PacketLight™ NETWORKS

Solutions for Carriers

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About PacketLight

- Established in 2000
- Develop state-of-the-art optical transport systems
  - DWDM/CWDM
  - OTN layer
  - Layer-1 encryption (FIPS 140-2 certified, CCEAL2 certified), QKD
- Solutions for data, storage, voice and video transport applications
- Compliant with international standards
- Green products
- Design & manufacturing in Israel
- Member of the RAD group

COMMON CRITERIA CERTIFIED EAL2+

FIPS VALIDATED 140-2

Certificate 4582

The RAD Group

Coordinated Strategy | Shared Sales Channels | Joint Development & Technology

5,310
employees

$
$1.8B
revenue in 2022

More than 100
startups in 40 years

RAD
Your Network's Edge®
The Service Assured Solutions Company
Established: 1981

PacketLight NETWORKS
DWDM and OTN Solutions
Established: 2000

RADWIN
Sub-6GHz Wireless Backhaul
Established: 1997

RAD COM
Network Test Solutions
Established: 1991*

radware
Integrated Application Delivery
Established: 1997*

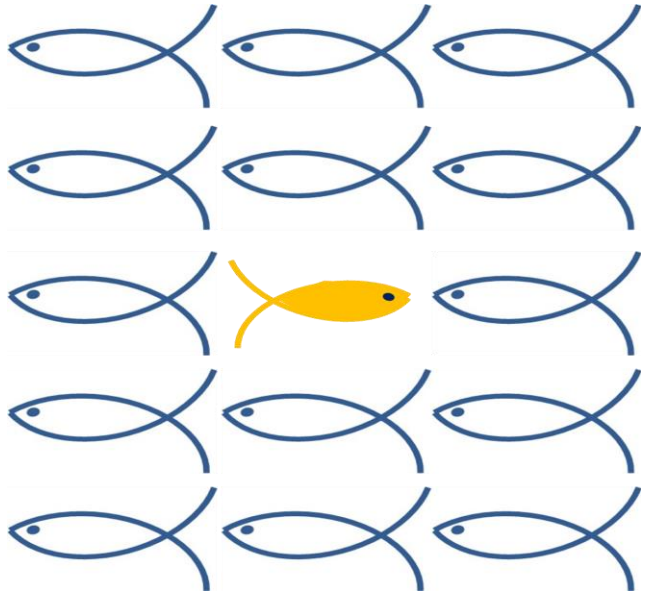
CERAGON
Wireless Mobile Backhaul
Established: 1996*

Bynet
DATA COMMUNICATIONS LTD
Group Distributor in Israel and Worldwide System Integrator
Established: 1975

