

Gmux-2000

Hub-Site Pseudowire and Voice Trunking Gateway



Scalable, carrier-class,
multiservice
pseudowire gateway
converging TDM voice,
video and data
services over PSNs

TDM
Driven®

- High capacity modular pseudowire gateway, transporting TDM traffic over packet-switched networks in a 6U, 19" enclosure
- Built on pseudowire technology, implementing the IETF, MFA Forum and ITU-T standards for Pseudowire Emulation Edge-to-Edge (PWE3)
- Transports two fully populated STM-1 or OC-3 streams via dual-port modules, up to seven channelized T3 links, or up to 196 E1 or T1 streams received via seven 28-port external E1/T1 interface modules
- Central site solution for Vmux voice trunking gateways, compressing up to 112 E1/T1 streams over E1, T1, STM-1, OC-3 or Gigabit Ethernet
- Full redundancy of the GbE and STM-1/OC-3 links and modules, clocks, control and power supply modules; N+1 redundancy for voice compression and E1/T1 server modules

RAD

data communications
The Access Company

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Gmux-2000 is a modular pseudowire gateway that extends the TDM traffic (originating from legacy circuit-switched networks) over packet-switched networks (PSNs). This is achieved by converting TDM data streams coming from the TDM ports into packets transported over the PSN. Gmux-2000 features the following ports:

- TDM ports: Two channelized SDH/SONET ports at the STM-1/OC-3 level (155.52 Mbps), or up to seven channelized T3 links, or up to 196 external PDH ports at the E1/T1 level
- PSN port: GbE interface via SFP modules.

Gmux-2000 capacity is 126 E1 streams (two channelized STM-1 streams) for the SDH version, and 168 T1 streams (two channelized OC-3 streams) for the SONET version. The E1 streams are transparently transported using a circuit emulation method, while supporting all the signaling protocols and payload types. Advanced packet handling capabilities, VLAN and ToS support ensure the highest quality of service (QoS) that modern packet-switched networks can provide.

When equipped with VC-E1/16 or VC-T1/16 modules, Gmux-2000 delivers compressed voice traffic over STM-1/OC-3 and E1/T1 links.

Packets sent over MPLS networks use smaller overhead in comparison to the IP encapsulation. This makes communication over MPLS ideal for networks with bandwidth constraints.

In addition to the TDMoIP connection mode, Gmux-2000 provides CESoPSN, SAToP and HDLCoPSN (HDLCoMPLS and HDLCoIP) transmission. Any HDLC-based application such as Frame Relay or PPP is supported in port mode.

Gmux-2000 is designed as a central site solution for RAD's TDMoIP products, operating opposite all members of the IPmux product line, Vmux-2100 and Megaplex ML-IP.

CHASSIS

The chassis of Gmux 2000 can accommodate up to seven I/O modules, two Gigabit Ethernet trunk modules, two control/clock modules, three power supply modules (AC or DC), one power inlet module (AC or DC) and a fan unit. The modules are hot swappable.

Gmux-2000 comes in a 6U-high chassis, mountable in a 19-inch ETSI or ANSI rack.

PSN INTERFACE MODULE

The Gigabit Ethernet module serves for packet network connection to the PSN. The module is equipped with a pair of redundant replaceable SFP-based fiber optic or electrical GbE interfaces.

The GbE interface operation complies with the IEEE 802.3, 802.1Q and 802.1p requirements.

Operating as a level-3/4 switch, the GbE module routes the packets coming from the packet network to the I/O modules and the system modules connected to the packet bus.

The routing is performed at wire speed, minimizing delays on the packet bus.

The GbE module supports link aggregation as per 802.3ad. This enables the operator to use two Ethernet links as a single virtual interface allowing load sharing and providing link resilience.

When redundancy is enabled at the module level (dual homing), the two ports of one module are active at any time, while the ports of the other module serve as backup.

