting), SSH, and SFTP.

Access Control Lists (ACL) can also be used to flexibly filter and mark management traffic, enabling service providers to maintain network security by dropping unwanted packets.

Table 3. ETX-2i Timing and Synchronization

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Synchronous Ethernet (SyncE) on all interfaces	+	+	+	-	-	+	-
SyncE recovery from PDH module to Ethernet ports	+	-	+	-	-	+	-
IEEE-1588v2 precision time protocol (PTP) per G.8265.1 and G.8275.1 Telecom profiles	OC, TC, BC	TC	TC	OC, TC, BC	TC	OC, TC, BC	-
Best Master Clock Algorithm (BMCA)	+	-	+	-	-	+	-

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NETCONF/YANG

The XML-based network configuration protocol NETCONF is supported and provides an easy interface for NFV/SDN orchestrators to install, manipulate, and delete the configuration of ETX-2i.

ARCHITECTURE

D-NFV Module

The ETX-2i and ETX-2i-B D-NFV options are provided with RAD's vCPE-OS software platform on their D-NFV modules.

ETX-2i is a Linux based, carrier-class operating system for vCPE applications, with open management interfaces. vCPE-OS runs on any white box server and can be preloaded in RAD's virtual CPE (vCPE) platforms. It combines powerful networking capabilities with virtualization for hosting SD-WAN and any other value-added virtual network function (VNF) applications from multiple vendors.

For more information on vCPE-OS, please refer to the vCPE-OS datasheet.

Specifications

CAPACITY

Max. Frame Size

12,288 bytes with Ethernet uplinks
 2,048 bytes with SHDSL uplink module
 2,112 bytes with VDSL uplink module
 10,240 bytes with E1/T1/T3 EoPDH uplink module
 12,288 bytes (ETX-2i-100G bridge)

E1/T1 INTERFACES (ETHERNET OVER PDH)

(ETX-2i/M and ETX-2i/19V with EoPDH network module)

Compliance

G.703, G.823

Connectors

Replaceable network module, with four RJ-45 connectors:
 Four E1/T1 ports – One E1/T1 interface per RJ-45
 Eight E1/T1 ports – Two E1/T1 interfaces per RJ-45, with adapter cable

Table 4. ETX-2i General and Management

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Zero-touch provisioning (DHCP, PPPoE)	+	+	+	+	+	+	+
SNMPv1/v2/v3	+	+	+	+	+	+	+
RADIUS and TACACS+ AAA	+	+	+	+	+	+	+
Network time protocol (NTP)	+	+	+	+	+	+	+
NETCONF	+	+	+	+	+	+	+
Power supply redundancy	+	+	+	–	–	+	+
NEBS option	+	–	+	–	–	+	–
Temperature-hardened option	+	–	+	+	–	+	–
MEF CE2.0	+	+	+	+	+	+	+

Data Rate

E1: 2.048 Mbps

T1: 1.544 Mbps

Framing

E1: Framed (G732N with CRC)

T1: Framed (ESF)

Impedance

E1: 120Ω, balanced; 75Ω, unbalanced (via adapter cable)

T1: 100Ω, balanced

Line Coding

E1: HDB3

T1: B8ZS

Number of Ports

Four or eight (EoPDH E1/T1 network module)

E1 INTERFACES (TDM PSEUDOWIRE)

(ETX-2i 64E1: built-in TDM PWE E1/T1 ports)

Compliance

G.703, G.732N, G.732S

Connectors

Electrical, RJ-45

Data Rate

2.048 Mbps

Framing

Framed (G.732N with or without CRC)

Framed with CAS (G.732S with or without CRC)