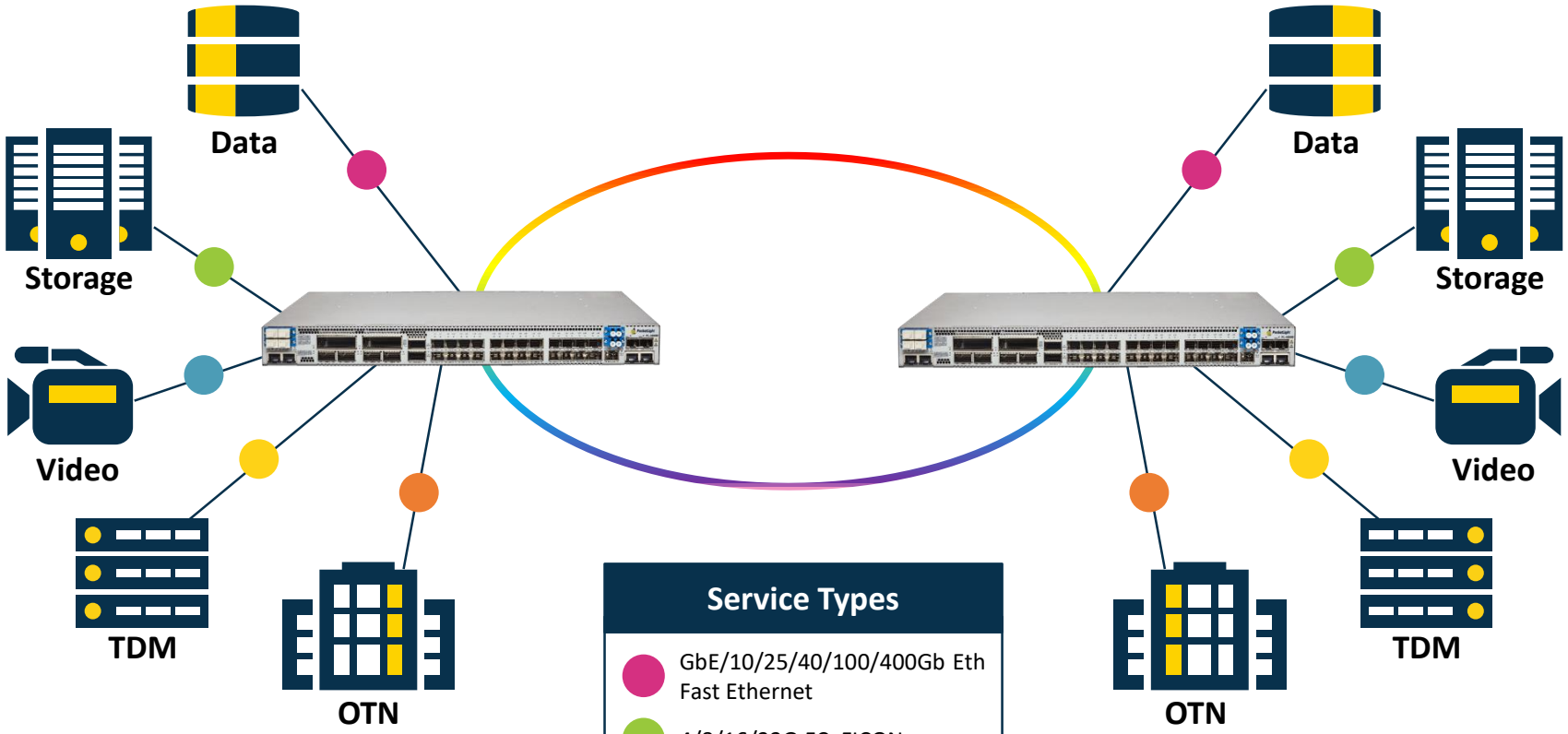
*Publicly Traded Company

PacketLight Differentiators

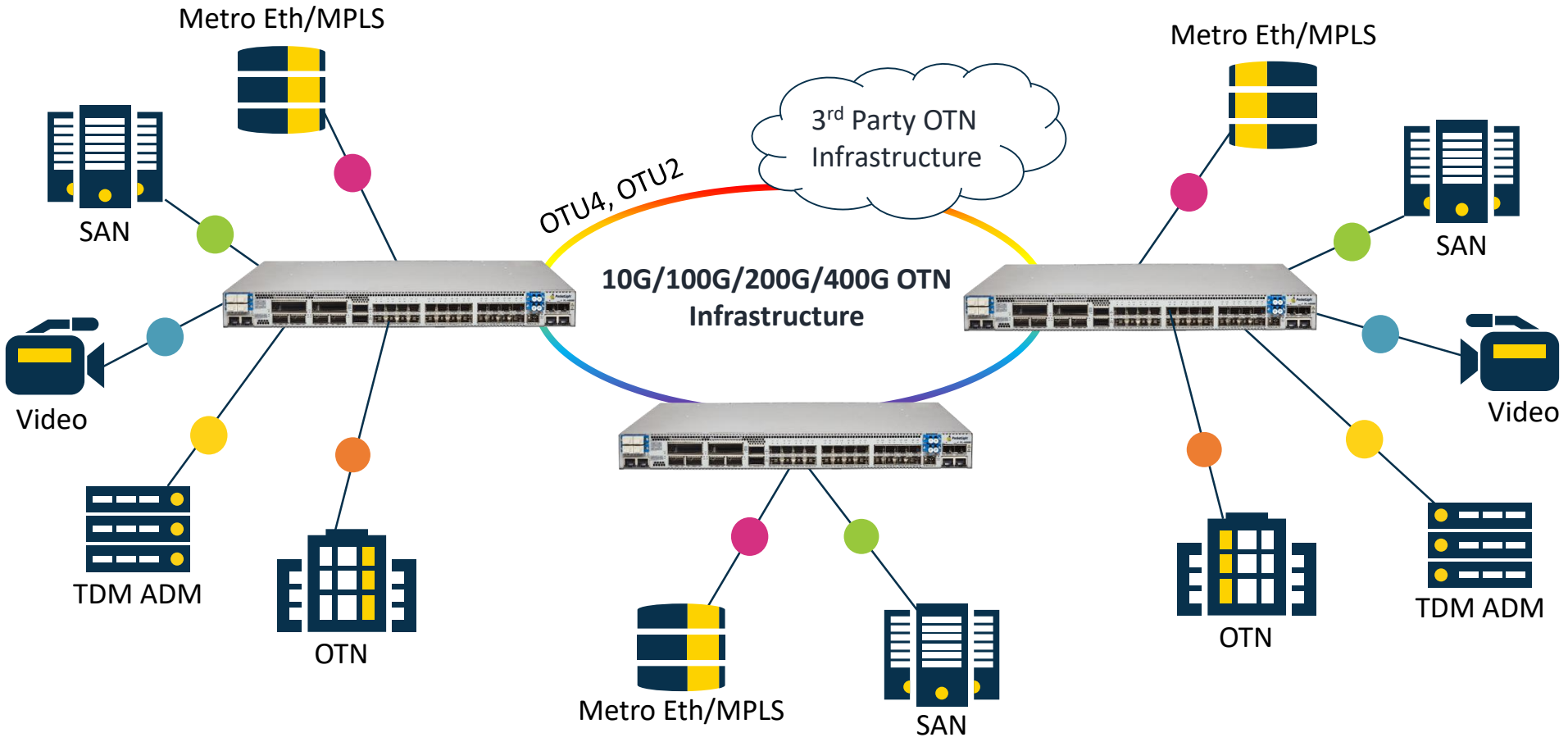
- Compact, low power 1U solutions
- Carrier-class feature set
- Flexible mix of services
- No port licensing
- Simple deployment and configuration
- Cost-effective stackable solution
- Transports up to 400G per wavelength



Building Agile DWDM, CWDM Infrastructure



Building OTN + DWDM Metro/Access Networks



Service Types

- GbE/10/25/40/100/400Gb Eth Fast Ethernet
- 4/8/16/32G FC, FICON
- 3G HD-SDI, HD-SDI, SD-SDI, 12G-SDI, DVB-ASI
- SONET, SDH/PDH, STM-1/4/16/64, OC-3/12/48/192
- OTU2/OTU2e/OTU3/OTU4

Product Portfolio

Transponders

PL-4000T: 4 x 400G Transponder/Muxponder

PL-4000G 4.8T Transponder

PL-2000T: 800G Transponder

PL-1000TN: 6 x 8G/10G OTN Services

PL-1000TE: 8 x 1G-16G services

PL-8000T: 3.2T Transponder/ADM

COMING SOON

Muxponders

PL-4000M: 600G Muxponder

PL-2000GM: 2x100G Long Haul ADM

PL-2000ADS: 200G ADM Short Haul

PL-2000M: 200G Muxponder/Transponder

PL-2000: 20G ADM

PL-8000M: 2x800G Muxponder

COMING SOON

Infrastructure

PL-1000D: Diagnostics

PL-1000RO: WSS ROADM

PL-1000IL: Optical Amplifiers

PL-1000R: Raman Amplifier

PL-300: Passive Solutions

Comprehensive Feature Set

Disaggregated Stackable Chassis

OTN Layer

Up to 96 WL Mux/Demux

EDFA, Raman

Remote Management OSC/GCC

Layer-1 Encryption QKD

FlexGrid WL

Network Diagnostics

Muxponders Family

Optical Protection

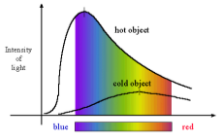
Single or Dual Fiber

MNG Firewall

800G per λ

LightWatch NMS SNMP MIB REST / NETCONF

Performance Monitoring

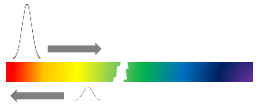


CWDM/DWDM

ROADM

Network Protocols

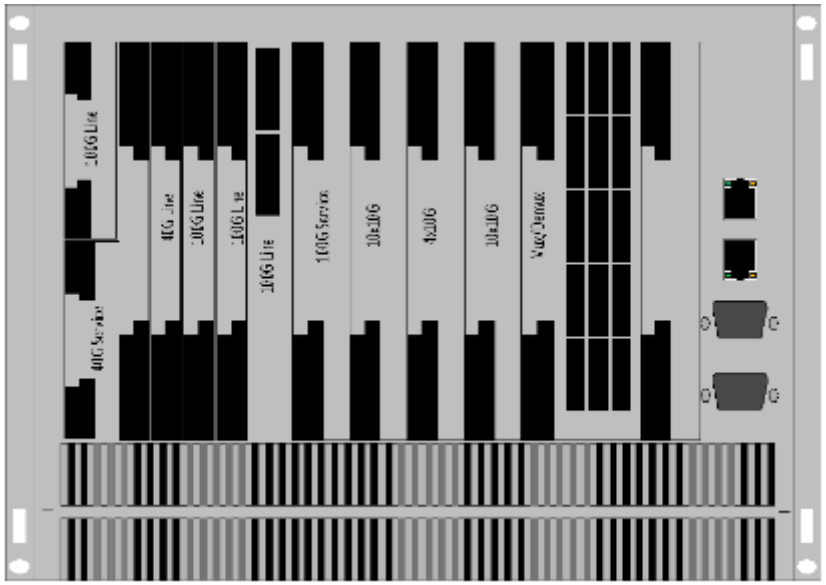
OSA



OTDR OSC OTDR

Chassis vs. Stackable

- Consumes space and high energy
- Cannot adapt to previously existing rates
- Needs to be replaced to adapt to newer, higher capacity services



- Easily supports existing infrastructure
- Quickly add higher capacity services
- Easy to adapt new WDM technologies
- Unlimited growing path

Stackable approach provides more flexibility for future growth and faster ROI

PacketLight Advantages

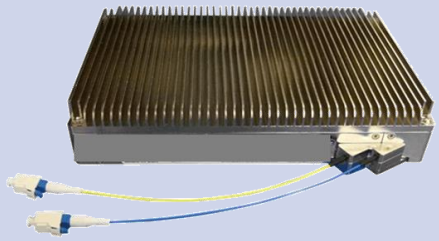
- Tailored to customer needs
- Small footprint, disaggregated, stackable 1U architecture
- Minimal initial investment, maximum future growth
- Deliver network solutions quickly and seamlessly
- Supports flexible mix of data, storage, video, and services
- Interoperable with any 3rd party switch/router and OTN
- Plug-and-play setup and configuration
- 24x7 support from RFP to post-sale
- Supports different network topologies and protection schemes
- Low power consumption and low latency

Selected Products

PL-4000T 1.6T 4 x 400G Transponder/Muxponder

- 4 x 400G slices of transponders/muxponders
- Operation modes for each 400G slice:
  - 4 x 100G muxponder
  - 1 x 400G transponder
- Client optical modules per 400G slice: 4 x 100GbE QSFP28, 400GbE QSFPDD
- Uplink optical modules: 400G CFP2-DCO or 400G QSFPDD-DCO
- Client interfaces: 100GbE, OTU4, 400GbE
- Remote management via GCC in-band channel or OSC
- Encryption per service or uplink
- Performance monitoring on all interfaces
- Hot swappable 2 x AC or DC PSU and fan modules
- Integrated optional optical modules:
  - Two EDFAs
  - 4ch mux/demux
  - Optical switch

