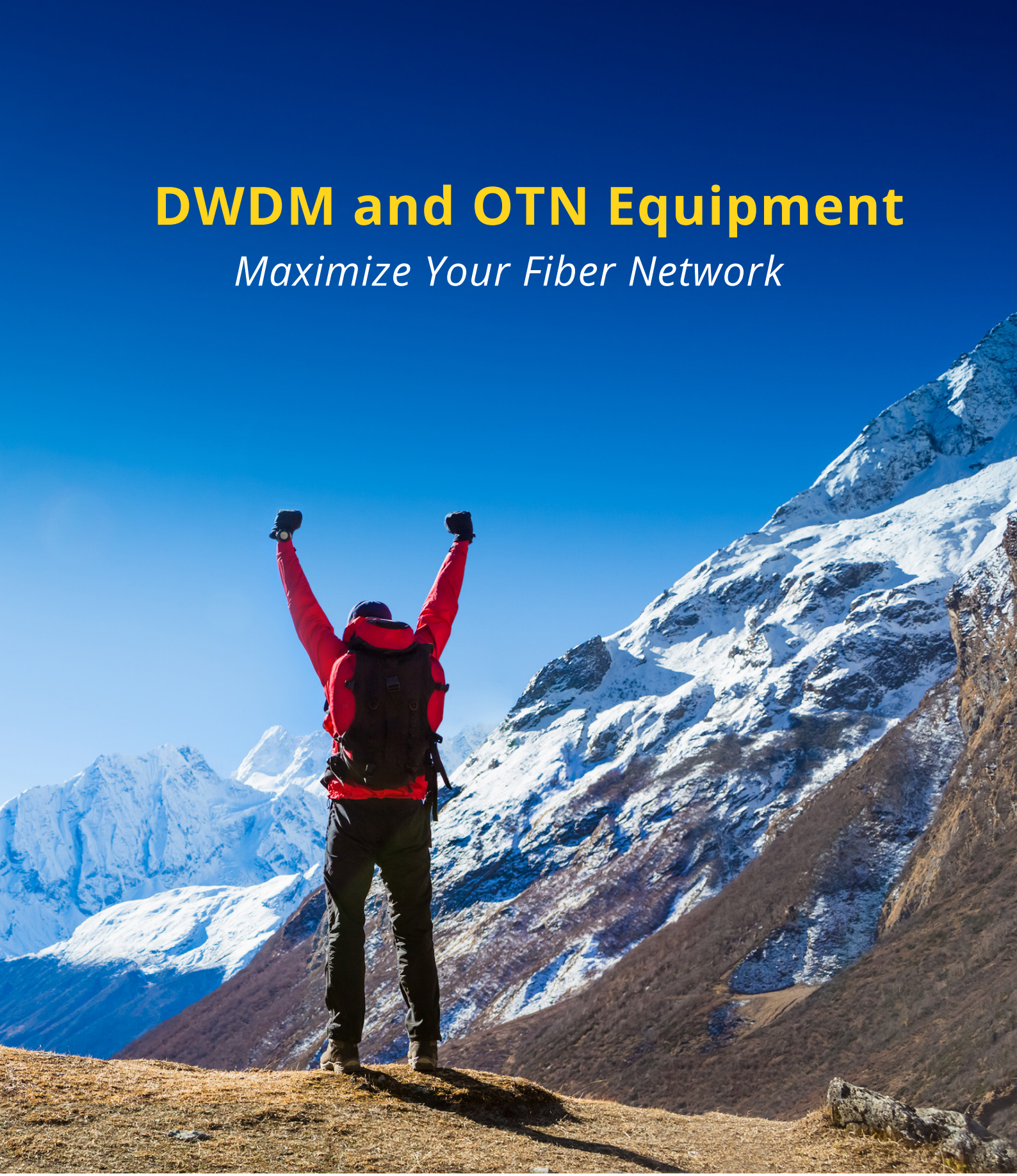
DWDM and OTN Equipment

Maximize Your Fiber Network



PacketLight™
NETWORKS
25 Years of Technology Excellence

Equipment for DWDM and OTN Networks

PacketLight's carrier-grade DWDM and OTN equipment offers the flexibility to build a cost-effective, highly efficient optical transport network for a variety of industries such as carriers, finance, enterprises, broadcast companies, utilities, government organizations, education networks, as well as content service providers.

PacketLight products are tailored to meet your fiber optic network challenges, and are simple to install, deploy and manage, using PacketLight's NMS for the whole deployment lifecycle.

Reasons to Choose PacketLight

Carrier-class Reliability

Reliable, carrier-grade devices ensure business and critical data links, while protecting your investment, with scalable, pay-as-you-grow architecture, network upgrades without service disruption, and guaranteed service level agreement (SLA).

Rich Feature Set

Integrated 1U architecture with a rich feature set, allowing scalability, manageability, and ease-of-use and maintenance, supporting any network infrastructure, from simple point-to-point, to metro access rings and linear add- and-drop networks.

Flexibility and Scalability

Transponders and muxponders that support a mix of data, storage and video services and standardized pluggable optics, optical amplification, and ROADM, all provide the flexibility to build a cost-effective, scalable, highly efficient optical network infrastructure.

Easy Deployment Life Cycle

PacketLight LightWatchTM NMS and free web-based management tools enable simple installation, remote configuration, performance monitoring, fault management, and administration capabilities that allow users to deploy the devices without lengthy training.

Solid Savings

Integrated 1U with high port density, reducing OPEX by saving space and power consumption. The modular design enables true pay-as-you-grow architecture that significantly reduces CAPEX.

Our Range of Products

Layer-1 encryption

Low power consumption

1U rack mount

Multi operation modes

Low latency connectivity

High wavelength utilization

Main Benefits

- High wavelength utilization
- Low latency connectivity
- Layer-1 encryption
- Simple to install and configure
- 1U form factor devices
- Network management system
- Integrated mux/demux, EDFA, optical switch, DCM (optional)
- Pay-as-you-grow architecture

Applications

- Data center interconnect
- Alien wavelength
- Fiber monitoring and diagnostics
- Video transport
- Layer-1 encryption
- Single fiber applications
- DWDM over CWDM
- Multimode fiber solutions

Industries

- Carriers & ISPs
- Dark Fiber Providers
- Utilities
- Research & Education
- Enterprises
- Smart City
- Financial Institutions
- Government
- Broadcasters

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PL-4000M 600G ADM/Muxponder/Transponder

600G multi-protocol multi-rate optical transport solution for metro and long haul networks

Features Overview

- Flexible high capacity architecture based on 400G pluggable digital coherent optical modules
- Supported clients: 10/25/100Gb Ethernet, 16G Fibre Channel, OTU2/2e/4
- Flexible mix of client services mapped into 100/200/300/400G DWDM wavelengths
- Supports oFEC on the line side
- Uplinks: Dual 400G CFP2-DCO Open ROADM pluggable coherent modules
- Range of modulation modes: 16QAM, 8QAM, QPSK
- Clients:
  - Up to 6 x QSFP28 for 100GbE or OTU4
  - 24 x SFP+ / SFP28 for lower rate services
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated EDFAs pre-amp/booster (optional)
- Facility protection using an integrated optical switch (optional)
- OTN SNCP 1+1 service protection for ring applications
- Remote management using in-band GCC or out-of-band OSC
- Easy maintenance with field-replaceable parts:
  - Dual hot pluggable power supply units (AC/DC)
  - Fan unit

100/200/300/400G Long Haul & Metro Applications

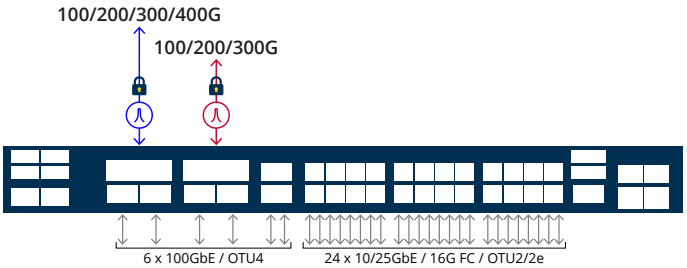
The PL-4000M is a cost-effective solution for rolling out multi-rate 10/25/100GbE, 16G FC, OTU2/2e/4 services, or increasing existing network capacity. The device delivers 600G in a 1U chassis using dual 400G CFP2-DCO Open ROADM standard-based pluggable coherent modules for metro and long haul applications.

