



# IPmux-2L, IPmux-4L, IPmux-16L

## TDM Pseudowire Access Gateways

- Delivers Ethernet and TDM-based services over fiber and packet switched networks (PSNs)
- Up to 16 E1 user ports
- Optional serial data port (IPmux-2L)
- Single SFP and two UTP/SFP; Fast/Gigabit Ethernet ports
- Multi-standard TDM pseudowire ASIC: TDMoIP, CESoPSN, SAToP
- QoS support with four priority queues
- Pseudowire OAM
- Per ITU-T G.823 jitter and wander performance

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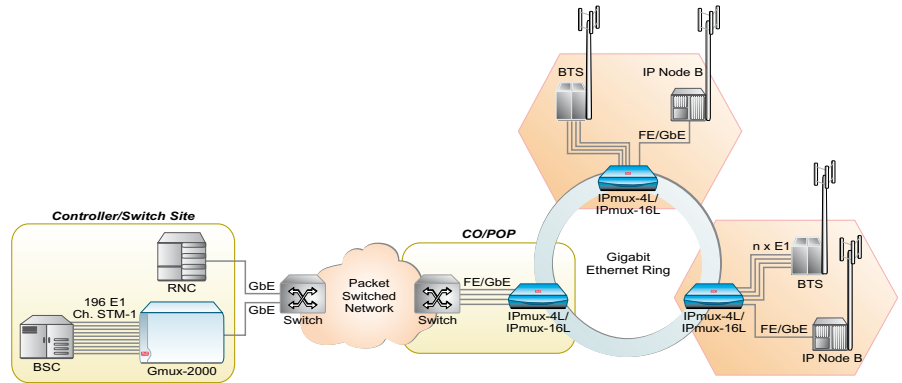
The IPmux-2L, IPmux-4L and IPmux-16L are cost-competitive TDM pseudowire access gateways, converging framed or unframed E1 streams along with user LAN traffic over dark fiber, IP, MPLS or Ethernet networks. The IPmux-2L also supports serial data delivery over PSN for X.21, V.35, V.36/RS-449, RS-530/RS-422, and V.24/RS-232 traffic. The devices offer an ideal solution for economical PSTN access and TDM trunking over wired and radio packet access. Their extensive TDM pseudowire support enables enterprises and utility companies to take advantage of new packet switched networks for legacy services transport, without replacing their existing equipment or affecting service quality.

### Advanced pseudowire functionality

Incorporating RAD's new generation of ASIC processors, the IPmux-xL CPEs deliver enhanced pseudowire performance with minimal processing delay, including support for all standard TDM circuit emulation modes: TDMoIP, CESoPSN, and SAToP. Featuring a 63-circuit pseudowire capacity (IPmux-2L) or 64-circuit pseudowire capacity (IPmux-4L), the devices support individually configured pseudowire connections in timeslot granularity, thereby supporting multiple PW types simultaneously. By grooming E1 bundles in timeslot granularity, the IPmux-xL also facilitates an efficient use of the TDM ports. Configurable packet size balances PSN throughput and delay, while a jitter buffer compensates for packet delay variation (jitter) of up to 200 msec in the network.

### Pseudowire timing

The IPmux-xL devices support various clocking options to ensure synchronization as any standard TDM device. These include loopback timing,



Corporate multiservice communications over a PSN

external clock source or internal, using the devices' internal oscillator.

The devices can also recover the original clock with great accuracy, using per-port adaptive clock recovery. They comply with G.823 traffic interface mask and provide frequency accuracy of up to 100 ppb (parts per billion).

### Ethernet capabilities

The IPmux-4L and IPmux-16L feature one or two GbE network ports, four FE user ports and one GbE user port. All ports support both copper and fiber interfaces with auto-negotiation.

The devices' internal Ethernet bridge supports both VLAN-aware and VLAN-unaware modes, as well as port-based rate-limiting, VLAN membership, VLAN tagging and stacking (Q-in-Q), and filtering. Standard IP features supported by the IPmux-4L and IPmux-16L include ICMP (ping), ARP, next hop, and default gateway.

The IPmux-4L and IPmux-16L employ ITU-T G.8032 Ethernet Ring Protection Switching (ERPS) to mitigate against link and node failures and ensure sub-50 ms restoration. Failures in the ring are detected using Ethernet OAM (ITU-T Y.1731) continuity check (CC) messages between adjacent nodes.

The IPmux-2L includes an Ethernet switch featuring three Ethernet ports, whereby one

port serves as the network interface and the other two are used for user traffic.

Supported Ethernet attributes include port-based VLAN membership and VLAN tagging, as well as VLAN stacking (Q-in-Q). In addition, the devices support port-based rate limitation, enabling the total transmitted bandwidth to be adapted to the limitations of the transport media. Ethernet QoS features include four priority queues, scheduled by Strict Priority or weighted fair queue (WFQ). Traffic is classified according to IP Precedence, 802.1p, DSCP, or port default priority

### EMS management

The IPmux-xL series features flexible management capabilities, including local management via an ASCII terminal (RS-232). In addition, remote management can be performed either inband or out-of-band, using the network or user ports, while maintaining separation between management and user traffic via the use of VLANs. Advanced FCAPS (Fault, Configuration, Administration, Performance, Security) and diagnostic tools are provided by RADview-EMS, RAD's carrier-class element management system, via an SNMP-based GUI.

The devices also support a variety of access protocols, including Telnet, SNMP, Web server, and TFTP.

	IPmux-2L	IPmux-4L	IPmux-16L
<b>User Ports:</b>			
E1	1 or 2	4	16
Ethernet (SFP/UTP)	1 or 2 FE	4 FE, 2 GbE	4 FE, 2 GbE
Optional n x 64 Serial Data	1	-	-
<b>Network Ports:</b>			
Ethernet (SFP/UTP)	1 FE	1 or 2 GbE	1 or 2 GbE