Unframed

Table 5. ETX-2i Power

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Power Supply (19" enclosure)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: 24/48 VDC (20-60 VDC)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: 48 VDC (40-60 VDC)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: 24/48 VDC (20-60 VDC)	–	–	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: 48 VDC (40-60 VDC)	Hot swappable, redundant PS AC: 100-240 VAC (±10%), 50/60 Hz DC: 48 VDC (40-60 VDC)
Power Supply (8.5" enclosure)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: Dual DC feed of 24/48 VDC (20-60 VDC)	–	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: Dual DC feed of 24/48 VDC (20-60 VDC)	Wide-range AC/DC with auto detection AC: 100-240 VAC, (-10%, +6%), 50/60 Hz DC: 48 VDC (40-60 VDC)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: Dual DC feed of 24/48 VDC (20-60 VDC)	AC: 100-240 VAC (-10%, +6%), 50/60 Hz DC: 48 VDC (40-60 VDC)	
Power Consumption	Non-modular product base (8 GbE): 35W max	AC PS: 74W Max DC PS: 60W Max	Modular base: 30W Modular uplink: 5W max VDSL: 10W max D-NFV: 30W	23W	Modular base: 23W D-NFV: 30W	8.5" enclosure: 90W 19" enclosure: 120W ETX-2i-10G-B 19" enclosure: 95W	Power consumption: 300W

Impedance

120Ω, balanced
75Ω, unbalanced (via adapter cable)

Line Coding

HDB3

Network Encapsulation

MEF 8, UDP/IP

Number of Ports

64

Payload Encapsulation

CESoPSN, SAToP

T3 INTERFACES

Compliance

G.703, G.823

Connectors

Replaceable network module, with one or two pairs of BNC connectors:

One T3 port – One pair
Two T3 ports – Two pairs

Data Rate

44.736 Mbps

Framing

C-bit parity

Impedance

75Ω, unbalanced

Line Coding

B3ZS

Number of Ports

One or two

SHDSL INTERFACES

Provided with SHDSL network module for ETX-2i modular and D-NFV ordering options

Bonding

According to IEEE 802.3ah, ITU-T G.998.2

Compliance

ITU-T G.991.2, G.994.1, ETSI TS 101524

Connectors

Replaceable network module, with one RJ-45 connector for 4-wire ordering option or two RJ-45 connectors for 8-wire ordering option

Impedance

135Ω

Line Coding

16 or 32 TC-PAM

Line Rate

192–5696 kbps (see [Table 6](#))

Number of Ports

Two or four

Number of Wires

Four or eight

Type

SHDSL.bis

Table 6. SHDSL Typical Ranges (26 AWG)

Data Rate (kbps)	4-wire (km)	4-wire (mi)	8-wire (km)	8-wire (mi)
192	8	4.9	8	4.9
512	6.7	4.1	6.7	4.1
1536	6	3.7	6.5	4
2048	5.7	3.5	6.4	3.9
4096	5.1	3.1	5.7	3.5
4608	5	3	5.5	3.4
5696	4.6	2.8	5.1	1
11392	2.9	1.8	4.6	2.8
17088	–	–	3.5	2.1
22784	–	–	2.9	1.8

VDSL2 INTERFACES

Provided with VDSL2 network module for ETX-2i modular and D-NFV ordering options

Operates in CPE mode only

Bonding

According to ITU-T G.998.2 VDSL2 PTM

One bonding group; supports up to four VDSL ports per group
Bonding payload rate up to 400 Mbps DL /200 Mbps UL, with packet forwarding throughput 380 Mbps DL/180 Mbps UL

Compliance

ITU-T G.993.2, G.997.1, G.998.2, IEEE 802.3, ETSI TS 101524

Connectors

Replaceable network module, with two RJ-45 connectors (UTP)

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Impedance

VDSL2 over POTS: 100Ω

VDSL2 over ISDN: 135Ω

Line Coding

DMT

Number of Ports

Four VDSL2 ports (two per connector)

Number of Wires

Eight

Payload Rate

100 Mbps DL/50 Mbps UL per line

Temperature

Operates in non-hardened devices of up to 35°C (90°F). Above this temperature, requires hardened device.

