



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



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

Your Network's Edge®

The Service Assured
Solutions Company
Established: 1981

DWDM and OTN
Solutions
Established: 2000

Sub-6GHz Wireless
Backhaul
Established: 1997

Network Test
Solutions
Established: 1991*

Integrated Application
Delivery
Established: 1997*

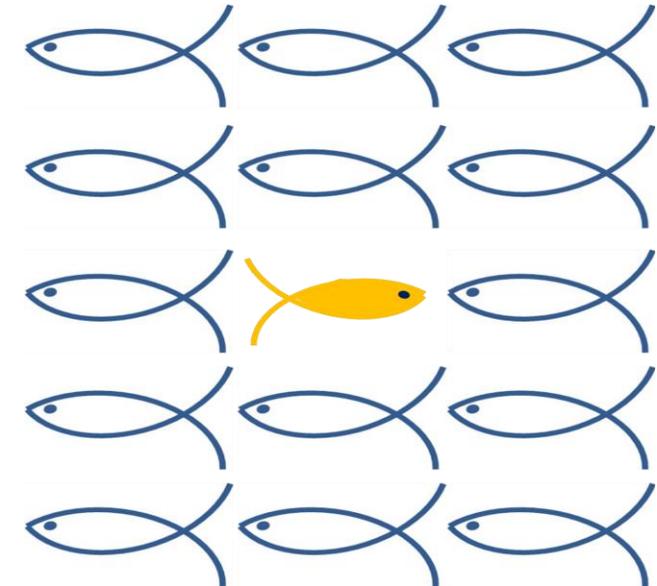
Wireless Mobile
Backhaul
Established: 1996*