Main Benefits

- **Cost-effective high capacity transport of 400G over single wavelength**
- **Supports flexible mix of client interface protocols**
- **Embedded Layer-1 GCM-AES-256 encryption**
- **Integrated EDFAs and optical switch in 1U chassis**
- **User-configurable operation mode**
- **Supports 100/200/300G ring application**

Flexible Architecture, Facility Protection

The PL-4000M provides full demarcation point between the service and the OTN/DWDM network, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both line optical transport layer (OTN) and 10/25/100GbE, 16G FC, and OTU2/2e/4 service interfaces.



PL-4000M Diagram

Recommended Applications

- 300G/400G metro / long haul applications
- 100G/200G long hall applications
- High capacity DCI for enterprise, campus and cloud computing networks
- 400G links to bolster existing OTN/DWDM infrastructure
- Last mile access/aggregation CPE for 100GbE managed services
- Secured and encrypted communication for 10/25/100GbE, and OTU2/2e/4 services

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PL-2000M 200G Muxponder/Transponder

200G over a single wavelength coherent transport solution

Features Overview

- User-configurable muxponder and transponder operation modes
- Supported clients: 10GbE, 40GbE, 100GbE, 8G/16G/32G Fibre Channel, 12G-SDI, STM-64/OC-192, SONET/SDH, OTU2/OTU2e/OTU3/OTU4 OTN
- 200G uplink aggregation using any mix, for example: up to 20x10GbE (multi-rate) clients, 2x100GbE clients, 1x100GbE + 10x10GbE clients, 4x40GbE + 4x10GbE clients
- Forward error correction (FEC)
- 200G pluggable CFP2 coherent (ACO) tunable DWDM line interface
- Operation modes:
  - 16QAM 200G metro ~650km
  - DP-QPSK 100G long haul ~4000km
- Layer-1 GCM-AES-256 encryption
- Diffie-Hellman key exchange
- Line and service performance monitoring
- Optional integrated EDFA, mux/demux and optical switch
- Facility protection using an optional integrated optical switch
- Remote management with in-band GCC or out-of-band OSC
- Dual AC or DC pluggable power supply and pluggable fan unit
- Supports standard MSA pluggable SFP+, SFP28, QSFP+, QSFP28 and CFP2
- 1U footprint with low power consumption

Data Center Interconnect and Metro Applications

The PL-2000M is an advanced 200G multi-protocol multi-rate solution for building high capacity optical transport networks. This 1U platform with flexible architecture enables the same device to be used in multiple applications and to adapt to network growth and changes.

Main Benefits

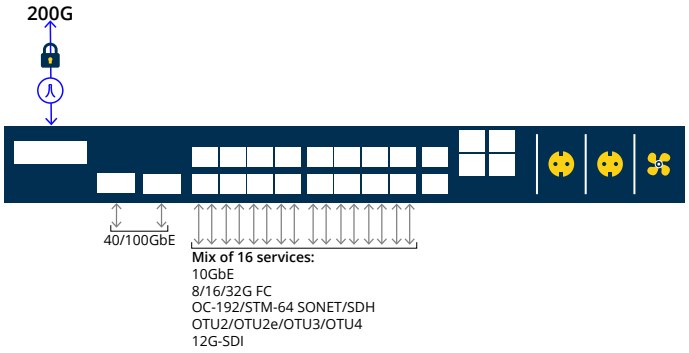
- **Cost-effective 200G capacity over single wavelength**
- **Highly integrated 1U muxponder and transponder**
- **Supports flexible mix of client interface protocols**
- **Embedded GCM-AES-256 encryption for all protocols**
- **User-configurable 100G/200G operation mode**

Modular, Cost-effective 200G Transport Solution

The PL-2000M provides a modular and cost-effective way of rolling out services or uplifting existing network capacity. It is low power consumption, saves rack space and reduces the overall solution CAPEX and OPEX by increasing the capacity of enterprise DCI and metro networks.

The PL-2000M can multiplex 2x100G clients into a single coherent CFP2 uplink, providing low cost high spectral efficiency.

The device seamlessly integrates with PacketLight's products to deliver carrier grade, high-end 200G solutions.



200G Muxponder/Transponder

Recommended Applications

- 100G for alien wavelength applications
- Metro network applications ranging up to 1,000km
- High capacity DCI for enterprise, campus and cloud computing networks
- 200G links to bolster existing OTN/DWDM infrastructure
- Last mile access/aggregation CPE for 10G/40G/100G managed services
- Secured, encrypted communication for all protocols

PL-2000ADS 200G ADM/Muxponder/Transponder

Multi-protocol multi-rate 200G transport solution for short haul networks, with Layer-1 encryption

Features Overview

- Supports multiple, user-configurable, operation modes: muxponder, transponder, and ADM
- Supported clients:
  - 10Gb/40Gb/100Gb Ethernet
  - 8G/16G/32G Fibre Channel
  - 12G-SDI
  - STM-64/OC-192
  - OTU2/OTU2e, OTU4
- Standards-based forward error correction (FEC) for short haul applications
- Dual pluggable QSFP28 interfaces for uplink and client
- Layer-1 GCM-AES-256 based encryption
- Low latency muxponder/transponder/ADM
- Comprehensive line and service performance monitoring
- Remote management with in-band or out-of-band optical supervisory channel (OSC)
- Supports standard MSA pluggable:
  - SFP+ (8G/10G/16G/32G FC client)
  - SFP28 (32G FC client)
  - QSFP+ (40GbE client)
  - QSFP28 (100GbE client)
  - QSFP28 (100GbE uplink)
- Dual AC or DC pluggable power supply and pluggable fan unit

Short Haul 200G Applications

The PL-2000ADS provides modular and cost-effective high transport capacity of up to 200G by aggregating multiple services into dual 100G OTU4 uplinks. The solution is low power consumption and saves rack space, reducing overall CAPEX and OPEX, and enabling to easily and cost-effectively increase capacity of short haul networks.

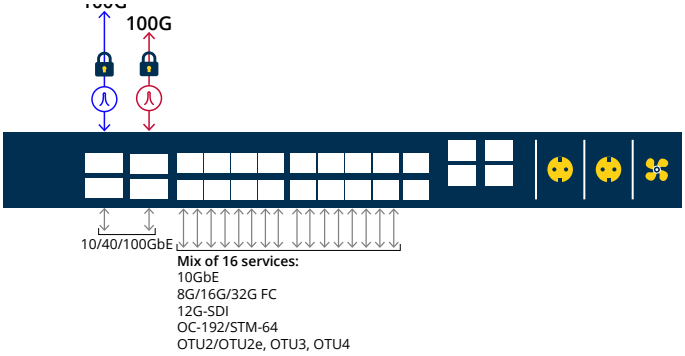
Main Benefits

- **Easy deployment and management of dual 100G short haul / access networks**
- **Versatile 1U chassis platform, with very low power consumption**
- **Embedded GCM-AES-256 encryption for all protocols**
- **Encryption feeder in front of any third party OTU4 interface**

Security and Encryption for all Services

The PL-2000ADS is a cost-effective 200G solution for short haul and access networks, incorporating GCM-AES-256 Layer-1 encryption.

The unit can also function as a standalone 200G encryption machine for any mix of the featured client services.