Type

VDSL.bis

Table 7. VDSL Typical Ranges

Profile	BW (MHz)	Number Down-stream Carriers	Carrier BW (kHz)	Max Aggregate Downstream Transmit Power (dBm)	Max Downstream Throughput (Mbit/s)
8a	8.832	2048	4.3125	+17.5	50
8b	8.832	2048	4.3125	+20.5	50
8c	8.5	1972	4.3125	+11.5	50
8d	8.832	2048	4.3125	3.9	50
12a	12	2783	4.3125	3.5	68
12b	12	2783	4.3125	3.4	68
17a	17.664	4096	4.3125	3.4	100

BRIDGE

Compliance

802.1D, 802.1Q, 802.1ad

VLAN Working Mode

VLAN-aware, VLAN-unaware

VLAN Editing

Inner/outer VLAN editing per VLAN and p-bit values

FLAWS

Classification

Per port, outer VLAN or outer + inner VLAN, PCP, TOS/DSCP, Ethertype, IP/MAC source/destination address, or 5-tuple ACL

HIERARCHICAL QUALITY OF SERVICE (HQOS)

Policing

Dual token bucket with user-configurable CIR + CBS and EIR + EBS

Bandwidth policing per MEF 10.3

Scheduling

8 × CoS per EVC scheduling elements

Strict Priority (SP) and Weighted Fair Queue (WFQ)

Shaping

Per port

Per EVC

Per EVC.CoS

ROUTER

(ETX-2i, ETX-2i-B)

Router (if ordered) providing:

- Up to 4 Gbps in ETX-2i-B
- Up to 8 Gbps in ETX-2i
- Bidirectional forwarding detection (IP-BFD single hop) for fast path failure detection

Static routing, or dynamic routing with OSPFv2, BGPv4, VRRPv2, and VRRPv3

MANAGEMENT

Control Port

Interface: V.24/RS-232 DCE

Connector: Mini USB

Format: Asynchronous

Data rate: 9.6, 19.2, or 115.2 kbps

Ethernet Management Port

Type: 10/100/1000BaseT

Connector: RJ-45

Management Options

Password-protected access, authorization levels

Secure CLI via SSH

Telnet, SNMPv3, SFTP

RADIUS or TACACS+ authentication

Plug and play zero touch provisioning

NETCONF/YANG management interface

Routing for Management

IP forwarding, dual-stack IPv4 and IPv6 routing, static routing

TIMING

1588v2

Ordinary clock (OC) (ETX-2i, ETX-2i-10G)
 Boundary clock (BC) (ETX-2i, ETX-2i-10G)
 Dual master operating simultaneously in G.8265.1 and G.8275.1 modes (ETX-2i, ETX-2i-10G)
 Transparent clock (TC)
 Phase and frequency synchronization

PTP Ports (ETX-2i, ETX-2i-10G)

ToD/1PPS (RJ-45)
 External clock (CONN.COAX SMA)
 1PPS (CONN.COAX SMA)

Station Clock (ETX-2i, ETX-2i-10G)

Type: Balanced E1, unbalanced E1 (via adapter cable)
 Connector: RJ-45

Synchronous Ethernet

ITU-T G.8261-G.8264

RESILIENCY

Dual Homing

Dual homed link redundancy

Ethernet Path Protection

G.8031, for linear 1:1 protection

Ethernet Ring

G.8032v2 rings with sub 50 ms protection for Ethernet traffic

Link Aggregation

IEEE 802.1ax (802.3ad) 1:1 LAG with LACP for pairs of network or user Ethernet ports

DIAGNOSTICS

Alarm Relay (optional)

Type: Dry contacts with three “in”
 Connector: Terminal block, 9-pin

Connectivity Fault Management (CFM)

