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Data Sheet

MiTOP-E1/T1

SFP-Format TDM Pseudowire Gateway

- TDM circuit emulation over a packet-switched network (PSN) with CESoPSN (RFC 5086) and SAToP (RFC 4553) payload encapsulation
- ASIC-based architecture for minimizing processing delay
- Advanced clock distribution mechanism, including synchronous Ethernet (Sync-E
- Configurable jitter buffer
- Comprehensive OAM and performance monitoring

MiTOP-E1/T1 is a TDM pseudowire (PW) access gateway extending TDM-based services over packet-switched networks.

Housed in a Small Form-Factor Pluggable (SFP) enclosure, it is designed for quick and simple insertion into any 100/1000BaseFx Ethernet port with an MSA-compatible socket.

MiTOP-E1/T1 is a simple and cost-effective alternative to external, standalone gateways or conversion cards for each user device, saving on space, power consumption, cabling, and simplifying management.

TDM PSEUDOWIRE SPACE BEFORE = 12

The TDM port connects to any standard E1 or T1 device. E1 and T1 interfaces feature:

- G.703, G.704, framed and unframed modes
- SF and ESF framing (T1).

MiTOP-E1/T1 is transparent to all signaling protocols.

Pseudowire Performance

High-performance ASIC-based buffering and forwarding techniques minimize end-to-end processing delay.

The gateway provides a legacy over PSN solution for transmitting E1/T1 streams over packet switched networks. The device converts the data stream from its user E1/T1 ports into packets for transmission over the network. The addressing scheme of these packets is UDP/IP, MPLS or MEF. These packets are transmitted via a 100/1000BaseFx port of the host device to the PSN. A remote pseudowire gateway converts the packets back to TDM traffic.

Configurable packet size balances between PSN throughput and delay.

Large configurable jitter buffer per each PW connection compensates for the delay variation introduced by the PSN.

The gateway supports the following encapsulation methods:

- Payload – CESoPSN and SAToP
- Network – MPLS, MEF, UDP/IP.

Pseudowire QoS/CoS

For Ethernet networks – the outgoing pseudowire packets are assigned a dedicated VLAN ID according to 802.1Q and marked for priority using 802.1p bits. For IP networks – the outgoing pseudowire packets are marked for priority using ToS (including the DSCP and Diffserv bits).

For MPLS networks – the outgoing pseudowire packets are assigned to a specific MPLS tunnel and marked for priority using EXP bits.

OAM and Performance Monitoring

RAD's TDM PW OAM mechanism verifies connectivity and prevents pseudowire configuration mismatch.

The following RFC-2495 E1/T1 physical layer performance statistics are available: BES, ES, SES and UAS.

RESILIENCY

E1 or T1 loss of signal is propagated by sending an electrical LOS signal to the 100/1000BaseFx port, and is visually indicated by the LOS LED (red) turning on. This in turn can automatically turn off the LAN link. Turning on/off the packet link is user-configurable (enabled or disabled).

TIMING AND SYNCHRONIZATION

Synchronization between TDM devices is maintained by deploying advanced clock distribution mechanisms. The clocking options are:

- Internal – the master clock source for the TDM circuit is the internal oscillator
- Loopback – the transmit clock for the TDM circuit is derived from the E1/T1 port receive clock
- Adaptive – the clock from the TDM circuit is recovered from the PSN. Clock recovery conforms to G.823 using G.8261/G.8262-defined scenarios.
- Sync-E (Gigabit Ethernet only) – Synchronous Ethernet timing is received via PSN and used to create a

locked TDM clock. This ensures both sides of the network work with the same clock source.

- External – E1/T1 Tx clock is locked to an external clock source, such as DSL NTR timing.

Jitter and wander of the recovered clock are maintained at levels that conform to G.823/G.824 traffic. For adaptive clock recovery, the recovered clock performance depends on the packet network characteristics.

MANAGEMENT AND SECURITY

The units can be managed using different ports and applications:

- Out-of-band via I2C channel via the SFP edge connector
- Inband via the Ethernet port, using a Web browser.

To facilitate integration of a new device into an IP network, if no IP address has been manually configured, MiTOP-E1/T1 automatically requests one from the DHCP server upon booting.

Management traffic can run over a dedicated VLAN.

Application software can be downloaded to MiTOP-E1/T1 via:

- SFP-CA unit, using YMODEM protocol
- Central server, using TFTP.

ARCHITECTURE

Housed in a Small Form Factor Pluggable (SFP) package, MiTOP-E1/T1 complies with the Multi-Source Agreement.

Running on power derived from the host device, it requires no additional power supply.

MiTOP-E1/T1 is hot-swappable and features a special release mechanism for easy extraction from the SFP socket.

OPERATION AND MAINTENANCE

An optional configuration adapter (SFP-CA) is available for connecting MiTOP-E1/T1 to a PC via a USB 2.0 port. The configuration adapter is used for preliminary configuration or software download.

MONITORING AND DIAGNOSTICS

External and internal loopbacks can be used to check TDM link connectivity.

Alarms detected during operation are stored in a buffer holding up to 100 events.

TDM alarms of a connected device are forwarded to the peer side using the control word of the PW packet. Alarm Indication Signals (AIS) are sent to the connected TDM device if no PW packets are received or an L-bit Active packet is received.