400G Optical Modules

	New CFP2/QSFP-DD 400G Modules	Traditional non-MSA 400G Modules
		
Power consumption	<24W	>65W
Pluggable from panel	yes	no
Standard base	OFEC/CFEC interoperability	proprietary
Multiple MSA sources	yes	no

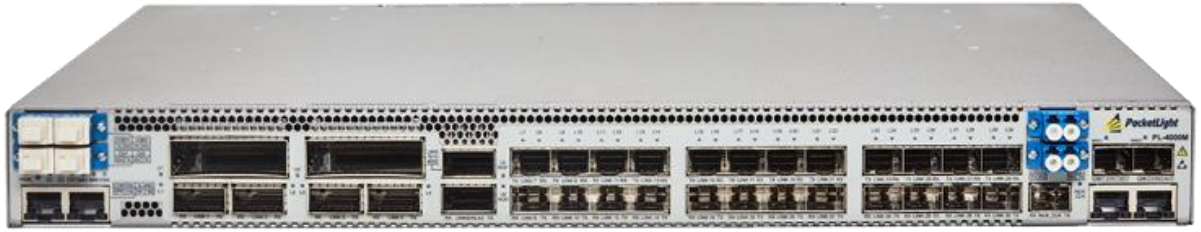
PL-4000G: 4.8T Transponder

- 4.8T solution based on pluggable QSFP-DD-DCO uplinks up to 120km
- Transponder options:
  - 12 x 400GbE over 12 x 400G uplinks
  - 48 x 100GbE over 12 x 400G uplinks
- Optional integrated DWDM mux/demux, 2 x EDFAs, optical switch
- Services:
  - 100GbE based on QSFP-DD optics
  - 400GbE based on QSFP-DD optics
- Performance monitoring on all interfaces
- OSC remote management support
- Dual AC/DC pluggable power supply and fan unit

PL-2000T: 800G Transponder

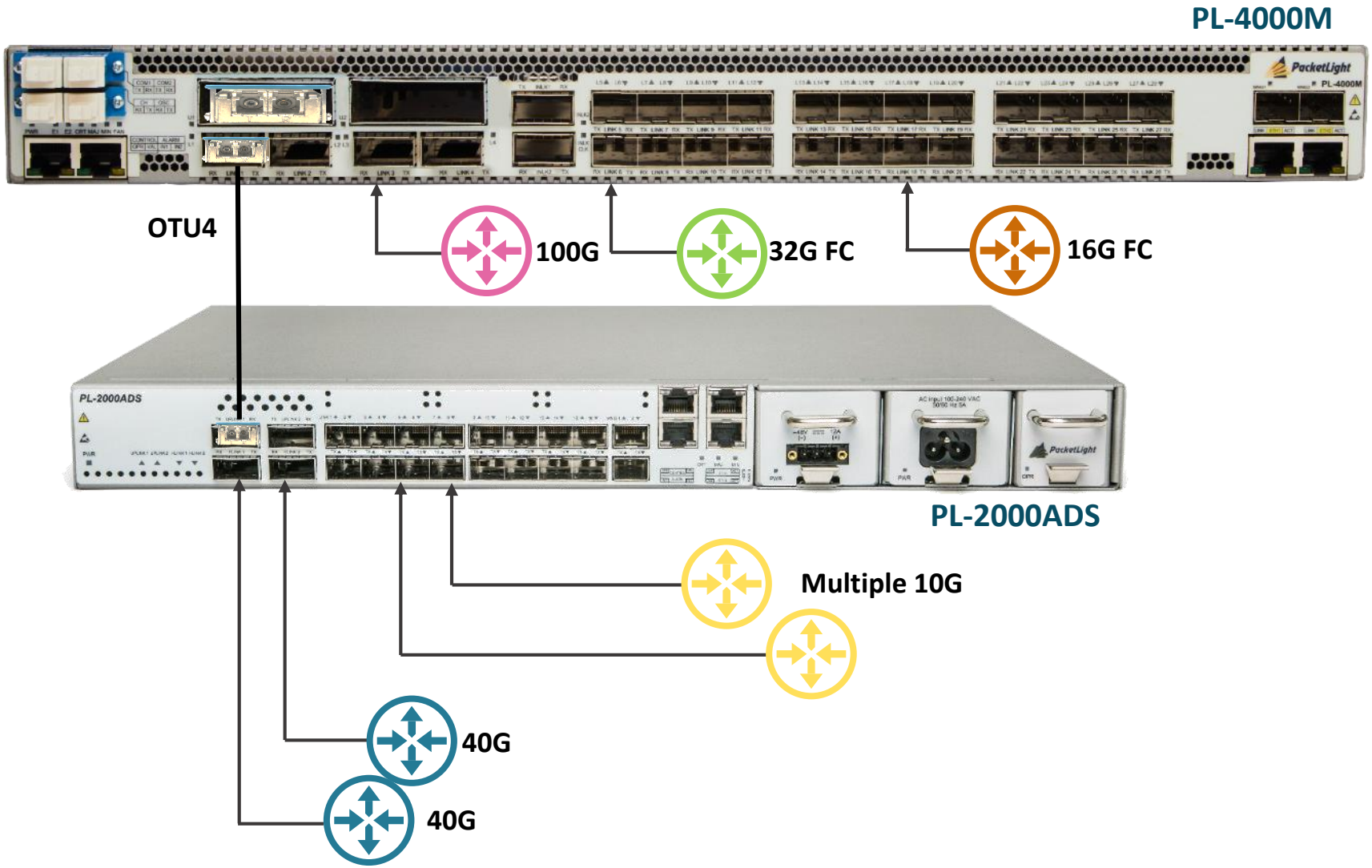
- Pluggable 200G digital coherent optical modules
- Operation modes:
  - 100G DP-QPSK long haul
  - 200G 8/16 QAM metro
- Supported client: 100G LAN, OTU4
- Standard MSA pluggable:
  - CFP2 DCO tunable DWDM for 100G/200G line interface
  - QSFP SR4/LR4/ER4/CWDM4 for 100G client interface
- Optional integrated Mux/DeMux , EDFAs and OSW
- Layer-1 encryption per service
- Performance monitoring on all interfaces
- Dual hot swappable AC/DC PSU and fan unit

PL-4000M: 400G Muxponder



- Supported clients: 10/25/100GbE, 16G/32G FC, OTU4
- Standard MSA optical pluggable modules:
  - Uplinks: dual 400G CFP2-DCO
  - Clients: 4 x QSFP28 for 100GbE clients, 24 x SFP+/28 for other clients
- Optional integrated two EDFAs and an OSW
- Remote management via in-band GCC or out-of-band OSC
- Encryption per service or uplink
- Performance monitoring on all interfaces
- Dual hot swappable AC/DC PSU and fan unit
- LightWatch support for end-to-end provisioning