Per IEEE 802.1ag

Table 8. ETX-2i Physical – 19-inch Enclosures

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Height	43.7 mm (1.7 in)	132.7 mm (5.2 in)	43.7 mm (1.7 in)	–	–	43.7 mm (1.7 in)	44 mm (3.46")
Width	440 mm (17.4 in)	440 mm (17.4 in)	440 mm (17.4 in)	–	–	440 mm (17.4 in)	440 mm (17.32")
Depth	240 mm (9.5 in)	240 mm (9.4 in)	2i/M: 300 mm (11.8 in) D-NFV: 350 mm (13.78 in)	–	–	240 mm (9.5 in)	400 mm (15.75")
Weight	3.6 kg (7.9 lb), maximum	7.15 kg (15.87 lb), maximum	Module: 0.91 kg (2.01 lb)			ETX-2i-10G: 3.1 kg (6.83 lb) ETX-2i-10G-B: 2.5 kg (5.51 lb)	7.35 kg (16.2 lb) including two power supplies; 6.58 kg (14.51 lb) with one power supply

Counters

RMON2 port-level counters

Delay and Loss Measurements

Per MEF 36

ICMP Echo

Over L2 and L3 services
Tests IP connectivity (PING)

KPI measurements

Accurate one-way KPI measurements

Link-level OAM

Per IEEE 802.3-2005

Limiting Multicast Traffic Flooding

DHCP and MLDv2 snooping

Loop Prevention

Using MSTP and RSTP

Loopback Tests

Non-disruptive loopback per flow, with MAC/IP address swap
Loopbacks at Ethernet port level
On-demand Layer-2 and 3 loopbacks

LLDP Discovery

Per IEEE 802.1AB

Service Activation Tests

RFC-2544: Eight built-in wirespeed testers
ITU-T Y.1564: Eight built-in wirespeed testers

Service Utilization and Performance Monitoring

Per ITU-T Y.1731.2012, including synthetic loss measurement

TWAMP

TWAMP light generator and responder (SW license)
ITU-T Y.1731 PM (SLM; DM)
RFC 5618 TWAMP responder and receiver
TWAMP sender

GENERAL

Compliance

CE 2.0, MEF 6 (E-Line – EPL and EVPL, E-LAN – EPLAN and EVPLAN), MEF 9, MEF 10, MEF 14, MEF 20, MEF 36, MEF 46, IEEE 802.3, 802.3u, 802.1D, 802.1Q, 802.1p, 802.3ad, 802.3-2005, 802.1ax, 802.1ag, ITU-T Y.1731, G.8031, G.8032v2, G.8262, G.8265, RFC-2544, ITU-T Y.1564

Push Buttons

FD push button for setting unit to default configuration.

Table 9. ETX-2i Physical – 8.5-inch Enclosures

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Height	43.7 mm (1.7 in)	–	43.7 mm (1.7 in)	1U: 43.7 mm (1.7 in) 2U: 88.2 mm (3.5 in)	43.7 mm (1.7 in)	43.7 mm (1.7 in)	43.7 mm (1.7 in)
Width	215.9 mm (8.5 in)	–	215.9 mm (8.5 in)	220 mm (8.7 in)	215.5 mm (8.5 in)	215.5 mm (8.5 in)	215.5 mm (8.5 in)
Depth	300 mm (11.8 in)	–	300 mm (11.8 in)	170 mm (6.7 in)	280 mm (11 in)	301 mm (11.8 in)	301 mm (11.8 in)
Weight			2.16 kg (4.76 lb), maximum M: Module: 0.91 kg (2.01 lb)	1U: 0.7 kg (1.54 lb) 2U: 1.34 kg (2.95 lb)	2.01 kg (4.4 lb) (Module: .091 kg (2.01 lb))	4.25 kg (9.4 lb), maximum	

Ordering

RECOMMENDED CONFIGURATIONS

Note: For temperature-hardened options, use SFPs with maximum operating temperature 85°C (185°F).

