MiTOP-E3/T3
SFP-Format TDM Pseudowire Gateway

- Miniature TDM pseudowire access gateway employing SAToP (RFC 4553) payload encapsulation
- SFP enclosure
- ASIC-based architecture for minimizing processing delay
- Advanced clock distribution mechanism, and configurable jitter buffer
- Comprehensive OAM and performance monitoring

E3/T3 circuit emulation over packet-switched networks

TDMoIP Driven®

MiTOP-E3/T3 is a TDM pseudowire (PW) access gateway extending E3/T3 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-E3/T3 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.

PSEUDOWIRE PERFORMANCE

The gateway provides a legacy over PSN solution for transmitting E3/T3 streams over packet switched networks. The device converts the data stream from its user E3/T3 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 E3/T3 traffic.

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

Configurable packet size balances between PSN throughput and delay.

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

The gateway employs SAToP payload encapsulation. On the network side, the unit uses MPLS, MEF and UDP/IP encapsulation techniques.

SFP ENCLOSURE

Housed in a Small Form Factor Pluggable (SFP) package, MiTOP-E3/T3 complies with the Multi-Source Agreement.

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

MiTOP-E3/T3 is hot-swappable and features a special release mechanism for easy extraction from the SFP socket.

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.

RAD
data communications
The Access Company

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.

TIMING

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 is derived from the E3/T3 port's receive clock
- Adaptive – the clock is recovered from the PSN.

  Advanced clock recovery conforms to G.823 using G.8261-defined scenarios.

  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.

TDM INTERFACE

The TDM port connects to any standard E3 or T3 device.

E3 and T3 interfaces feature:

- HDB3 (E3) and B3ZS, AMI (T3) line codes
- M23, C-bit framing (T3).

MiTOP-E3/T3 is transparent to all signaling protocols.

FAULT PROPAGATION

Loss of E3 or T3 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).

MANAGEMENT

The units can be managed using different ports and applications:

- Out-of-band via the I2C channel (of 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-E3/T3 automatically requests one from the DHCP server upon booting.

Management traffic can run over a dedicated VLAN.

Application software can be downloaded to MiTOP-E3/T3 via:

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

OAM AND PERFORMANCE MONITORING

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

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.

TEMPERATURE-HARDENED SFP

A temperature-hardened version of the gateway with Fast Ethernet interface is intended for industrial installations.

CONFIGURATION ADAPTER

An optional configuration adapter is available for connecting MiTOP-E3/T3 to a PC via a USB 2.0 port.

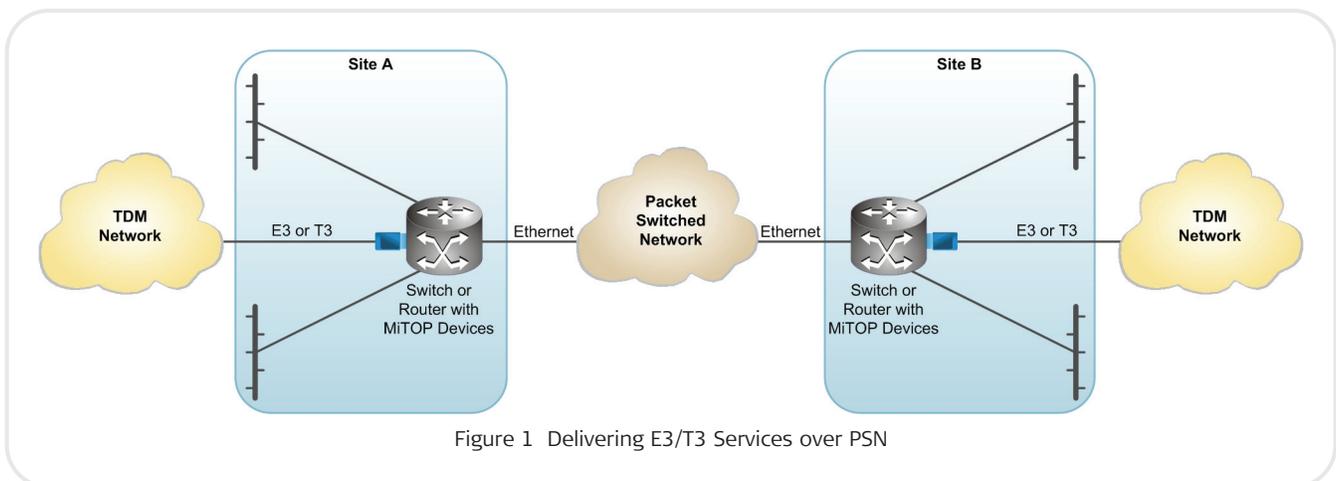The configuration adapter is used for preliminary configuration or software download.