Multiple Client Services Aggregate into Dual 100G OTU4 Uplink

Recommended Applications

- Last mile access/aggregation CPE for 10/40/100GbE managed service
- High capacity, short haul enterprise and campus networks
- Dynamic add/drop of services in ring and linear add/drop topologies
- Feeder solution for third party OTU4 transponder card
- Up to 200G Layer-1 encryption solution for 10/40/100GbE services
- High bandwidth connectivity for data center and cloud computing

PL-2000 20G ADM/Muxponder

Multi-protocol multi-rate muxponder with flexible uplink aggregation, capacity of up to 20G

Features Overview

- Single or dual configurable 10G muxponders
- Up to 16 multi-protocol and multi-rate services aggregation over single or dual OTU2 uplinks
- Service types supported:
  - Fast Ethernet
  - GbE
  - 1/2/4G FC/FICON
  - STM-1/OC-3, STM-4/OC-12, STM-16/OC-48
  - Video protocols such as DVB-ASI, SD-SDI, HD-SDI, 3G-SDI
- Dual standard-based optical transport network (OTN) OTU2 uplinks supporting multiple forward error correction (GFEC/I.4/I.7) types
- 1+1 facility protection
- Low latency
- Supports standard MSA SFPs (client), XFPs (uplink), and C-band tunable XFPs
- Supports line and service performance monitoring
- Remote management optical supervisory channel (OSC)
- Optional integrated EDFA, mux/demux, DCM and optical switch
- Dual AC or DC pluggable power supply and pluggable fan unit
- Web-based GUI and SNMP EMS management
- 1U footprint with low power consumption

Sub-10G Multi-protocol Multi-rate ADM/ Muxponder

The PL-2000 provides an efficient and flexible aggregation layer of multi-protocol multi-rate sub-10G services into a 10G OTU2 uplink trunk, reducing the number of wavelengths needed for a sub-10G solution by a factor of 8 on average. The PL-2000 increases the spectral efficiency of WDM networks.

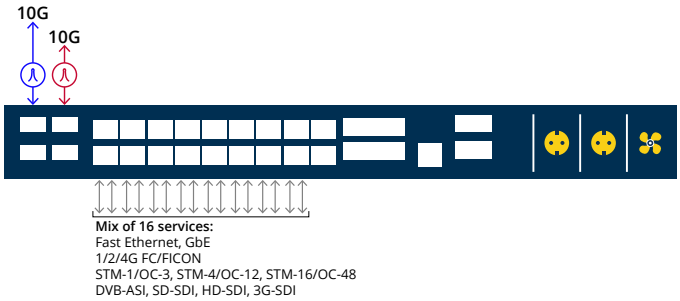
Main Benefits

- **Provides a sub-10G gateway for 10/100G OTN networks supporting LR and tunable DWDM uplink modules**
- **Transparently multiplexes up to 16 client services into single or dual independent 10G OTU2 wavelengths**
- **Simultaneously aggregates SDH/SONET, Ethernet, Fibre Channel and video services**

A Flexible Platform

The PL-2000 reduces the solution cost and operation complexity by increasing fiber utilization and spectral efficiency. Each of the 10G OTU2 uplinks can simultaneously aggregate SDH/SONET, Ethernet, Fibre Channel and video services, providing a perfect access platform for multiple clients, and enables to merge legacy and new services transparently.

Together with PacketLight LightWatch NMS the system provides A-to-Z provisioning. The PL-2000 Incorporates forward error correction suitable for long distance amplified DWDM network.



PL-2000 Product Diagram 2 x 10G OTU2 Uplinks

Recommended Applications

- 10G ring applications
- Sub-10G gateway for 10G/100G OTN networks
- Multi-service access platform for service providers
- Transporting multi-services over long distance optical network
- Upgrading legacy infrastructure with new services
- Efficient aggregation of multiple native video streams over DWDM and OTN infrastructure

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PL-4000T 1.6T Muxponder / Transponder

Transport of 4 x 200G/300G/400G wavelengths, for high capacity metro and long haul applications

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Up to 4 slices of 200G/300G/400G
- Supported services: 100GbE, 400GbE, OTU4
- Supported line FEC:
  - CFEC (OIF-ZR)
  - oFEC (Open ROADM and Open ZR+)
- Range of modulation modes: 16QAM, 8QAM, QPSK
- Client options per slice:
  - 400GbE QSFPDD
  - 4 x 100GbE QSFP28
  - 4 x OTU4 QSFP28
- Supported 400G QSFPDD client optics: LR8/SR8/FR4/DR4/DR+/LR4
- Uplink options per slice:
  - 400G CFP2-DCO
  - 400G QSFPDD-DCO
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Integrated EDFA, mux/demux and up to 4 optical switches (optional)
- Facility protection using integrated optical switches (optional)
- Remote management with in-band GCC, or out-of-band OSC
- Easy maintenance with field-replacable and hot-swappable parts:
  - Dual hot pluggable power supply units (AC/DC)
  - Fan unit

400G Muxponder/Transponder

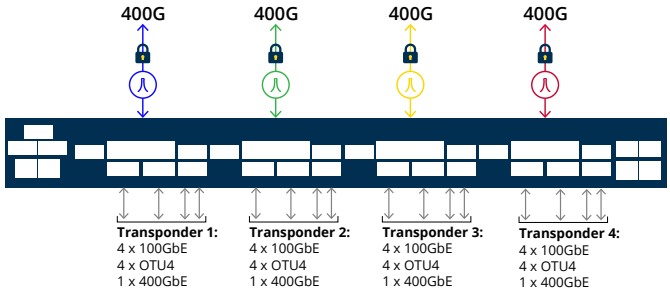
The PL-4000T is a modular and cost-effective high capacity solution for rolling out 400GbE and 100GbE services, or increasing existing network capacity. The device has four 400G pluggable uplink optical modules, delivering up to 1.6T in a 1U chassis. The PL-4000T integrates mux/demux, EDFA and OSW and delivers the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

Main Benefits

- **Cost-effective high capacity transport of 200G/300G/400G over single wavelength**
- **Up to 4x400G transponders/muxponders in 1U**
- **Embedded Layer-1 GCM-AES-256 encryption**
- **Integrated EDFA, mux/demux and optical switch in 1U**
- **Modular and cost-effective for future growth and maintenance**

Flexible Pay-as-you-grow Architecture, with Redundancy

The solution provides full demarcation point between the service and the DWDM network, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both the optical transport layer (OTN) and 100GbE/400GbE/OTU4 service interfaces.



PL-4000T Transponder/Muxponder Diagram

Recommended Applications

- Metro and long haul network applications
- High capacity DCI for enterprise, campus and cloud computing networks
- 400G wavelengths to bolster existing OTN/DWDM infrastructure
- Last mile access/aggregation CPE for 100/400GbE managed services
- Secured and encrypted communication for 100/400GbE services

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PL-4000G 4.8T Transponder

Mix of 400GbE and 100GbE over 400G wavelengths for high capacity DCI applications, in integrated 1U

Features Overview

- Pay-as-you-grow architecture based on standard pluggable coherent optical modules
- Operation modes:
  - 12 x 400GbE transponder
  - 48 x 100GbE transponder
- Supported services: 100GbE, 400GbE
- Supports oFEC (OpenROADM standard) and CFEC (OIF-ZR standard) on the line side
- Standard MSA pluggable modules:
  - 12 x 400GbE QSFP-DD-DR4/DR4+/FR4/LR8/FR8 clients
  - 48 x 100GbE QSFP-DD-DR4/DR4+/FR4 clients
- Comprehensive line and service performance monitoring
- Integrated EDFA, mux/demux and optical switch (optional)
- Facility protection using an integrated optical switch (optional)
- Remote management with out-of-band OSC
- Easy maintenance with field-replaceable parts:
  - Dual hot pluggable power supply units (AC/DC)
  - Fan unit

100GbE/400GbE Transponder

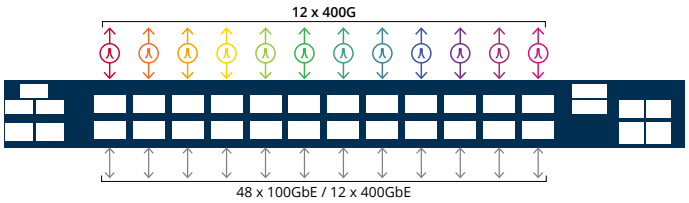
The PL-4000G is a modular and cost-effective high capacity solution for rolling out 400GbE and 100GbE services, or increasing existing network capacity. The device has twelve 400G pluggable uplink optical modules, delivering up to 4.8T in a 1U chassis. The PL-4000G integrates mux/demux, EDFA and OSW and delivers the entire optical layer. This flexible solution enables pay-as-you-grow architecture.