SDH/SONET INTERFACE MODULE

Gmux-2000 uses STM1/OC3 modules for the SDH/SONET connection. Each STM-1/OC-3 module has two ports that can be ordered with electrical (75Ω coax), or optical interfaces with various characteristics (850 nm or 1310 nm with laser and LED transmitters). The module complies with the applicable requirements of ITU-T Rec. G.957, G.958, I.432 and G.703.

The STM-1/OC-3 module operates as a terminal multiplexer and is usually connected to an STM-1/OC 3 add/drop multiplexer port for access to the SDH/SONET backbone.

The STM-1/OC-3 module provides 1+1 APS line redundancy to ensure rapid restoration of service in case of line failure. Two STM-1/OC-3 modules operate in APS mode for hardware redundancy.

PW CIRCUIT EMULATION MODULES

Gmux-2000 uses the following PW Circuit Emulation (CE) modules, in accordance with the required external TDM interface:

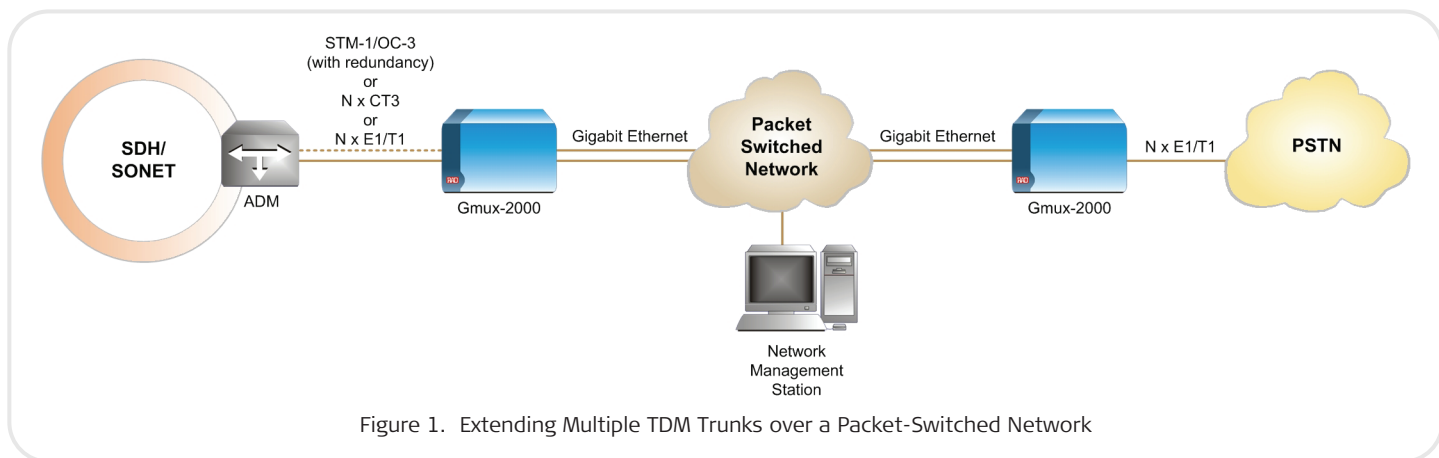


Figure 1. Extending Multiple TDM Trunks over a Packet-Switched Network

- When external E1/T1 interfaces are required, 28-port external E1/T1 modules are used
- Channelized T3 interface is provided by CT3-PW/1 modules with a single CT3 port served by 28 internal T1 channels
- For SDH/SONET connection, dedicated PW server modules are used to bridge between the PSN interface module and the STM1/OC3 interface module.

VOICE COMPRESSION MODULES

Each VC-E1/12/16 or VC-T1/12/16 module transmits up to 12 or 16 E1/T1 data streams over two E1/T1 links or aggregates them into an STM-1/OC-3 trunk.

Note: For detailed information on the voice compression modules, see the VC-E1/12/16 and VC-T1/12/16 data sheets.