Adding 40G/8G & FC



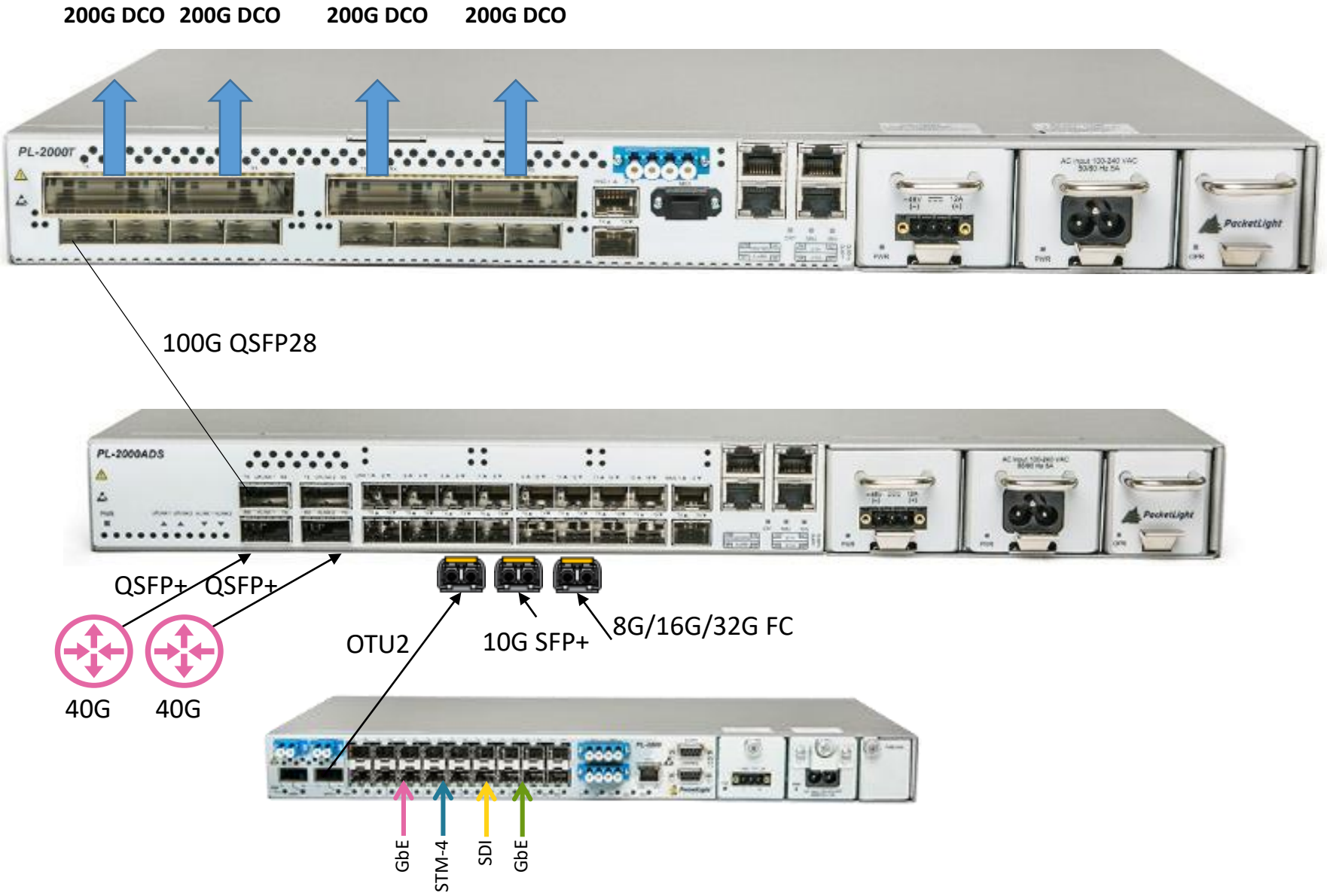
PL-2000M: 200G Single Wavelength Muxponder

- High capacity 200G next generation OTN muxponder
- Flexible configurations for different protocols and rates
- Supported client protocols:
  - 10/40/100Gb Ethernet, 8/16/32G FC, OTU2/OTU2e/OTU4, STM-64/OC-192
- Single coherent CFP2 uplink operating at:
  - 200G (16QAM) - ~600 km
  - 100G (QPSK) - ~4000 km
- Layer-1 encryption per service or uplink (optional), FIPS 140-2 and CCEAL2 certified
- Integrated optical amplifiers and optical switch (optional)
- Performance monitoring on all interfaces
- Dual hot-swappable AC/DC PSU and fan unit

PL-2000ADS: 200G Short Haul ADM

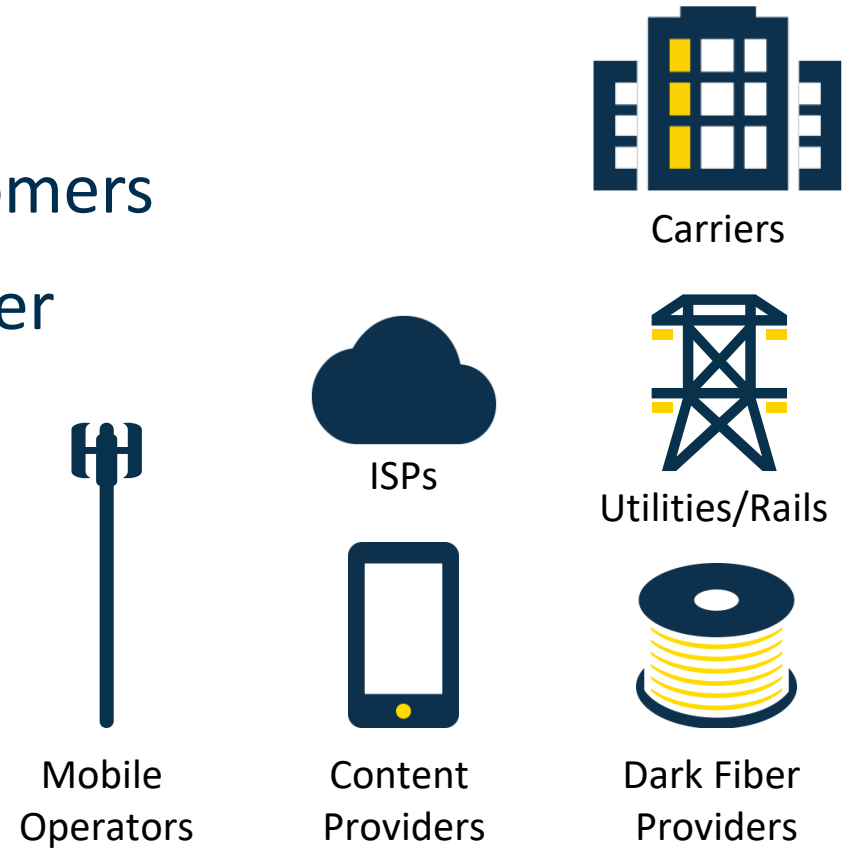
- Configurable muxponder options:
  - 100G ADM solution with ODU2 cross connect
  - 100G muxponder solution with 1+1 uplink protection
  - 100G transponder + sub-100G muxponder
- 100GBase- ER4/LR4/SR4 transponder
- Dual uplink based on QSFP28
- Pluggable optics for 100G line and 8/10/16/32/40/100G client interfaces
- Layer-1 encryption per service or uplink (optional)
- Performance monitoring on all interfaces
- In-band GCC or OSC remote management support
- Dual AC/DC pluggable power supply and fan unit