Main Benefits

- **Cost-effective high capacity transport mix of 100GbE and 400GbE client services**
- **Up to 12 x 400GbE transponders**
- **Up to 48 x 100GbE transponders**
- **Integrates EDFA, mux/demux and optical switch in 1U**
- **Modular and cost-effective for future growth and maintenance**
- **Low power consumption, high density device ports**

Full Demarcation

The device provides full demarcation point between the service and the DWDM network, and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both the optical transport layer and 100GbE/400GbE service interfaces.



PL-4000G Transponder Diagram

Recommended Applications

- High capacity DCI for Internet exchange and research and education networks
- 400G links to bolster existing DWDM infrastructure
- Last mile access/aggregation CPE for 100/400GbE managed services

PL-2000T 800G Transponder

800G Transport Platform for high capacity applications

Features Overview

- Pay-as-you-grow architecture based on pluggable 200G digital coherent optical modules
- Operation modes: QPSK 100G long haul and 8/16 QAM 200G metro
- Supported clients: 100Gb Ethernet, OTU4
- Supported FEC modes:
  - **Line:** SD-FEC for metro and long haul applications, or oFEC
  - **OTU4 service:** ITU G.709 GFEC, or Zero FEC
  - **100GbE service:** IEEE Clause BJ-FEC
- Standard MSA pluggable:
  - CFP2 DCO tunable DWDM for 100G/200G line interface
  - QSFP28 SR4/LR4/ER4/CWDM4 for 100G client interface
- Layer-1 GCM-AES-256 encryption
- Elliptic Curve Diffie-Hellman key exchange
- Comprehensive line and service performance monitoring
- Optional integrated EDFA, mux/demux and optical switch
- Facility protection using an optional integrated optical switch
- Remote management with in-band GCC, or out-of-band OSC
- Easy maintenance with field-replaceable parts:
  - Dual hot pluggable power supply units AC/DC
  - Fan unit

200G Metro and 100G Long Haul Applications

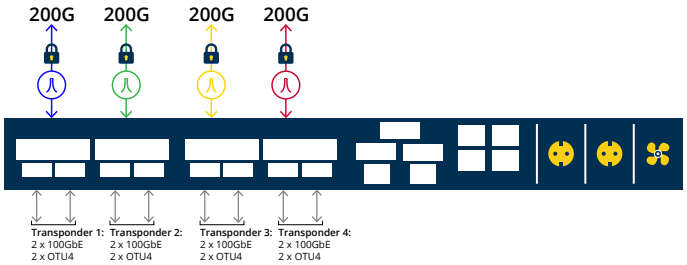
The PL-2000T is a modular and cost-effective solution for rolling out 100G services or increasing existing network capacity. The device has four 200G pluggable optical modules, delivering up to 800G in a 1U chassis, and enabling pay-as-you-grow architecture.

Main Benefits

- **Integrated EDFA, mux/demux and optical switch in 1U**
- **High transport capacity of 800G with configurable modulation scheme**
- **Embedded Layer-1 optical encryption**
- **Managed service platform**
- **Modular and cost-effective for future growth and maintenance**

Flexible Pay-as-you-grow Architecture, with Redundancy

The solution provides full demarcation point between the service and the uplink DWDM side and is interoperable with any third party switch or router. This provides full visibility and performance monitoring of both line optical transport layer (OTN) and 100G LAN/OTU4 service interfaces.



PL-2000T Transponder Diagram

Recommended Applications

- Metro network applications ranging up to 1,000km
- High capacity DCI for enterprise, campus and cloud computing networks
- 200G links to bolster existing OTN/DWDM infrastructure
- Last mile access/aggregation CPE for 100G managed services
- Secured and encrypted communication for 100G protocols

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PL-1000TN 10G OTN Transponder

6x10G OTN multi-protocol multi-rate OTN transponders, with total capacity of 60G

Features Overview

- 6 independent ITU G.Sup43 standard-based multi-rate 8/10G OTN transponders
- Supported clients:
  - 10Gb/40Gb Ethernet
  - 8G/10G Fibre Channel (FC)
  - STM-64/OC-192
  - OTU2/2e
- Three FEC types: ITU G.709 GFEC, G.975.1 EFEC I.4 and UFEC I.7 for enhanced performance
- Supports full C-band tunable DWDM on line side optics
- Supports multi-rate client interfaces over a common OTN infrastructure
- 1+1 facility and optical switch line protection
- Comprehensive performance monitoring and full OTN managed layer
- Optional integrated EDFAs, DCM, mux/demux and optical switch modules
- Remote management with in-band GCC or out-of-band optical supervisory channel (OSC)
- Cost-effective 1U platform with low power consumption, ideal for customer located equipment (CLE)
- Supports standard MSA pluggable modules:
  - SFP+ (client)
  - XFP (uplink)
- Dual AC or DC pluggable power supply and pluggable fan unit
- Operates on single or dual fiber networks

Multi-protocol 10G OTN Transponders

The PL-1000TN holds up to 6 multi-protocol transponders for mapping 8G/10G services over OTU2/2e/2f OTN. It is a highly integrated solution for unified transport of different protocols over a common optical transport layer.

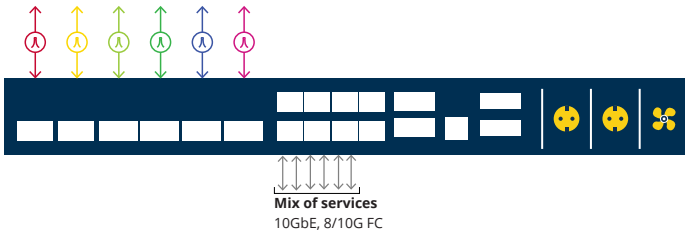
Main Benefits

- **Long haul connectivity for up to 52dB using a single 1U device**
- **Smallest integrated transport solution of its kind, saving rack space**
- **Enhanced forward error correction**
- **Reduces backbone cost by cutting the number of regenerators**

Integrated 1U OTU2 Transponder

The PL-1000TN meets market demands for low power consumption and rack space savings, reducing the overall solution CAPEX and OPEX.

The device provides the entire optical solution in a 1U, integrating EDFAs, mux/demux and DCM with the OTN transponders.