ETX-2i:

ETX-2i/AC/19

AC power supply, 19" enclosure, 8 fixed GbE SFP/copper combo ports

ETX-2i/AC/M

AC power supply, 8.5" enclosure, 4 fixed GbE SFP/copper combo ports, modular uplink

ETX-2i/DDC/M/PTP

Dual DC feed power supply, 8.5" enclosure, 4 fixed GbE SFP/copper combo ports, modular uplink, SyncE and 1588v2 timing

ETX-2i/H/AC/19/PTP

AC power supply, 19" enclosure, temperature-hardened, 8 fixed GbE SFP/copper combo ports, SyncE and 1588v2 timing

ETX-2i/H/ACR/19/PTP

Dual AC power supply, 19" enclosure, temperature-hardened, 8 fixed GbE SFP/copper combo ports, SyncE and 1588v2 timing

ETX-2i/HN/AC/19/PTP

AC power supply, 19" enclosure, NEBS compliant, temperature-hardened, 8 fixed GbE SFP/copper combo ports, SyncE and 1588v2 timing

ETX-2i/N/ACHP/19V

AC power supply, 19" enclosure, NEBS compliant, 4 fixed GbE SFP/copper combo ports, modular uplink, D-NFV module slot

ETX-2i/H/AC/M/VDSL8W/POTS

Hardened, AC power supply, modular uplink, four VDSL ports (8-wire) over POTS

ETX-2i/H/AC/M/VDSL8W/ISDN

Hardened, AC power supply, modular uplink, four VDSL ports (8-wire) over ISDN

ETX-2i/DC/19/64E1T1/SYE

19" 3U enclosure, 6 GbE SFP/copper combo ports, 64 E1 ports, DC power supply, SyncE

Note: Any ETX-2i with D-NFV option must be ordered together with a RADcare Package and RADcare Project Assurance Package.

ETX-2i-B:

ETX-2i-B/WR/2SFP/2CMB

Wide-range power supply, 1/2 19" metal enclosure, 2 SFP Ethernet ports, 2 combo ports

ETX-2i-B/WR/2SFP/2CMB/DRC

Wide-range power supply, 1/2 19" metal enclosure, 2 SFP Ethernet ports, 2 combo ports, 2 IN dry contacts

ETX-2i-B/WR/2SFP/4UTP

Wide-range power supply, 1/2 19" metal enclosure, 2 SFP Ethernet ports, 4 Ethernet UTP ports

ETX-2i-B/H/WR/2SFP/8SFP

Wide-range power supply, temperature-hardened, 1/2 19" metal enclosure, 2 SFP network ports, 8 SFP user ports

Note: Although this device option has ten active ports, processing capability is limited to six GbE

Table 10. ETX-2i Environmental

Specifications	ETX-2i Fixed Ports	ETX-2i 64E1	ETX-2i/M & D-NFV	ETX-2i-B	ETX-2i-B D-NFV	ETX-2i-10G	ETX-2i-100G
Storage Temperature	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)	-40 to 85°C (-40 to 185°F)
Operating Temperature (regular)	0 to 50°C (32 to 122°F)	0 to 50°C (32 to 122°F)	0 to 50°C (32 to 122°F)	-5 to 55°C (23 to 131°F)	0 to 50°C (32 to 122°F)	0 to 50°C (32 to 122°F) ETX-2i-10G-B: -5 to 50°C (23 to 122°F)	0 to 50°C (32 to 122°F)
Operating Temperature (temperature-hardened)	-40 to 65°C (-40 to 149°F)		-40 to 65°C (-40 to 149°F)	ETX-2i-B with ten ports (2U): -20 to 65°C (-4 to 149°F); a single SFP-30H is supported at temperature up to 62°C.		-40 to 65°C (-40 to 149°F)	
Humidity	5% to 90%, non-condensing	5% to 90%, non-condensing	5% to 90%, non-condensing	5% to 90%, non-condensing	5% to 90%, non-condensing	5% to 90%, non-condensing	5% to 90%, non-condensing

ETX-2i

IP and Carrier Ethernet Demarcation with D-NFV

ETX-2i-B/AC/V/2SFP/4UTP

AC power supply, 1/2 19" metal enclosure, 2 SFP Ethernet ports, 4 Ethernet UTP ports, D-NFV module slot

ETX-2i-B/DDC/V/2SFP/4UTP

Dual DC feed power supply, 1/2 19" metal enclosure, 2 SFP Ethernet ports, 4 Ethernet UTP ports, D-NFV module slot

ETX-2i-10G:

ETX-2i-10G/AC/4SFPP/4SFP4UTP

AC power supply, 1/2 19" metal enclosure, four SFP+ Ethernet ports, four SFP Ethernet ports, four Ethernet UTP ports

ETX-2i-10G/AC/4SFPP/8SFP/PTP

AC power supply, 1/2 19" metal enclosure, four SFP+ Ethernet ports, eight SFP Ethernet ports, SyncE and 1588v2 timing

ETX-2i-10G/H/ACR/4SFPP/12SFP12UTP/PTP

Dual AC power supply, 19" enclosure, temperature-hardened, four SFP+ Ethernet ports, 12 SFP Ethernet ports, 12 Ethernet UTP ports, SyncE and 1588v2 timing

ETX-2i-10G/H/DCR/4SFPP/12SFP12UTP/PTP

Dual DC power supply, 19" enclosure, temperature-hardened, 4 SFP+ Ethernet ports, 12 SFP Ethernet ports, 12 Ethernet UTP ports, SyncE and 1588v2 timing

ETX-2i-10G/DCR/4SFPP/24SFP/PTP

Dual DC power supply, 19" enclosure, four SFP+ Ethernet ports, 24 SFP Ethernet ports, SyncE and 1588v2 timing

ETX-2i-10G/ACR/4SFPP/24SFP

Dual AC power supply, 19" enclosure, four SFP+ Ethernet ports, 24 SFP Ethernet ports

ETX-2i-10G/AC/4SFPP/8SFP

AC power supply, 1/2 19" metal enclosure, four SFP+ Ethernet ports, eight SFP Ethernet ports

ETX-2i-10G/H/DCR/4SFPP/12CMB/PTP

Dual DC power supply, 19" enclosure, temperature-hardened, four SFP+ Ethernet ports, 12 GbE combo ports, SyncE and 1588v2 timing

ETX-2i-10G/DDC/4SFPP/4SFP4UTP/PTP

Dual DC feed power supply, 1/2 19" metal enclosure, four SFP+ Ethernet ports, four SFP Ethernet ports, four Ethernet UTP ports, SyncE and 1588v2 timing

ETX-2i-10G/H/DCR/4SFPP/12CMB

Dual DC power supply, 19" enclosure, temperature-hardened, four SFP+ Ethernet ports, 12 GbE combo ports

ETX-2i-10G-B:

ETX-2i-10G-B/ACDC/4SFPP/4S/4U/PTP

Integrated dual AC and DC power supplies, four SFP+ Ethernet ports, four empty SFP slots, four Ethernet UTP ports, SyncE and 1588v2 timing

ETX-2i-100G

ETX-2i-100G/ACR/3QSFP/10SFPP

Redundant AC and/or DC power supply, 1U 19" metal enclosure, 3 QSFP28 Ethernet ports, 10 SFP+ Ethernet ports

SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

SUPPLIED ACCESSORIES

AC power cord (when AC power supply is ordered)

DC connection kit (when DC power supply is ordered)

OPTIONAL ACCESSORIES

AC/DC adaptor

CBL-MUSB-DB9F

Mini-USB cable to connect device to a serial port

ETX-2i-PS/?/!

?

NEBS

NULL International

N NEBS3

!

Power supply

AC Single AC power supply

DCHP High power DC power supply for D-NFV and non D-NFV

ACHP High power AC power supply for D-NFV

SFP-GPON-1DH

GPON optical network terminal SFP

ETX-2i-100G-PS/AC

Single AC power supply

ETX-2i-100G-PS/DC

Single DC power supply

ETX-2i-PS/DC/64

ETX-2i-64E1 DC power supply

ETX-2i-PS/AC/64

ETX-2i-64E1 AC power supply

NETWORK INTERFACE MODULES FOR MODULAR OPTIONS (FOR ETX-2i)

ETX-M/2ETH

Ethernet uplink module with two combo ports

ETX-M/SH4W

EFM bonded uplink module with two SHDSL ports (4-wire)