Scalable OTN Solution for Any Service at Any Rate



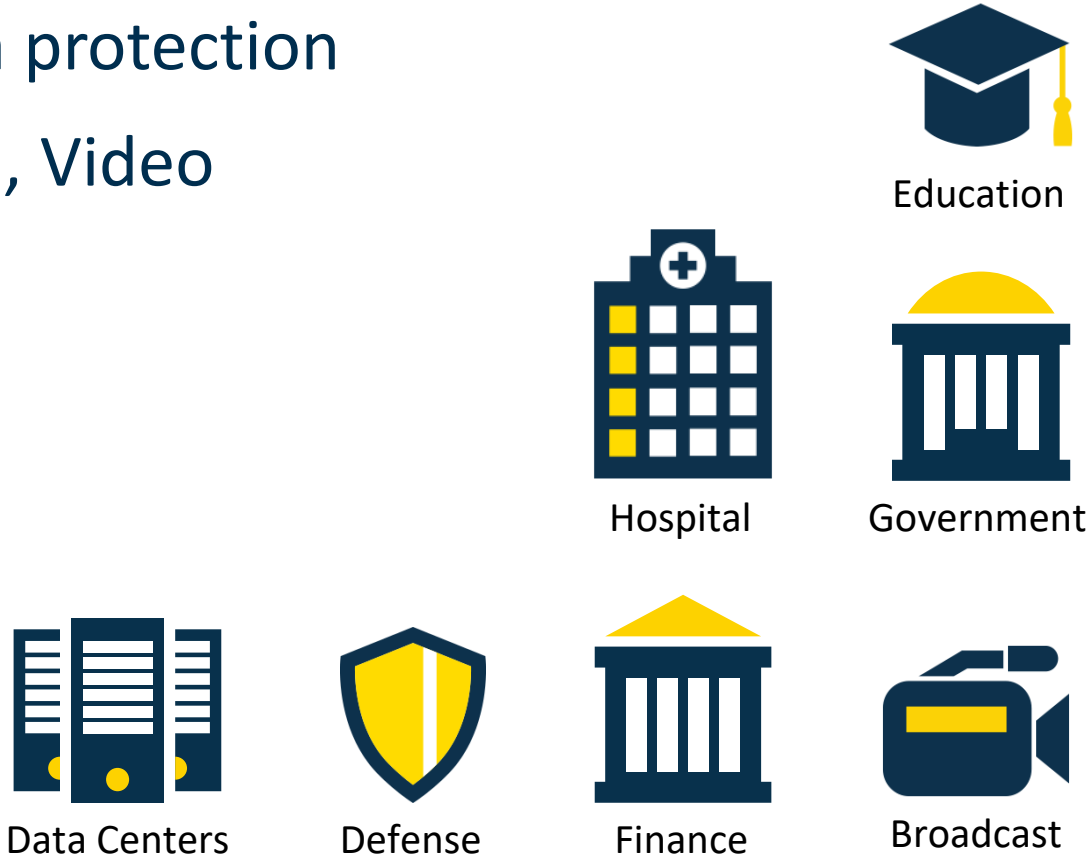
Applications

- High capacity, metro and long-haul backbone
- Extend existing backbone – with alien wavelength solution
  - Relieve bottlenecks
  - Encrypt existing OTN network
- Offer managed services for enterprise customers
- Enabling encrypted services over optical fiber



Applications for Enterprise

- Data center interconnect (DCI)
- Connectivity between office branches
- Layer-1 Optical encryption for data protection
- Mix of services - Ethernet, FC, STM, Video
- Build easy to manage backbones
- Campus / ring connectivity



Why PacketLight for Carriers?

- State-of-the-art technology
  - High capacity
  - Standard OTN
  - Carrier rate feature set
  - Remote management and monitoring
  - Easy to install and maintain - do it yourself
  - Relieve bottlenecks
  - Enable to add encryption services
  - Flexible solutions

COMMON CRITERIA CERTIFIED EAL2+

FIPS VALIDATED 140-2

Certificate #3529

Selected Case Studies

Case Study: Alternative Service Provider

Challenges

- High capacity cross-region backbone
- Transmit 100GbE
- Scalable

Solution

- PL-2000T 800G transponder in 1U
- Option to expand up to 1.6T
- Service access to several add/drop points

Success!

- Easy and quick expansion
- Low CAPEX and OPEX
- Scalable per customer needs
- Simple maintenance and support

Where: Austria
What: Alternative Carrier
Services: 8 x 100Gb Ethernet
Distance: 1,000+ km

Case Study: Country-wide Utility

Challenges

- Infrastructure upgrade
- Create multi-location-based network
- Support 10G MLPS
- Scalable

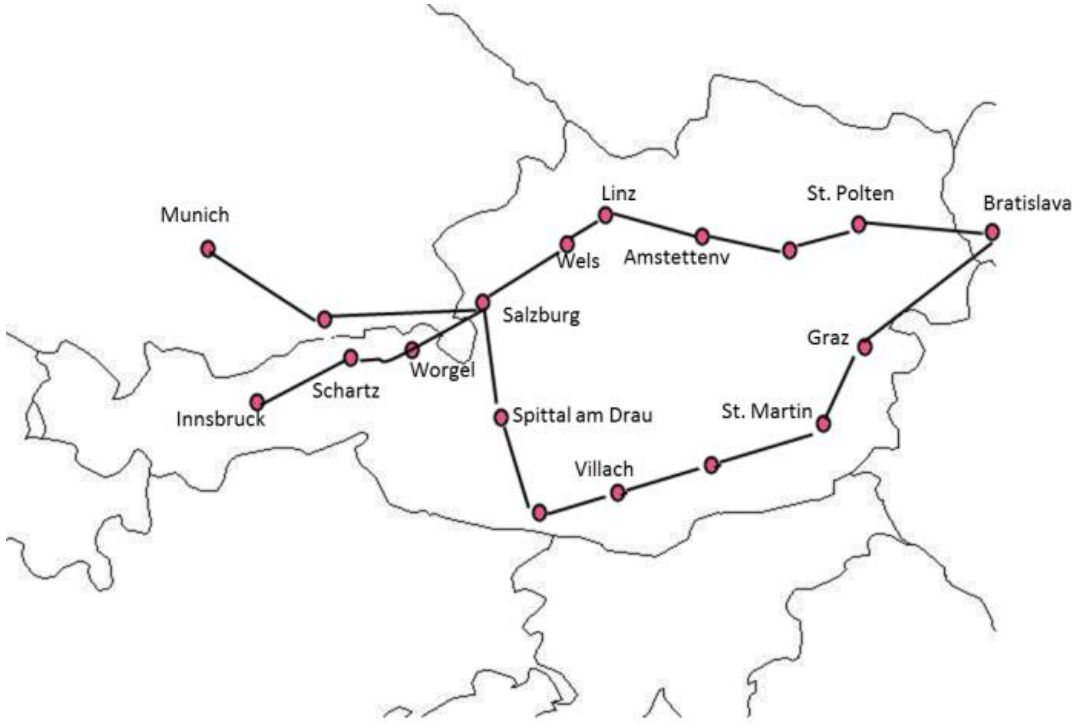
Solution

- 10G DWDM 1U transponder
- 10GbE throughput
- Simple configuration
- Upgrade – add pluggable XFPs or devices

Success!

- Fast and simple deployment
- Low Latency
- Managed Layer-1 infrastructure
- Simple future growth
- Reduced operating costs

Where: Austria
What: IT&Tel – Utility company
Services: 8 x 10Gb Ethernet
Distance: 10 locations