PL-1000TN Multi-rate Transponder Diagram

Recommended Applications

- Building efficient DWDM OTN transport solutions for enterprises over common OTN long distance optical network
- Building a robust packet optical network infrastructure
- Multi-rate OTN transpodner for ROADM-based applications
- CPE device for end-to-end managed services over carrier backbone
- Upgrading SONET/SDH backbones to OTN backbones
- OTU2e OTN regenerator

PL-1000TE 1G-16G Transponder

8 multi-rate multi-protocol transponders, supporting Layer-1 encryption, for high capacity DCI

Features Overview

- Multi-rate and multi-protocol mix of 8 transponders, configurable from 622M up to 40G
- Supported services:
  GbE, 10GbE, 40GbE, 2G/4G/8G/10G/16G FC, STM-4/OC-12, STM-16/OC-48, STM-64/OC-192, HD-SDI, 3G-SDI (PAL and NTSC), SD-SDI
- Low latency connectivity, ideal for data center interconnect applications
- Encryption algorythm: GCM- AES-256 Layer-1 data encryption. Periodical Diffie Hellman key exchange. Complies with NIST FIPS-140-2 and CNSA Top Secret Suite B 2015 requirements
- Supported Layer-1 Encryption services:
  GbE/10Gb/40Gb Ethernet
- Remote management and topology discovery for the optical network
- Pluggable SFP/SFP+ interfaces for both service and WDM channels
- Supports full C-band tunable DWDM on the line side (SFP+)
- Optional integrated EDFAs, mux/demux, DCM and optical switch
- Supports 1+1 facility protection
- Bi-directional performance monitoring
- Dual AC or DC pluggable power supply and pluggable fan unit
- Supports single and dual fiber networks

Low Latency 1G-16G WDM Transponder

The PL-1000TE/PL-1000TE Crypto is a CWDM/DWDM solution for connecting two data centers or back up sites. The device is an advanced, all-in-one optical transport solution, supporting up to 8 transponders with a flexible mix of industry-standard-protocols. The product integrates a rich and cost-effective feature set in a 1U chassis with low power consumption.

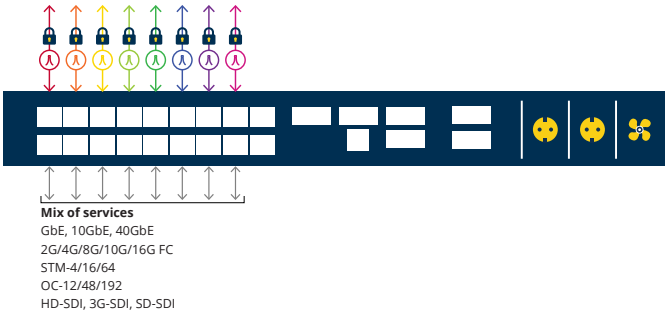
The PL-1000TE Crypto supports innovative Layer-1 optical encryption capability for 1G/10G/40G Ethernet LAN and 4G/8G/16G FC storage services.

Main Benefits

- **Flexible mix of services provides transparent migration capability from up to 10G to 10G services with no downtime**
- **Layer-1 encryption prevents disclosure of information to unauthorized parties with 100% throughput**
- **Maximum flexibility and scalability**

Standards-based Layer-1 Encryption

The PL-1000TE/PL-1000TE Crypto allows easy upgrade or expansion of the required services by simply adding pluggable optic modules (SFP/SFP+) into the available slots or by implementing PacketLight's multi-chassis stackable solution. This architecture provides true scalability at a minimum cost.



PL-1000TE Diagram - Multi-rate Transponder Layer-1 Encryption

Recommended Applications

- High capacity, low latency, secure data center interconnect (DCI)
- Efficient connectivity for campus, ISP and enterprise networks
- Upgrade of existing WDM networks to support 10/40Gb Ethernet and 16G FC services
- Trading applications and synchronous data center replication requiring low latency
- Distance extension for 40G data networks up to 120km

PacketLight™ NETWORKS

For more information please contact us at www.packetlight.com

PL-1000D Diagnostic and Monitoring Solution

Diagnostic device using OTDR to detect fiber quality and cut, and OSA for spectrum and OSNR analysis

Features Overview

- Monitoring up to 16 fibers simultaneously, 8 by the OTDR and 8 by the OSA
- Controlled with PacketLight web application or PacketLight's Lightwatch™ NMS
- Main Metro OTDR features:
  - Integrates 1:8 optical switch, OTDR, OADMs
  - 24dB fiber loss
  - Integrated with third party GIS tools
- Main Regional OTDR features:
  - Integrates 1:8 optical switch, OTDR, OADMs
  - 32dB fiber loss
  - Integrated with third party GIS tools
- Main OSA features:
  - Integrates 1:8 optical switch, OSA, splitters
  - Supports full C-band 50GHz/100GHz ITG grid
  - Measures the power, frequency and OSNR of the optical channels in the fiber
- 1U footprint 19"
- Dual redundant AC/DC power suppliers
- Hot swappable fan unit
- Low power consumption

How the PL-1000D Works

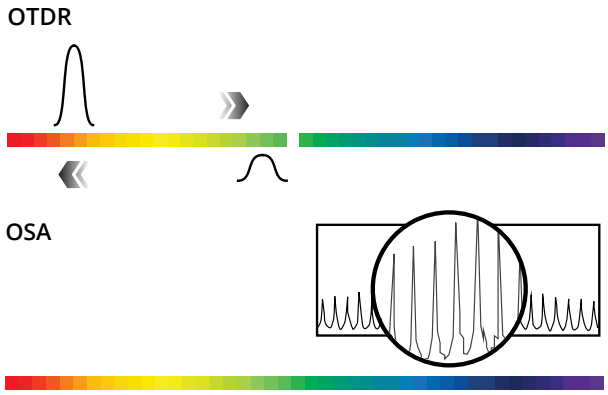
The PL-1000D consists of two technologies for non-intrusive monitoring live fiber optic networks. The OTDR locates fiber cut by sending high-powered diagnostic optical pulses into the fiber and creating Rayleigh back-reflections. The returning signals are measured and calculated, indicating the accurate location and intensity of the fault. The OSA presents for each fiber the optical spectrum and the OSNR of each wavelength, providing the operator with a full, accurate and detailed picture of the fiber.

Main Benefits

- **Simultaneous OTDR diagnostics of up to 8 fibers**
- **OSA monitoring of up to 8 fibers**
- **In-service fiber monitoring**
- **Can operate over dark fiber or over third party network**
- **Detection of fiber degradation**
- **Provide alarm when the trace events are changed**
- **Graphical display of the OTDR and OSA in any browser**

Full Fiber Diagnostic Device

The PL-1000D conducts full non-disruptive monitoring and analysis of the network's fiber. The OTDR monitors up to 8 fibers simultaneously, identifying a break or degradation in each fiber and where the break is. The embedded OSA provides the full optical DWDM spectrum and OSNR of up to 8 fibers simultaneously. The solution provides high-level visibility of the fiber characterization and operating wavelengths and saves network managers time and OPEX expenses associated with identifying and repairing faults.



PL-1000D OTDR and OSA Solution

Recommended Applications

- Monitoring dark fibers service/infrastructure
- Monitoring lighted DWDM fibers
- In service OTDR measurements for DWDM networks
- In service OSA measurements for DWDM networks
- Detection of fiber degradation

PL-1000RO WSS ROADM

Highly flexible wavelength routing

Features Overview

- Flexible add/drop of wavelengths
- Up to 8-degree ROADM
- Flex-grid ready
- Supports 10G/100G/200G and 400G wavelengths
- Up to 96 C-band add/drop wavelengths (configurable)
- WDM spacing - 50Ghz or 100GHz
- Supports automatic channel restoration
- Power monitoring on all channels
- Optical power equalization between all channels
- A-to-Z provisioning of wavelengths and protection through NMS system
- Supports up to 96 C-band channels
- Supports optional embedded EDFA booster/pre-amp
- Dual AC or DC pluggable power supply and pluggable fan unit

Colorless, Directionless ROADM for 50GHz and 100GHz Grid

The PL-1000RO offers ROADM functionality based on advanced next generation wavelength-selective switch (WSS) technology.

The solution offers highly flexible wavelength routing capabilities suitable for mesh, ring, linear add/drop, core and edge DWDM network topologies. The PL-1000RO supports colorless, directionless, flex-grid, 50GHz grid and 100GHz grid (configurable).