When used without STM1/OC3 modules, Gmux-2000 accommodates seven VC-E1/12/16 or VC-T1/12/16 modules. Chassis with one or two STM1/OC3 modules accommodate six or five VC-E1-T1/12 or VC-E1-T1/16 modules, respectively.

The modules use TDMoIP or AAL2oMPLS multiplexing and G.723.1 and G.729 Annex A voice compression algorithms.

CONTROL MODULES

The control modules interface with the external SNMP-based network management stations, supervision terminals and Telnet hosts. Each control module has two out-of-band ports: a serial RS-232 synchronous port and a 10/100BaseT Ethernet port.

The control modules store the application software in flash memory. This software can be remotely updated through the management link.

The control modules collect the operational history (alarms, configuration error messages, performance statistics, etc).

Gmux-2000 uses two control modules, providing hot standby system control.

PSEUDOWIRE QoS SUPPORT

Gmux-2000 supports VLAN tagging and priority labeling according to 802.1P&q. PW packets are assigned a dedicated VLAN ID and 802.1p bit.

The ToS or Diffserv of the outgoing PW packets are user-configurable, allowing the PW packets to be given a higher priority in IP networks.

EXP bits are used for QoS marking of the

pseudowire traffic in MPLS networks.

MANAGEMENT CAPABILITIES

The chassis can be managed using different ports and applications:

- Local out-of-band management via a terminal connected to the RS-232 port
- Remote out-of-band management via the dedicated 10/100BaseT port
- Remote inband management via the GbE interface. Remote management is performed using Telnet or RADview, RAD's SNMP-based NMS.

The following security protocols are provided by Gmux-2000 to ensure client-server communication privacy and correct user authentication:

- RADIUS (client authentication only)
- SSH for Secure Shell Telnet session.

For voice trunking applications when Gmux-2000 has only voice compression modules and the voice traffic is directed only to TDM ports, no packet traffic is generated by the chassis. In this case, it is not necessary to equip Gmux-2000 with GbE modules: VC-MGT inband management modules can be used. They provide FE management interfaces and no payload ports.