Applications

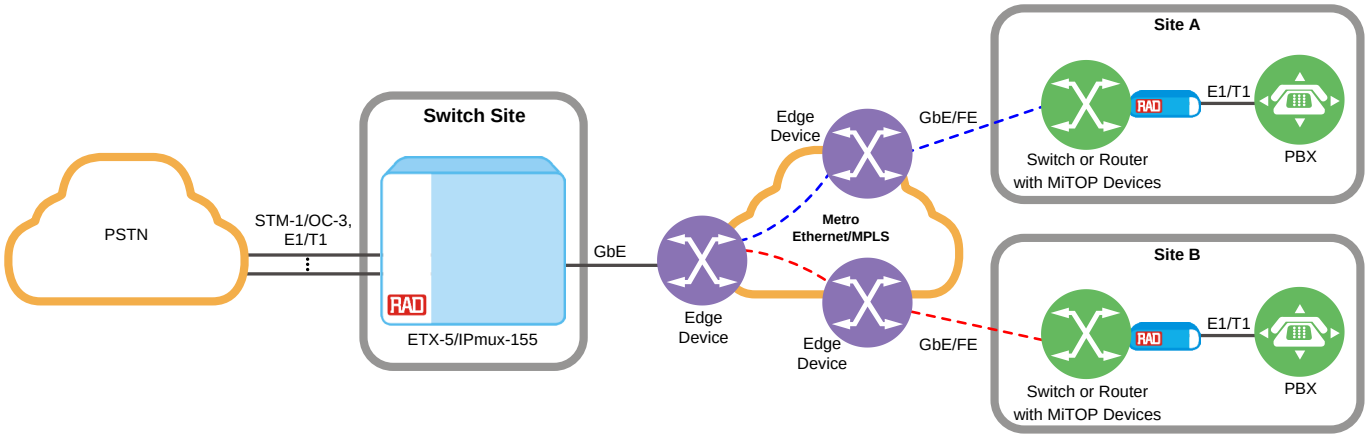

Figure 2. Aggregating TDM Services over PSN

Specifications

E1 INTERFACE

Number of Ports
1

Compliance
G.703, G.704, G.823, G.775

Data Rate
2.048 Mbps

Line Code
HDB3, AMI

Jitter and Wander Performance
Per ITU-T G.823

Framing
Framed, unframed

Line Impedance
120Ω, balanced

Cable Type
UTP CAT-5

Cable Length
Up to 2500m (8202 ft) max, over 22 AWG wire

Connector
RJ-45

T1 INTERFACE SPACE BEFORE = 12

Number of Ports
1

Compliance
G.824, T1.403, G.703, G.823, T1-231, AT&T TR-62411, G.775

Data Rate
1.544 Mbps

Line Code
B8ZS, AMI

Jitter and Wander Performance
Per AT&T TR-62411, ITU-T G.823, ITU-T G.824

Framing
Framed (ESF, D4), unframed

Line Impedance
100Ω, balanced

Cable Type
UTP CAT-5

Cable Length
Up to 1829m (6000 ft) max, over 22 AWG wire

Connector
RJ-45

ETHERNET INTERFACE SPACE BEFORE = 12

Type
100/1000BaseFx

Compliance
IEEE 802.3

Edge Connector
SFP-based, MSA-compliant

PSEUDOWIRE CONNECTIONS SPACE BEFORE = 12

Standard Compliance
CESoPSN: IETF RFC 5086

SAToP: IETF RFC 4553

MEF: MEF 8

Number of PW Connections
1

Jitter Buffer Depth
E1: up to 256 ms

Unframed T1: up to 340 ms

Framed T1: up to 256 ms

GENERAL

Indicators
LINK (green) – Ethernet link status

LOS (red) – E1/T1 signal status

Physical
Height: 12.4 mm (0.49 in)
Width: 14.0 mm (0.55 in)
Depth: 74.1 mm (2.91 in)
Weight: 30.0 g (1.0 oz)

Power Supply
3.3V, up to 330 mA (Fast Ethernet)

3.3V, up to 410 mA (Gigabit Ethernet)

Power Consumption
1.1W (Fast Ethernet)

1.35W (Gigabit Ethernet)

Environment
Temperature:

MiTOP-E1/T1/FE:
Ambient: -40 to 65°C (-40 to 149°F)
Case: -40 to 80°C (-40 to 176°F)

MiTOP-E1/T1/GE:
Ambient: -40 to 60°C (-40 to 140°F)
Case: -40 to 75°C (-40 to 167°F)

Humidity: Up to 90%, non–condensing

Figure 3. Delivering E1/T1 Services over PSN

MiTOP-E1/T1

SFP-Format TDM Pseudowire Gateway

Ordering

RECOMMENDED CONFIGURATIONS

MiTOP-E1/T1/ FE
SFP-format TDM pseudowire gateway,
Fast Ethernet SFP port interface

MiTOP-E1/T1/ GE
SFP-format TDM pseudowire gateway,
10/100/1000BaseT Ethernet user port

SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options

OPTIONAL ACCESSORIES

SFP-CA.2
Configuration adapter for connecting MiTOP-E1/T1 to a PC

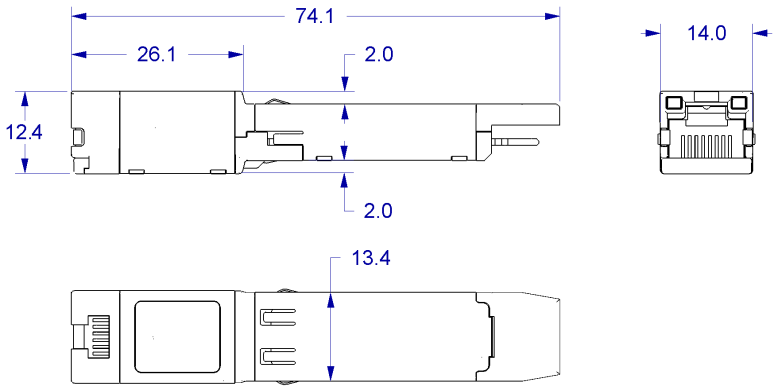

Figure 4. Physical Dimensions

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