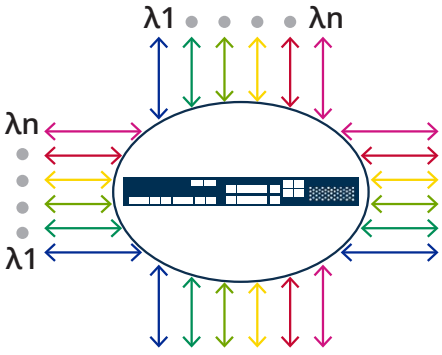
Main Benefits

- **Power monitoring for all channels and automatic power balancing**
- **Supports optional embedded EDFA booster/preamp**
- **Optional DCM and band splitters**
- **Embedded optical supervisory channel (OSC) for remote management**
- **User-friendly NMS to deploy new services, control and monitor the optical network**

Full Fiber Diagnostic Device

The user configures the PL-1000RO dynamically to add/drop selected wavelengths at any node in the network and can seamlessly change the network node capacity as needed. The device automatically equalizes and balances the power of the added and bypassed wavelengths.

The PL-1000RO simplifies network management and reduces operation costs (OPEX) by allowing fast deployment of new wavelengths remotely. The ROADM fully integrates with PacketLight's WDM product line.



PL-1000RO Integrated ROADM Platform

Recommended Applications

- Configuration and management of mesh and ring DWDM network architecture
- Wavelength routing for mesh, ring, linear add/drop, core and edge DWDM network topologies
- Wavelength power balancer in amplified links
- Network management by remotely deploying new wavelengths

PL-1000IL DWDM EDFA Amplification Solutions

Versatile, cost-effective platform with single, dual or quad DWDM amplifiers

Features Overview

- Up to 4 amplifier modules in a 1U chassis
- Supports up to 96 wavelengths
- Supports AGC and APC operation modes
- Embedded OSC for remote management and topology detection
- Optional optical switch for facility protection
- Integrated single/dual DCM for long distance 10G amplified links
- Supports single and dual fiber operation
- Supports optional up to 16 channel mux/demu
- Offers several EDFA types:
  - Booster
  - Inline
  - Pre-amplifiers
  - Midstage
- Low power consumption
- Built-in eye safety mechanism
- Monitoring on the input and output power and user configurable gain
- Dual AC or DC pluggable power supply and fan unit

Long Distance and Attenuation in the Network

The PL-1000IL is designed to cost-effectively extend the optical link power budget for building long distance DWDM solutions. It provides amplification for a range of optical solutions, from single wavelength, up to the full C-band, and incorporates several types of low-noise Erbium-doped fiber amplifiers (EDFAs): booster, inline, and pre-amplifier.

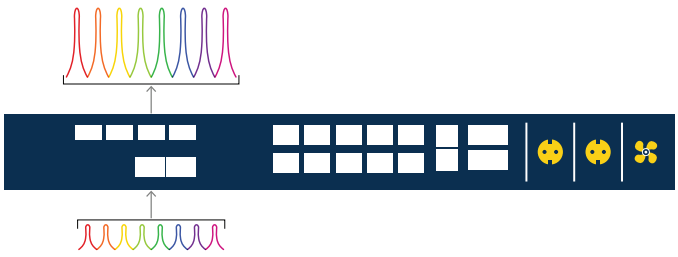
Main Benefits

- **Fully managed via dedicated integrated OSC**
- **Full remote monitoring on the input and output power, and user-configurable gain**
- **Eye safety feature - automatically shuts down the EDFA in case of fiber interruption**
- **Fully integrated solution including mux/demux, amplifier, and DCM**
- **Integrates with PacketLight management platforms and transponder/muxponder products**

Flexibility in Services over the Same Fiber

The PL-1000IL is fully managed, configured and monitored remotely as part of the network, via optical supervisory channel (OSC). The device supports AGC and APC operation modes. The EDFA gain is controlled, adjusted and monitored by the user, and APC operating mode allows to maintain constant output power.

The EDFA has high optical signal to noise ratio (OSNR), enabling to cascade several EDFAs to form an amplified OTN link over long distances, without the need for regenerators.



PL-1000IL Integrated Amplification Solution

Recommended applications:

- Extending the optical link power budget to meet distance and attenuation requirements of DWDM networks
- Upgrading the optical link budget to support 10G/40G/100G services
- Reducing the number of regenerators and sites along the fiber
- Overcoming high loss in old fiber infrastructure
- Facility protection for fiber redundancy solutions
- Inline, edge and unidirectional mid-stage applications

PL-1000R DWDM Raman Amplification Solutions

Counter-propagating Raman amplifier and hybrid Raman-EDFA

Features Overview

- Counter-propagating Raman amplifier with optionally embedded booster and preamp EDFAs in 1RU
- Detection of open connectors and/or broken fiber up to few tens of kilometers from the pump module
- High power connector safety switch cover
- Supports the following Raman configurations:
  - Counter-propagating Raman
  - Hybrid Raman-EDFA
- Up to 12dB average gain for G.652 fiber (2-pump)
- Gain flattening optimization based on fiber type and pump power
- Effective noise figure (NF) of -1dB
- 1U footprint with low power consumption
- Dual AC or DC pluggable power supply and pluggable fan unit
- Web-based GUI and SNMP EMS management

Distributed Raman Amplification

The PL-1000R is designed for distributed Raman amplification applications, cost-effectively extending the optical link power budget and significantly improving OSNR for building long distance DWDM solutions. It provides amplification for a range of optical solutions and incorporates several configurations of Raman amplifier, including counter-propagating and hybrid Raman-EDFA.

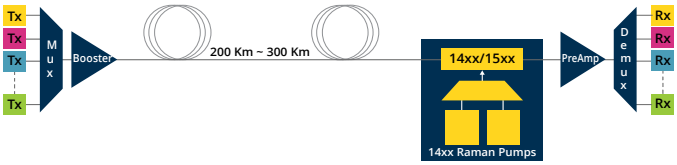
Main Benefits

- **Acts as terminal Raman amplifier and as inline hybrid Raman-EDFA**
- **Full remote monitoring**
- **Eye safety feature - automatically shuts down the Raman in case of fiber interruption**
- **Detects fiber disruption or cut tens of kilometers from the pump**
- **Integrates with PacketLight management platforms and transponder/muxponder products**

Laser Safety

The PL-1000R is fully managed, configured and monitored remotely as part of the network via optical supervisory channel (OSC). The Raman is controlled, adjusted and monitored by the user.

The Raman includes three eye safety mechanisms that shut down the unit in case of fiber link disruption, such as open connectors or broken fiber, even at a distance of a few tens of kilometers from the unit.



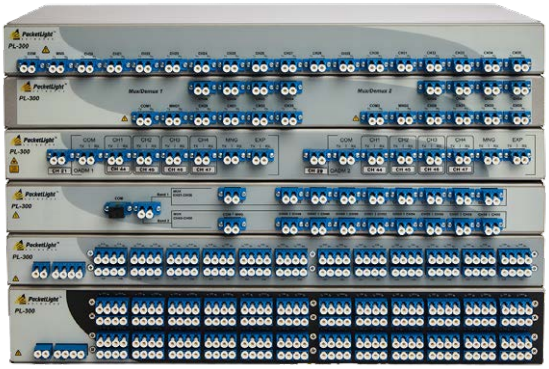
PL-1000R Raman Amplification Solution

Recommended Applications

- Long repeaterless links
- Low latency links (less FEC and O-E-O conversion)
- Storage area networks (SANs), remote locations, disaster recovery
- Security-sensitive applications
- Improving OSNR in long-haul and ultra-long haul links
- 400G, 200G and 100G transmission and/or increasing channel count to 96 WDM channels

PL-300 Passive Family

Up to 96ch Mux/Demux, DCM, OADM in 1U



Features Overview

- Passive transparent any rate, any service multiplexing
- Compliant with all optical networking products (ITU grid)
- DWDM passive optical mux/demux supported configuration: 4/8/16/48/96 channels
- CWDM passive optical mux/demux supported configuration: 4/8/16 channels
- Integrates up to four DCMs
- OADM for 1-4 wavelengths
- Supports single and dual fiber operation
- Integrates with all PacketLight products
- Stackable solution for multiplexing optical services up to 200G each
- Supports full C-band and L-band
- Supports 100GHz and 50GHz
- 1U, 19” rack mount chassis
- Simple installation and modularity
- Optional TAP Monitoring Port

Maximize Fiber Utilization & Capacity

The PL-300 provides passive optical layer functions for 4-96 DWDM wavelengths mux/demux, 4-16 CWDM wavelengths mux/demux, optical dispersion compensation module (DCM), optical add and drop (OADMs), splitters and combiners.