Case Study: Long-haul Link

Challenges

- 100G network over 4,000 km 10G network
- Low latency
- Compact equipment

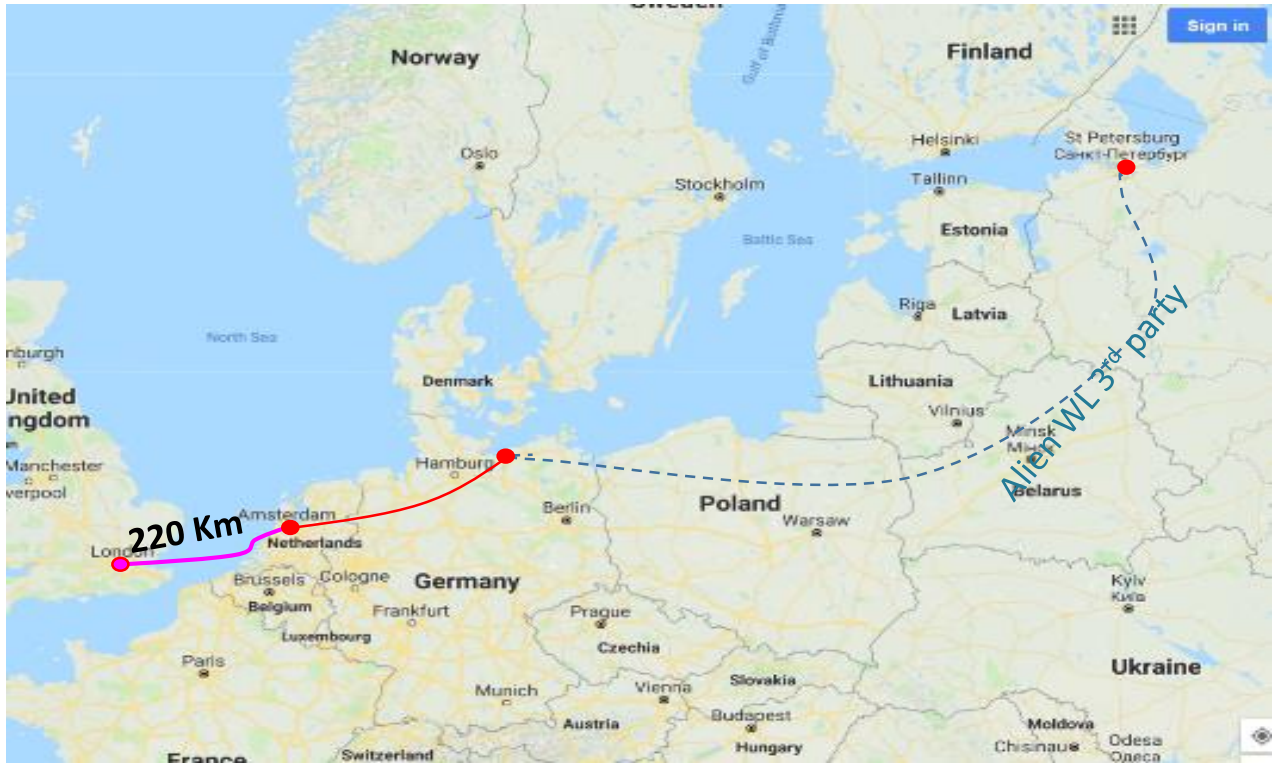
Solution

- 1,100 km 100G PtP link
- 2000 km alien wavelength (PL-2000AD)
- Partially submarine (220 km) - Raman

Success!

- Easy and fast deployment
- Low latency
- Low power consumption
- Scalable
- Simple maintenance and support

Where: Russia
What: RETN & Avelacom - international backbone ISP
Link Type: Long-haul PtP
Distance: 4,000 km, 18 nodes



Case Study: Alternative Telecom Provider

Challenges

- Build joint private and government-owned networks transmitting 10Gb Eth
- Long-haul 2,500 km country-wide network

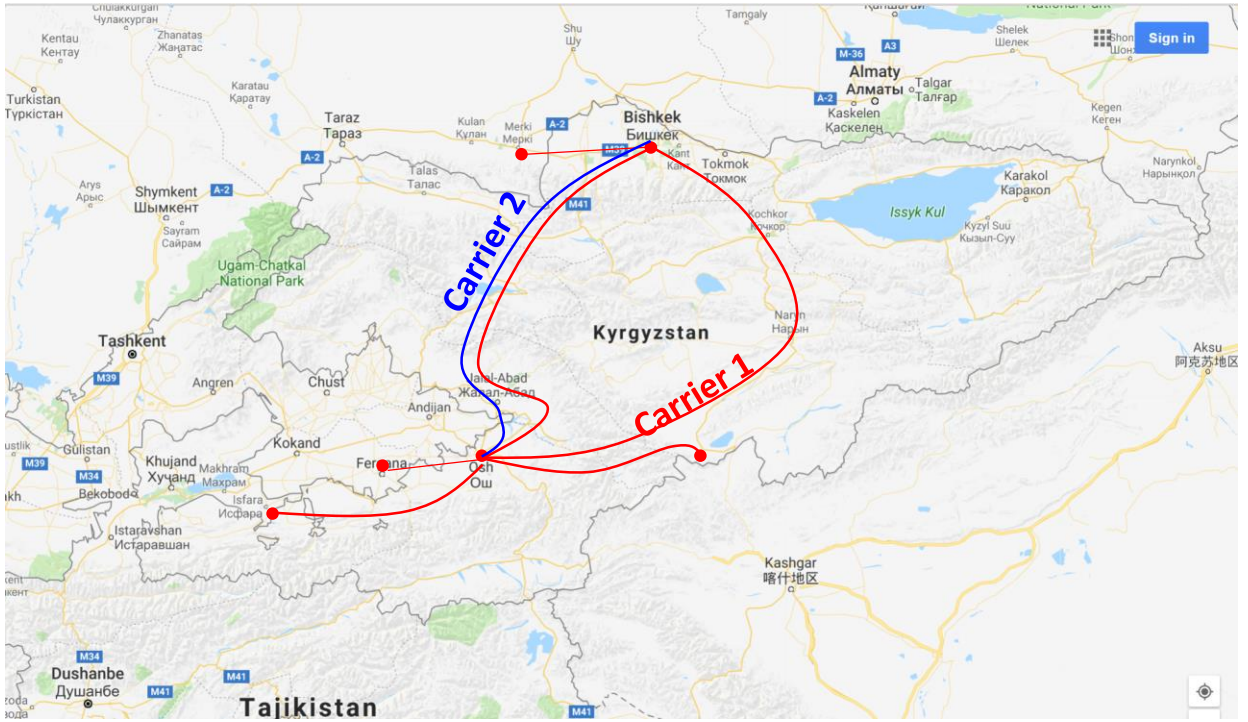
Solution

- PL-2000 20G ADM built 10G backbone enabling Ethernet and TDM (STM) services
- Two carriers network, one privately owned and second government-owned

Success!

- Easy and quick deployment
- Low OPEX
- Scalable per customer needs (upgradeable to 100G network)
- Simple maintenance and support

Where: Kyrgyzstan
What: Elcat, Kyrzys telecom
Services: 10Gb Ethernet, STM-16, STM-64 OTN backbone, 100G-ready
Distance: 2,500 km link



Case Study: Internet Service Provider

Challenges

- Expand 10GbE services to 100GbEth
- No replacing of existing infrastructure
- Quick turn-up of new services
- Avoid network downtime

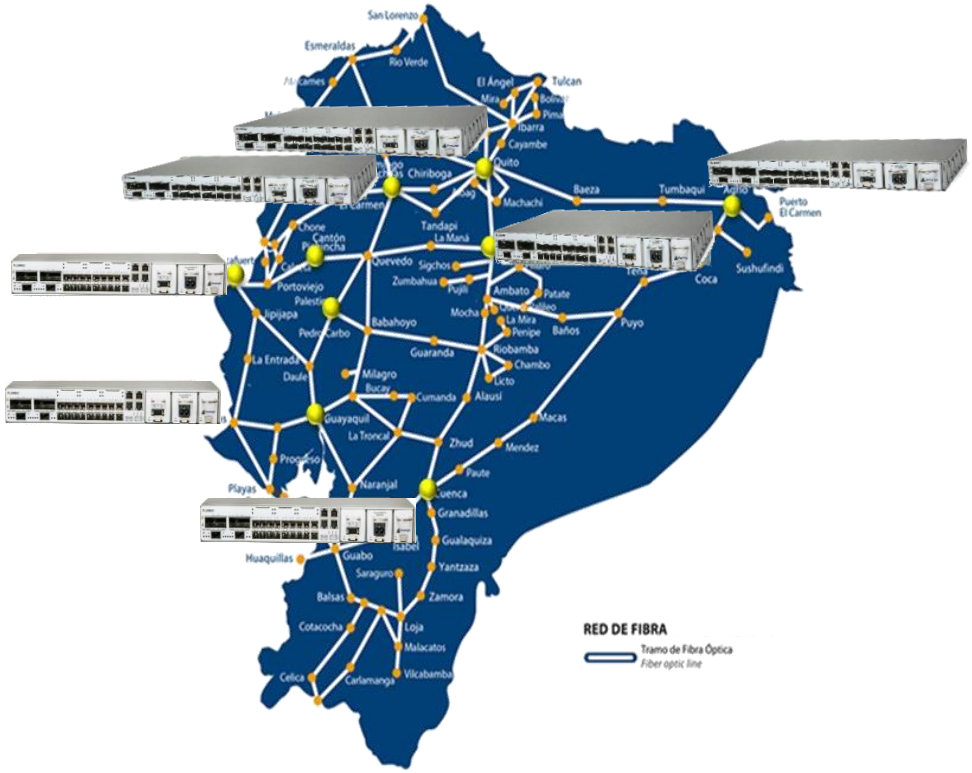
Solution

- 200G Long Haul ADM (PL-2000AD) and EDFAs
- Agile 100G backbone infrastructure
- No changes to existing backbone
- No downtime

Success!