Figure 1 Delivering E3/T3 Services over PSN

Specifications

E3 INTERFACE

Number of Ports
1

Compliance
ITU-T Rec. G.703, G.751, G. 775, G.823, G.832

Data Rate
34,368 Mbps

Line Code
HDB3

Framing
Framed (G.832, G.751), unframed

Line Impedance
75Ω, unbalanced

Transmit Clock
Receive, internal, adaptive

Jitter and Wander Performance
Per ITU-T G.823

Cable Length
Up to 275m (900 ft)

Connector
DIN 1.0/2.3

T3 INTERFACE

Number of Ports
1

Compliance
GR-499-CORE, T1.107, T1.404, G.703, G.704, G.775, G.824

Framing
C-bit, M23, unframed

Data Rate
44.736 Mbps

Line Code
B3ZS, AMI

Line Impedance
75Ω, unbalanced

Transmit Clock
Receive, internal, adaptive

Jitter and Wander Performance
Per ITU-T G.823, G.824

Cable Length
Up to 275m (900 ft)

Connector
DIN 1.0/2.3

ETHERNET INTERFACE

Type
100/1000BaseFx

Compliance
IEEE 802.3

Edge Connector
SFP-based, MSA-compliant

PSEUDOWIRE CONNECTIONS

Standard Compliance
SAToP: IETF RFC 4553

MEF: MEF 8

Number of PW Connections
1

Jitter Buffer Depth
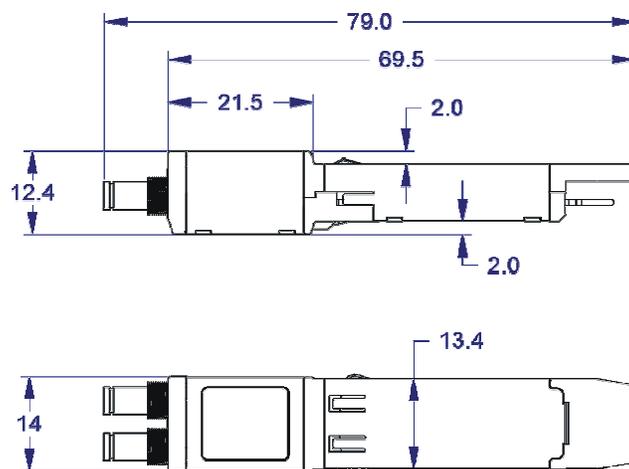Up to 60 ms (E3) or 45 ms (T3)

Figure 2 Physical Dimensions

MiTOP-E3/T3

SFP-Format TDM Pseudowire Gateway

GENERAL

Indicators
LINK (green) – Ethernet link status and activity

LOS (red) – E3/T3 signal status

Physical
Height: 12.4 mm (0.48 in)
Width: 14.0 mm (0.55 in)
Depth: 79 mm (3.1 in)
Weight: 30.0g (1.0 oz)

Power Supply
3.3V, up to 400 mA (Fast Ethernet)

3.3V, up to 470 mA (Gigabit Ethernet)

Power Consumption
1.3W (Fast Ethernet)

1.55W (Gigabit Ethernet)

Environment
Temperature:
MiTOP-E3/T3/FE:
Ambient: -40 to 55°C (-40 to 131°F)
Case: -40 to 70°C (-40 to 158°F)

MiTOP-E3/T3/GE:
Ambient: -40 to 60°C (-40 to 140°F)
Case: -40 to 75°C (-40 to 167°F)

MiTOP-E3/T3/FE/H:
Ambient: -40 to 65°C (-40 to 149°F)
Case: -40 to 80°C (-40 to 176°F)
Humidity: Up to 90%, non–condensing

Ordering

MITOP-E3T3/+/?

Legend
+ PSN interface:
   FE   Fast Ethernet
   GE   Gigabit Ethernet

? Enclosure (Default=regular enclosure):
   H   Temperature-hardened enclosure
         (MiTOP-E3/T3/FE units only)

SUPPLIED ACCESSORIES

CBL-1023-BNC
Two 30 cm (11.8 in) DIN 1.0/2.3 to BNC cable adapters

OPTIONAL ACCESSORIES

SFP-CA
Configuration adapter for connecting MiTOP-E3/T3 to a PC

Table 1. MiTOP Family Product Comparison

Features	MiTOP-E1/T1 (Ver. 2.0)	MiTOP-E3/T3 (Ver. 2.0)
TDM interface	E1/T1	E3/T3
Ethernet port	100/1000BaseFx	100/1000BaseFx
Number of PWs	1	1
Payload encapsulation	CESoPSN, SAToP	SAToP
Jitter buffer size (msec)	Up to 256 (E1, framed T1) Up to 340 (unframed T1)	Up to 60 (E3) Up to 45 (T3)

Figure 3. SFP-CA Module

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