The passive optical network products interconnect seamlessly with PacketLight’s transponder, muxponder, amplifier and ROADM product lines, and third party WDM products, to form cost-effective high capacity DWDM and CWDM solutions.

Main Benefits

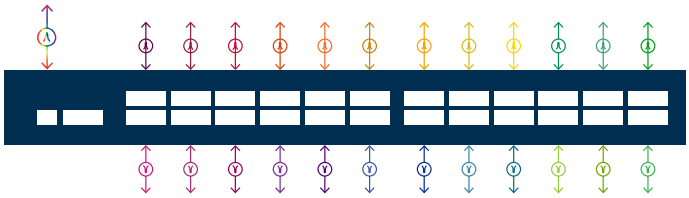
- **Customized per customer application requirements**
- **Standards-based and can integrate with third party solutions**
- **Scalable solution, allowing customers to expand as needed, saving operating costs and resources**

Flexibility in Services over the Same Fiber

The PL-300 provides high granularity wavelength add and drop capabilities and offers a large set of passive optical modules that are tailored to the customers’ network requirements.

The device supports a wide range of CWDM and DWDM mux/demux, OADMs and DCMs in various configurations, suitable for any type of CWDM, DWDM, OTN and ROADM network building block.

PL-300 Passive Product Family



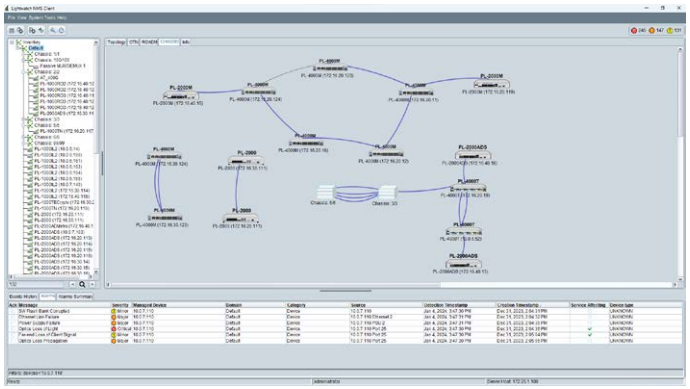
4-96 Wavelengths Mux/Demux, 50/75/100GHz Spacing

Recommended Applications

- Expansion of existing fiber capacity regardless of service type
- Building scalable high capacity pay-as-you-grow optical networks
- Low cost fully passive optical layer solution, transparent to service rate and type
- Extending the fiber optical solution reach for 10G services with DCMs
- Building cost-effective add and drop networks
- Enables stackable solution of 100G/sub-100G products

PacketLight LightWatch NMS

Multi-platform Java-based network management system (NMS)



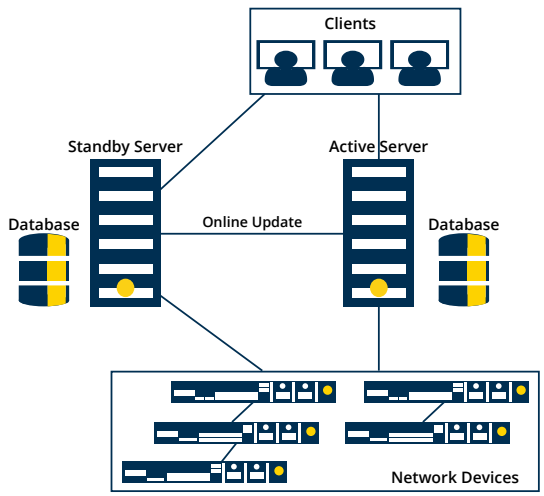
Overview

PacketLight LightWatch™ provides full fault management, configuration, accounting, performance, security (FCAPS) functionality and is compliant with telecommunications management network (TMN) standards.

LightWatch is built with a client-server architecture. It uses the MySQL™ database, and is built with modular client pay-as-you-grow offerings, scalable to 700 network elements and 20 clients.

For fast and complete recovery, LightWatch supports server redundancy and daily database backup.

LightWatch also provides centralized management of user accounts and several types of users with configurable access privileges: Administrators, NetAdmins, Technicians, Users.



Client-server Architecture

Technical Specifications

Hardware Requirements

Server:

Devices	CPU	RAM	Disk Space
200	6 cores @ 3Ghz	12Gb	HDD/SSD 400Gb
400	12 cores @ 3Ghz	24Gb	SSD 600Gb
700	16 cores @ 3.5Ghz	32Gb	SSD 800Gb

Client:

- CPU: Intel® Core I5 2.5GHz or higher
- RAM: Minimum 8GB
- Hard Disk: 4GB free space

Software Requirements

Server:

- Windows Server 2019/2022
- Windows 10/11
- Linux Ubuntu 22.04/ 20.04.6

Client:

- Windows 10/11
- Linux Ubuntu 22.04/ 20.04.6
- macOS 14.1.1 Big Sur

Scalability

Network Elements: Up to 700

Clients: Up to 20

Management Protocols

Between Server to NE: SNMPv2c/v3

File Transfer Between Server to/from NE: TFTP/SFTP

Web Browser to NE: HTTP/HTTPS

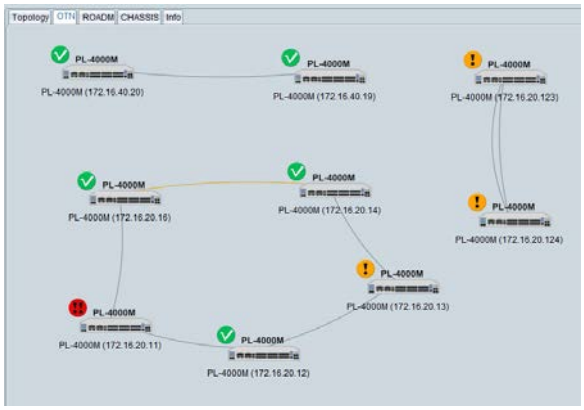
CLI to NE: Telnet/SSH

Syslog Messages from NE to the Server: Syslog

Highlights

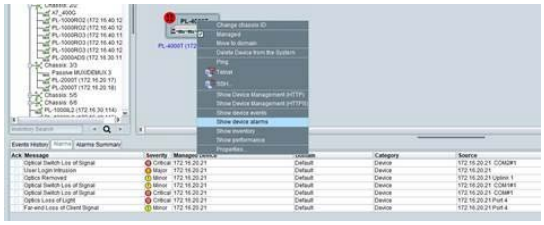
- Hierarchical topology of the devices in the network
- NMS server resiliency
- Network fault management
- Network inventory management
- Task scheduling (upload/download)
- Collects and stores PM counters from all network elements
- Advanced A-Z service management