Group Distributor in
Israel and Worldwide
System Integrator
Established: 1975

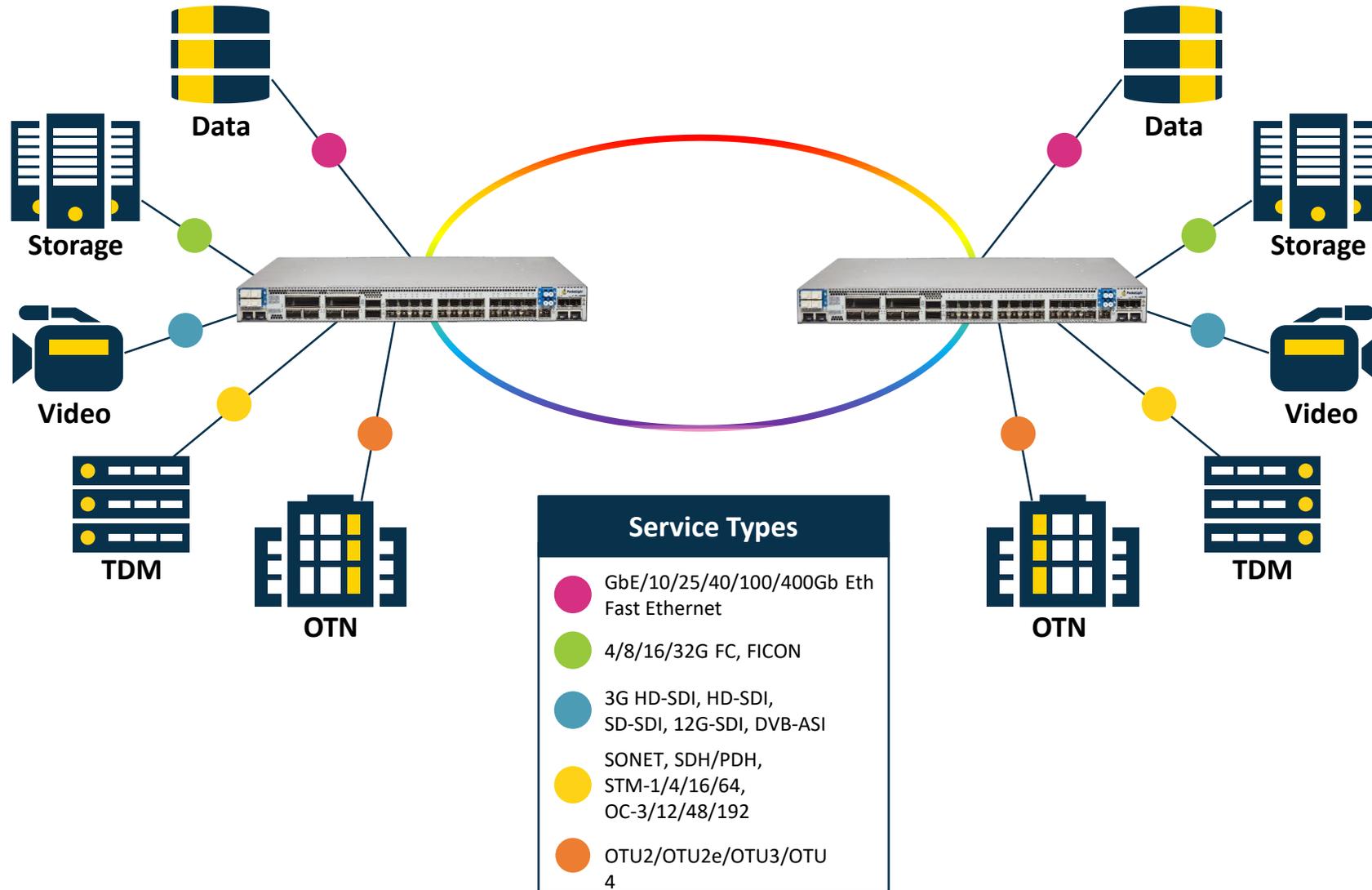
*Publicly Traded Company

PacketLight Differentiators

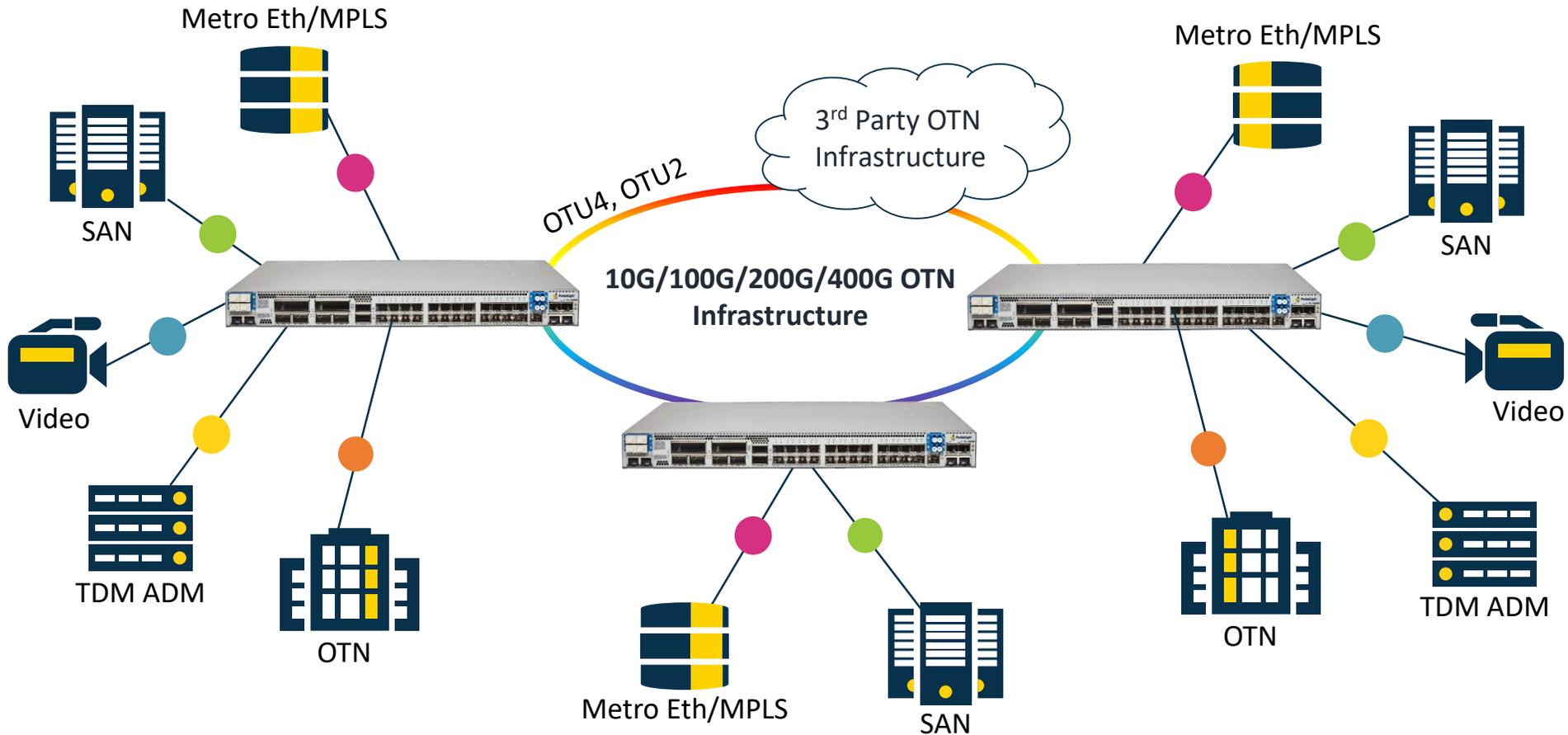
-  Compact, low power 1U solutions
-  Carrier-class feature set
-  Flexible mix of services
-  No port licensing
-  Simple deployment and configuration
-  Cost-effective stackable solution
-  Transports up to 400G per wavelength