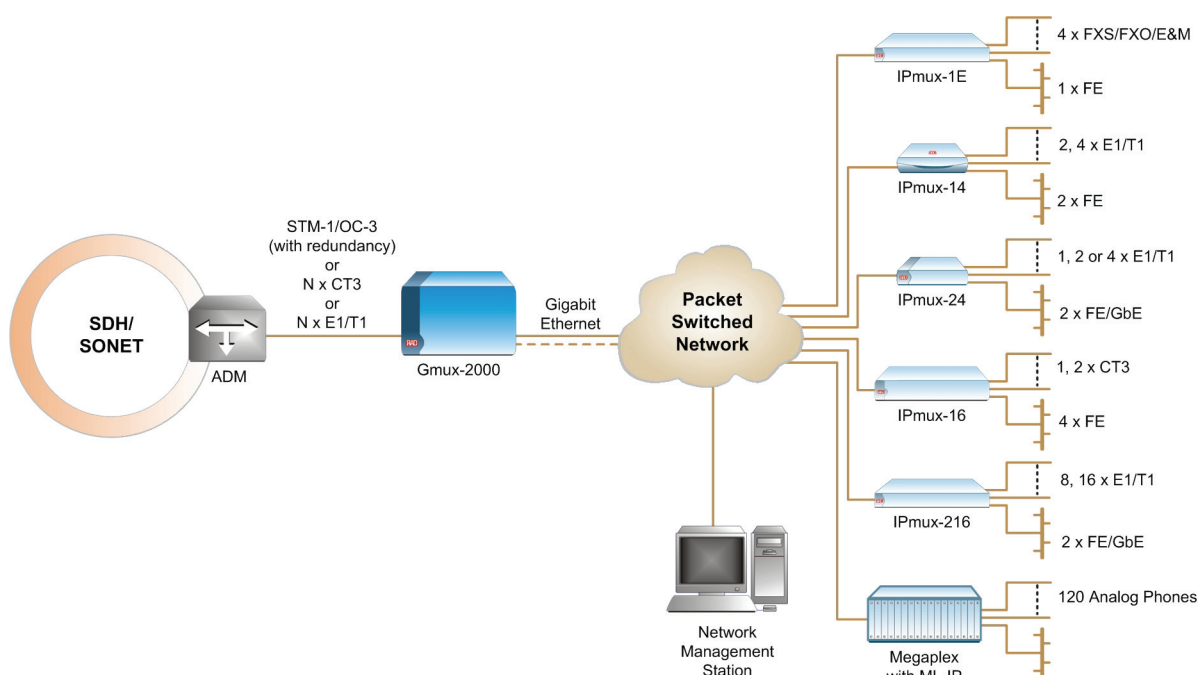


Figure 2. Aggregating TDMoIP Links for Transmission over an SDH/SONET Network



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ALARM REPORTING

The chassis features a dry-contact connector for reporting alarms to external equipment. The connector also has an external alarm input for monitoring external sensors.

TIMING

Gmux-2000 features a flexible clock management using external and internal timing signals coming from:

- External station clock source
- SDH/SONET clock (8 kHz)
- 2.048/1.544 MHz clock recovered from external, internal E1/T1 port, or a generated PW flow.

Each clock signal type is received on two different lines, one designated as main source and the other as fallback.

Two station clock ports are located on each control module. If a control module providing a system clock fails, Gmux 2000 switches to the second control module, without affecting system performance.

SYSTEM REDUNDANCY

Gmux-2000's modular architecture provides redundancy at different levels without a single point of failure.

Service module redundancy:

- Hot standby control modules ensure continuity of the system control and timing functions
- Power supply modules with 2+1 redundancy

- Intelligent fan unit with eight independently controlled fans.

PSN and I/O module redundancy:

- PSN modules with 802.3ad-based link aggregation, dual homing for Gigabit Ethernet link protection and module redundancy
- Voice compression and pseudowire server modules offer N+1 redundancy by adding a standby module to a group of N modules that carry the traffic
- STM1/OC3 modules with module redundancy or 1+1 line redundancy for 50 ms restoration of service in case of line faults.

Specifications

TDM Interfaces

SDH (STM-1)/SONET (OC-3)

Channelized T3

PDH: E1/T1

PSN Interface

Two GbE ports (1.25 Gbps) via SFPs)

PW Routing

Any E1/T1 stream from any PDH or SDH/SONET interface to any IP destination

MANAGEMENT

Methods

Supervision terminal, directly or via modem link

Telnet/SSH

RADview-SC/TDMoIP or other SNMP-based NMS

Interfaces

Serial ports on control modules

10/100BaseT ports on control modules

Inband via PSN interface ports

Serial Port

Type: RS-232 (V.24) async DCE

Data rate: 0.3–115.2 kbps

Connector: 9-pin, D-type, female

EXTERNAL ALARM INTERFACE

Alarm Outputs

Major and minor alarm indication by floating change over dry contacts

Output Contact Ratings

Maximum 60 VDC/30 VAC across open contacts

Maximum 1 ADC through closed contacts

Maximum load switching capacity: 60W

External Alarm Input

One active-low input, RS-232 levels

POWER

Source

AC: 100 to 240 VAC, 50/60 Hz, via 3 inlets

DC: -48 VDC, via 2 inlets

Power Consumption (per power supply)