Topology



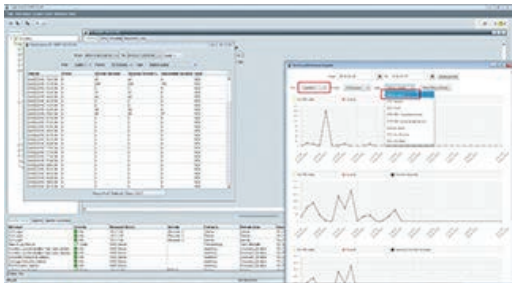
- Allows hierarchical domains in the network
- Automatic network topology discovery
- Manual drawing of the connections between nodes
- Multi-chassis management
- Allow definition of background map

Fault Management



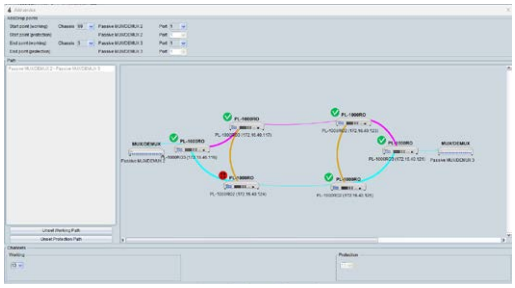
- Displays history of network events
- Shows current alarms
- Supports filtering events and alarms
- Keeps up to 30 days of event history
- Event forwarding to email
- Supports audible alarms

Performance Management



- Collects PM from all devices in the network
- Displays 30 days of history of 15–minute and Day PM data
- Supports configurable graphical view of PM data
- Supports export of PM information into an external file

SMM - Service Management Module



- Supports OTN and channel service provisioning.
- Supports ring, linear add/drop and multi degree topologies.
- Supports provisioning of unprotected, protected and restoration services.

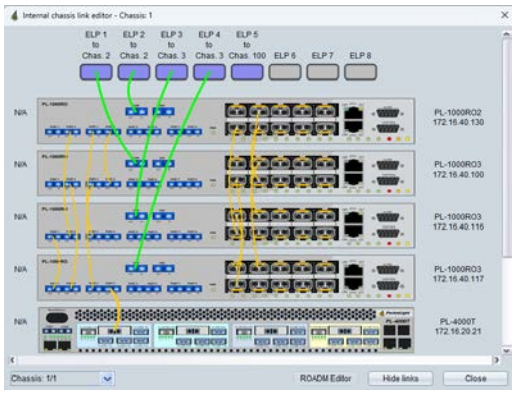
Task Scheduling

- Download of new SW version into groups of device elements
- Upload of configuration files from group of device elements
- Download of configuration files into group of devices
- Downloading license files into group of devices
- Uploading log files from group of devices

Inventory

- Displays inventory of group of network elements
- Filters network elements according to field values
- Supports export of inventory into an external file

Chassis Management



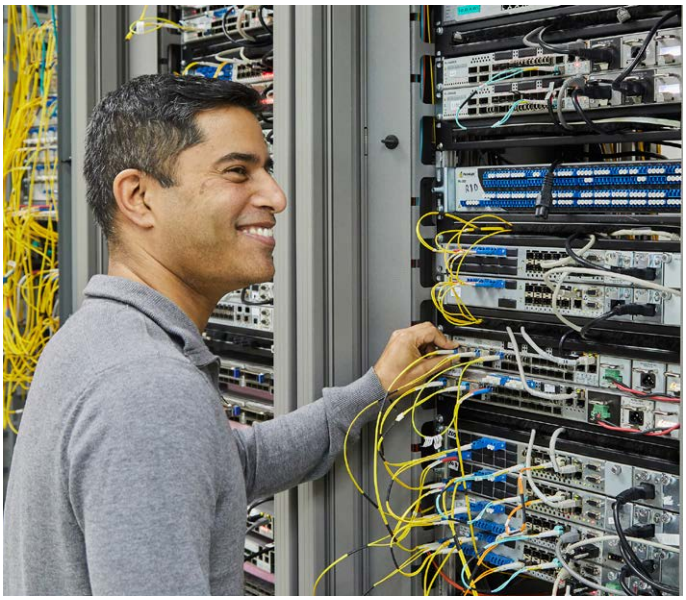
- Supports virtual chassis view with each device information
- Supports drawing the internal connections within the virtual chassis
- Supports full service awareness with advanced chassis service management module (CSMM)
- Automatic consistency check with other service provisioning wizards

For more information please contact us at www.packetlight.com

PacketLight™ NETWORKS

PL-Care Support

Global Professional Services



PacketLight Care Center (PLCC)

PacketLight's optical network solutions are designed and engineered for smooth installation and uninterrupted service

PacketLight Care Center (PLCC) goals are to deliver exceptional support and consulting services to our customers, with the aim of ensuring successful operation and no disruptions to mission-critical operations.

Your Partners

- Our fiber optic professional team is your partner in design, planning, implementation and maintenance of your optical network.
- We are your consultants in optimizing optical networks in order to meet your business objectives and budgets.
- We are here to assist you every step of the way in building a reliable, scalable and cost-effective optical network.
- Our highly trained technical team is here to provide 24/7 support, and ensure your network is always up and running.

Expert Assistance

The PLCC team consists of highly trained support and engineering teams, and certified personnel that serve as the backbone for providing professional and quick resolution where required. We provide our customers with expert consulting and troubleshooting assistance, online tools, and a variety of training programs.

In addition, customers can take advantage of PLCC's tools that monitor and simulate their networks. The service team provides 24x7 support to customers worldwide, with mission critical services when needed.

PLCC Support Packages

PL-CARE1

PL-CARE1 covers initial hardware and software warranty for a period of one year after shipment.

The initial hardware warranty includes repair of faulty PacketLight equipment in accordance with the warranty agreement and PLCC's RMA guidelines.

The initial software warranty includes new software versions and access to the most updated maintenance versions for all PacketLight equipment.

PL-CARE2

PL-CARE2 package includes PL-CARE1 features, as well as a dedicated 24x7 call center for nonfunctioning or faulty PacketLight products, and any other issue that may arise.

PL-CARE3

PL-CARE3 package includes all PL-CARE1 and PL-CARE2 features, as well as spare parts dispatched from local offices or PacketLight headquarters, within the next business day (NBD).

Highlights

- Pre-sales consulting
- 24x7 technical support
- Worldwide training
- Turnkey projects
- Onsite installation

	Software Upgrades	Extended Warranty	8x5 Phone Support	24X7 Phone support	Spares - NBD Delivery
PL-CARE 1	●	●	●		
PL-CARE 2	●	●	●	●	
PL-CARE 3	●	●	●	●	●

Industry Leading Optical Networks Manufacturer

Established in 2000, PacketLight Networks offers a suite of leading CWDM and DWDM solutions for transport of data, storage, voice and video applications over dark fiber and WDM networks.

PacketLight provides the entire optical layer transport solution within a highly integrated compact platform of 1U devices, designed for maximum flexibility, easy maintenance and operation, with real pay-as-you-grow architecture, while maintaining a high level of reliability and low cost.

Our products are easy to install, enable fast network deployment, take up minimal rack space and have low power consumption, all of which significantly reduce OPEX and CAPEX.

Applications

- **Carriers, service providers, and dark fiber providers**
- **Insurance and financial institutions**
- **Strategic government organizations**
- **Research and education**
- **Enterprises and manufacturers**
- **IT integrators and data center providers**
- **Utility companies such as railway and power companies**

Packetlight Partners

PacketLight works with a worldwide network of resellers and partners to provide you with a complete set of network services.

Consultancy and network design

PacketLight's partners offer our clients the benefit of their optical networking expertise by providing consultancy services that enable enterprises to understand how to implement a fiber optic network that best fits their organization.

Installation and deployment services

Our partners bring a wealth of experience from the optical networking market and have successfully deployed hundreds of PacketLight solutions worldwide.

Many partners hold close relationships with local fiber providers and are able to source out dark fiber for our clients, providing a full end-to-end optical solution.

Managed services

PacketLight partners offer deployment services as well as network monitoring services, fully managed from their network operation center (NOC).

For more information please contact us at www.packetlight.com

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