- Easy to install and maintain
- Low initial CAPEX
- Low CAPEX
- Scalable
- Simple maintenance and support

Where: Ecuador
What: Telconet – Main ISP in Ecuador
Solution: Expanding existing 10G services to 100G services
Distance: Country-wide



EMS/NMS and GUI

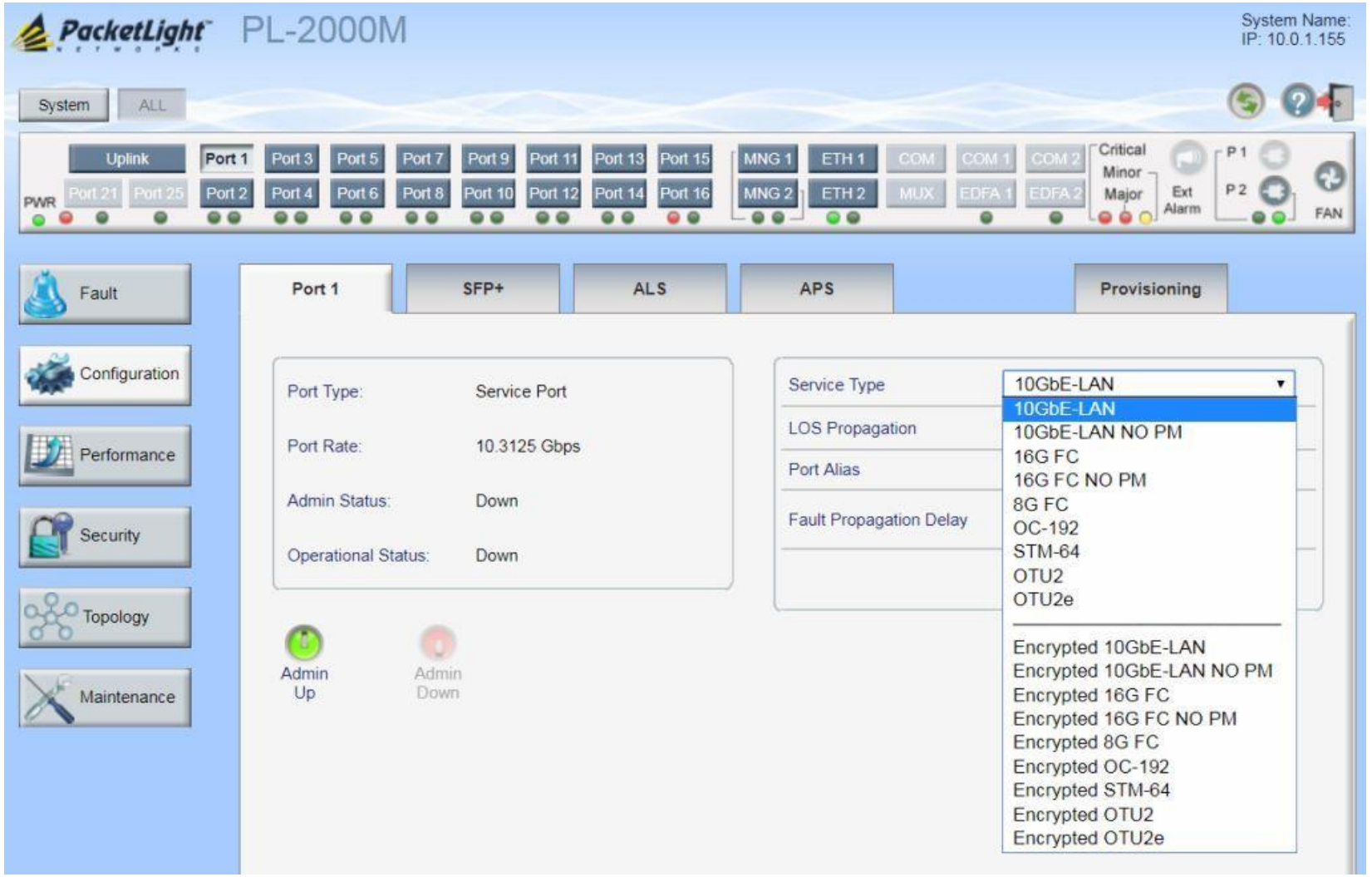
Web-based Management System

- Web-based management system
- Simple common configuration process for all product families
- Provides performance monitoring for all optical modules, Client (service) types and Line (uplink)
- Built-in troubleshooting tools both link and service sides
- Network topology view
- Maintenance services with, SW download, hot and cold restart
- Full alarm and event history, and activities log
- No extra licensing or server cost