200W max

Number of Power Supply Modules

3

Redundancy

2+1

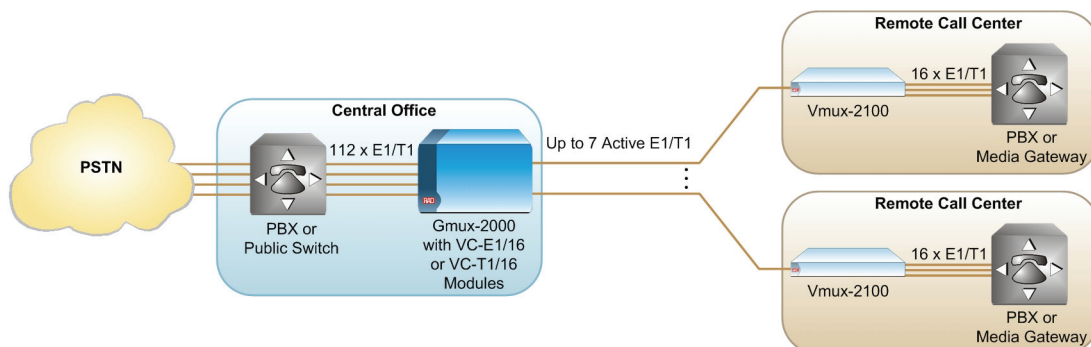


Figure 3. Compressing up to 112 E1s or T1s over up to 7 E1s or T1s

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PHYSICAL

Number of Slots

- 1 power inlet slot
- 3 power supply slots
- 2 control slots
- 2 PSN slots
- 7 I/O slots
- 1 cooling fan tray slot

Dimensions

- Height: 265 mm (10.4 in)
- Width: 440 mm (17.3 in)
- Depth: 210 mm (8.2 in)
- Weight: 12 kg (26.4 lb), max

Environment

- Operating temperature: 0–55°C (0–131°F)
- Storage temperature: -20 to +70°C (0 to 150°F)
- Humidity: Up to 90%, non-condensing

Ordering

Standard Gmux-2000 systems are comprised of a chassis, service modules (control, power supply, etc), and interface modules (GbE, STM1, OC3, CT3, E1, T1 voice compression and servers). *Figure 4* illustrates minimal required combinations of the service and interface modules in the chassis. See separate module data sheets for interface module details and ordering information.

GMUX-2000/%/*

Gmux-2000 chassis with service modules (1 power inlet, 2 or 3 power supplies, 1 fan unit)

Legend

- % Power supply/power inlet type:
 - AC AC power inlet and 2 AC power supply modules

- 48 DC power inlet and 2 DC power supply modules
- ACR AC power inlet and 3 AC power supply modules
- 48R DC power inlet and 3 DC power supply modules

* Rack type:

- A ANSI rack
- E ETSI rack

GMUX-M/@/#

Gmux-2000 service module

Legend

@ Service module type:

- PI Power inlet module
- PS Power supply module
- CL Control and timing module
- CL-VMX Control module for voice compression applications
- VC-MGT Inband management module for voice compression applications (see *Note* below)
- FANS Fan unit module

Note: GMUX-M/ VC-MGT modules are required for managing Gmux-2000 inband over a TDM link, when no GbE module is installed in the chassis.

Power inlet and power supply module type:

- AC AC power inlet module and AC power supply module
- 48 DC power inlet module and DC power supply module

SUPPLIED ACCESSORIES

RM-2000

Hardware kit for mounting one Gmux-2000 chassis into a 19-inch rack

RM-2000E

Hardware kit for mounting one Gmux-2000 chassis into an ETSI rack

1 Power Inlet Module	1 PSN Module	Fan Unit
2 or 3 Power Supply Modules	1 STM1 or OC3 Module	
1 or 2 Control Modules	1–6 E1/T1 Server Modules or Voice Compression Modules	

Channelized STM-1/OC-3 Service

1 Power Inlet Module	1 PSN Module	Fan Unit
2 or 3 Power Supply Modules	1–7 External E1/T1 Modules or Channelized T3 Modules or Voice Compression Modules	
1 or 2 Control Modules		

N × E1/T1 or N × Channelized T3 Service

Figure 4. Gmux-2000 Configurations

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