ETX-M/SH8W

EFM bonded uplink module with four SHDSL ports (8-wire)

ETX-M/VDSL8W/POTS

EFM bonded uplink module with four VDSL ports (8-wire) over POTS

ETX-2i

IP and Carrier Ethernet Demarcation with D-NFV

ETX-M/VDSL8W/ISDN

EFM bonded uplink module with four VDSL ports (8-wire) over ISDN

ETX-M/4E1T1

Ethernet uplink module with four E1/T1 ports

ETX-M/8E1T1

Ethernet uplink module with eight E1/T1 ports

ETX-M/1T3

Ethernet uplink module with one T3 port

ETX-M/2T3

Ethernet uplink module with two T3 ports

D-NFV ORDERING OPTION MODULES (FOR ETX-2i)

ETX-DNFV-M/X4C/128S/16R

D-NFV module based on Xeon D with 4 Cores, SSD 128 GB, 16 GB RAM

ETX-DNFV-M/X8C/256S/24R

D-NFV module based on Xeon D with 8 Cores, SSD 256 GB, 24 GB RAM

D-NFV ORDERING OPTION MODULES (FOR ETX-2i-B)

ETX-DNFV-M/R4C/128S/8R

D-NFV module based on Intel® Atom Rangeley C2558 4-core processor and 128 GB SSD, 8 GB RAM

ETX-DNFV-M/R4C/128S/8R/ACC

D-NFV module based on Intel® Atom Rangeley C2558 4-core processor and 128 GB SSD, 8 GB RAM, DPDK acceleration

ETX-DNFV-M/R8C/128S/8R

D-NFV module based on Intel® Atom Rangeley C2758 8-core processor and 128 GB SSD, 8 GB RAM

ETX-DNFV-M/R8C/128S/8R/ACC

D-NFV module based on Intel® Atom Rangeley C2758 8-core processor and 128 GB SSD, 8 GB RAM, DPDK acceleration

ETX-DNFV-M/R8C/128S/16R

D-NFV module based on Intel® Atom Rangeley C2758 8-core processor and 128 GB SSD, 16 GB RAM

ETX-DNFV-M/R8C/128S/16R/ACC

D-NFV module based on Intel® Atom Rangeley C2758 8-core processor and 128 GB SSD, 16 GB RAM, DPDK acceleration

ETX-DNFV-M/BLNK

D-NFV module, Blank

MOUNTING KITS

Product	19" Rack	Wall
ETX-2i (8.5")	RM-35/P1 – one unit RM-35/P2 – two units	WM-35
ETX-2i (19")	RM-34 (supplied) – one unit	WM-34
ETX-2i-64E1 (19" 3U)	RM-52 (supplied) – one unit without cable management CM-52 – one unit with cable management	-
ETX-2i-DNFV (19")	RM-34 (supplied) – one unit	-
ETX-2i-B (8.5")	RM-35/P1 – one unit RM-35/P2 – two units	WM-35-TYPE4
ETX-2i-B 2U (8.5" 2U)	RM-54/A – one unit RM-54/A2 – two units	-
ETX-2i-B-DNFV (8.5")	RM-35/P1 – one unit RM-35/P2 – two units	WM-35
ETX-2i-10G (8.5")	RM-35/P1 – one unit RM-35/P2 – two units	WM-35
ETX-2i-10G (19")	RM-34 (supplied) – one unit	WM-34
ETX-2i-10G-B (8.5")	RM-35/P1 – one unit RM-35/P2 – two units	WM-35
ETX-2i-10G-B (19")	RM-34 (supplied) – one unit	WM-34
ETX-2i-100G (19")	RM-50 (supplied) RM-53 (optional) – 100mm deep installation	-

SOFTWARE LICENSES

ETX-2i-SW TWAMP

License to activate and operate TWAMP related functionalities in ETX-2i.

ETX-2i-10G-LIC/2X10G

SFP+ two-port 10G speed license for ETX-2i-10G

ETX-2i-10G-LIC/4X10G

SFP+ four-port 10G speed license for ETX-2i-10G

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