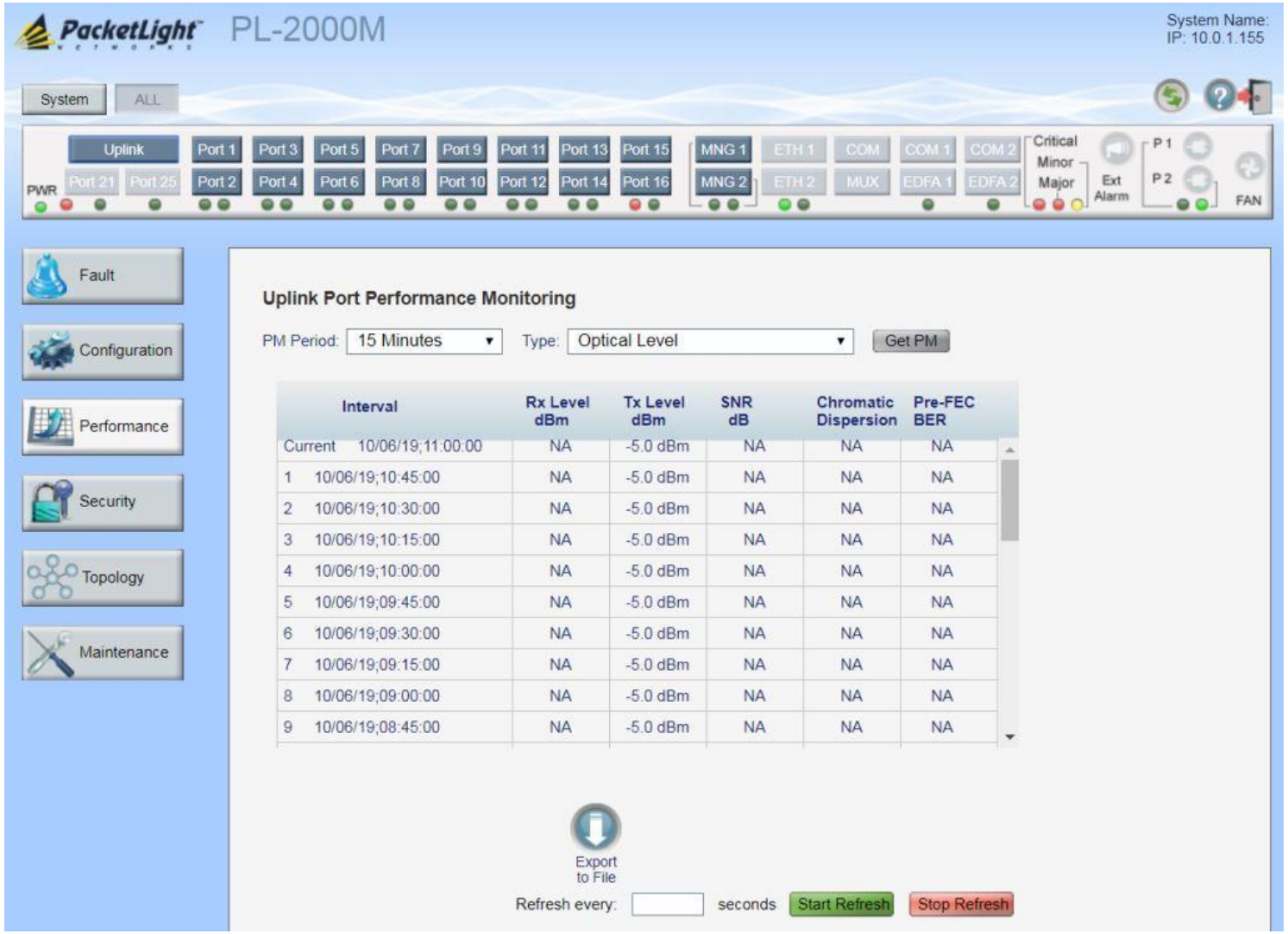
PL-2000M Uplink Configuration

PL-2000M Uplink CFP2 Configuration

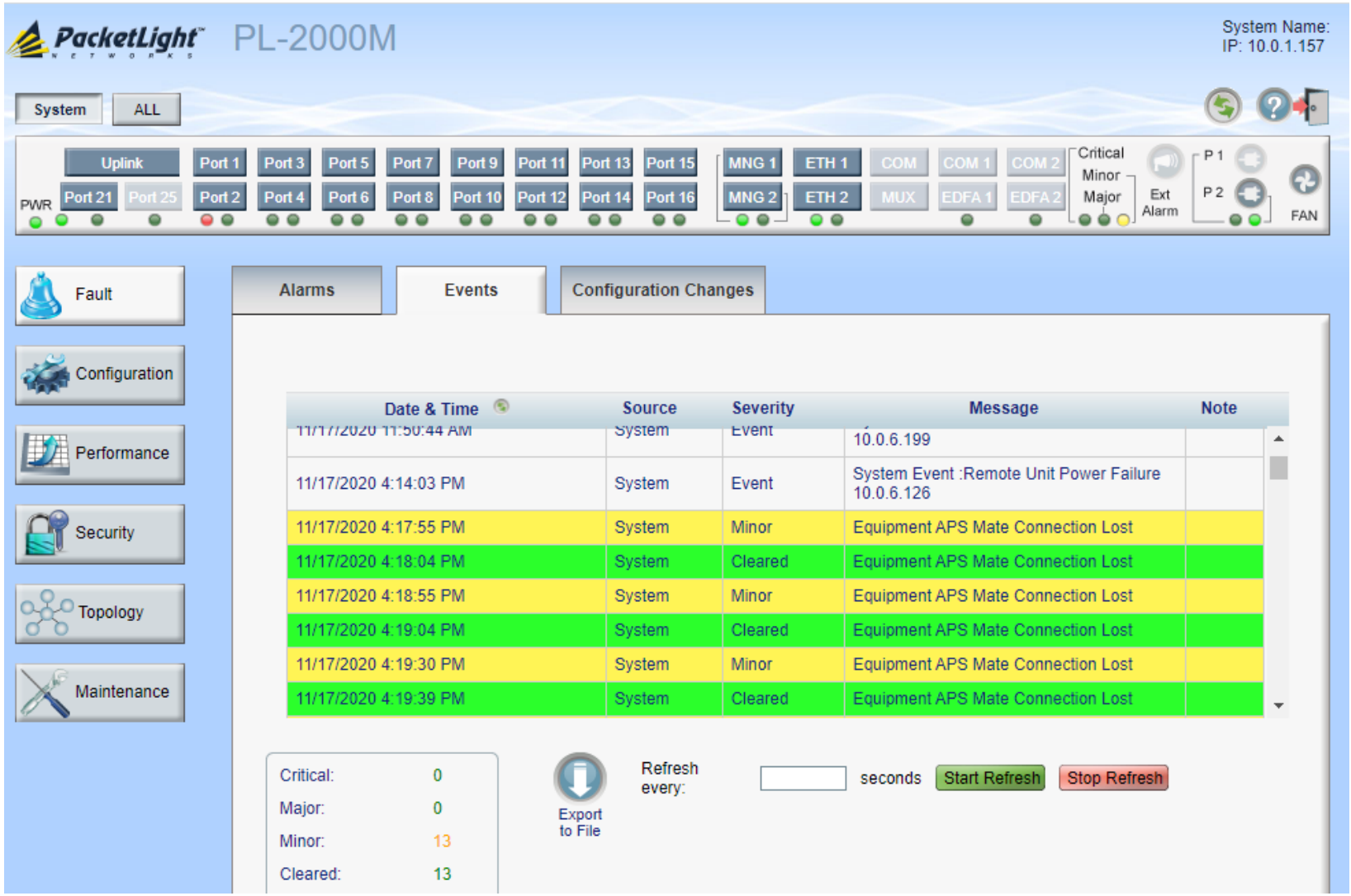
PL-2000M Port Configuration



PL-2000M Uplink Performance Monitoring



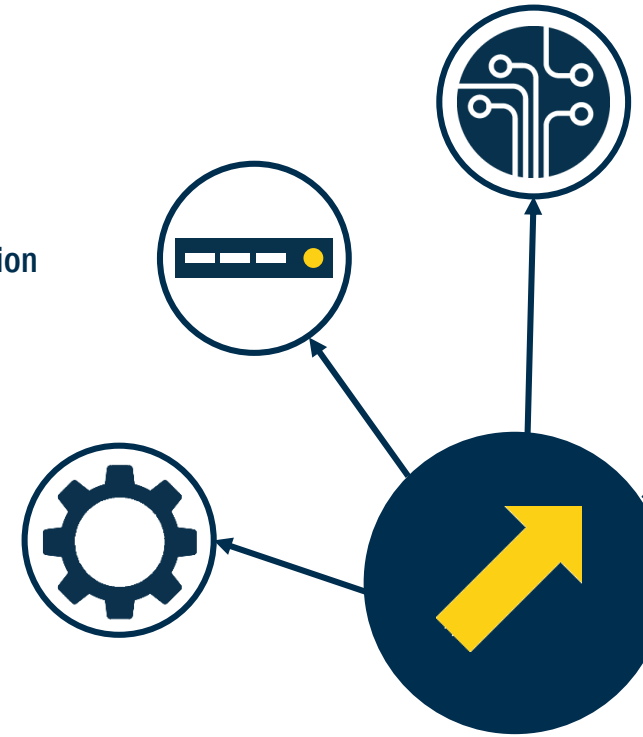
PL-2000M Events and Alarms



PacketLight Advantages

The Technology
- State-of-the-art WDM technology
- Carrier grade features
- All building blocks for any WDM solution
- Advanced security and encryption
- Adding features per customer needs
- Flexible mix of services
- Low latency

Size
- Saves rack space
- Lower power consumption



Support
- Support from RFP to post-sale
- 24x7 technical support

Ease of Use
- No need for a WDM expert
- Easy to Install, maintain and configure

Fast ROI
- Minimal initial investment
- Maximum future growth
- Tailored to customer needs

PacketLight™ NETWORKS

20 Years of Technology Excellence