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



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



Infrastructure

PL-1000D: Diagnostics



PL-1000RO: WSS ROADM



PL-1000IL: Optical Amplifiers



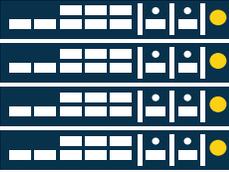
PL-1000R: Raman Amplifier



PL-300: Passive Solutions



Comprehensive Feature Set



Disaggregated
Stackable Chassis



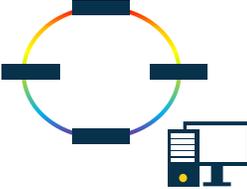
OTN Layer



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



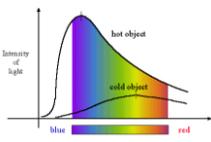
800G per λ



LightWatch NMS
SNMP MIB
REST / NETCONF



Performance
Monitoring



CWDM/DWDM



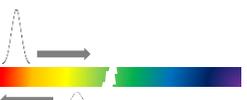
ROADM



Network
Protocols



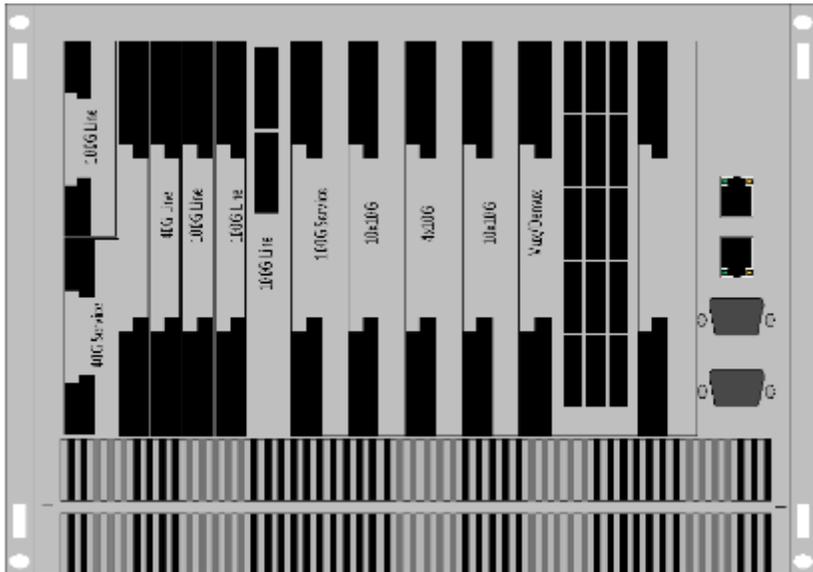
OSA



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

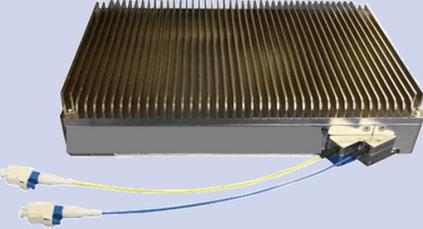


PL-4000T 1.6T 4 x 400G Transponder/Muxponder



- 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



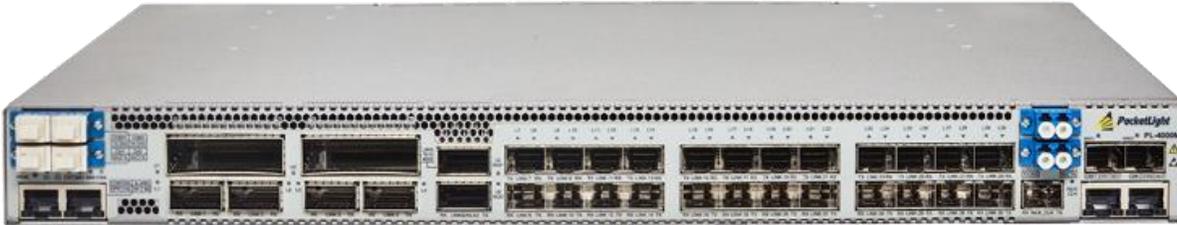
- 4.8T solution based on pluggable QSFP-DD-DCO uplinks up to 120km
- Transponder options:
 - 12 x 400GbE over 12 x 400G uplinks
 - 48 x 100GbE over 12 x 400G uplinks
- Optional integrated DWDM mux/demux, 2 x EDFAs, optical switch
- Services:
 - 100GbE based on QSFP-DD optics
 - 400GbE based on QSFP-DD 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

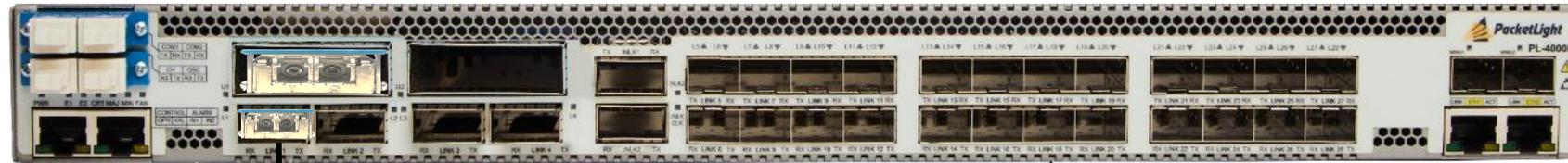
PL-4000M: 400G Muxponder



- 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-4000M



OTU4



100G



32G FC



16G FC



PL-2000ADS



Multiple 10G



40G



40G

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

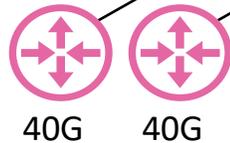
200G DCO 200G DCO 200G DCO 200G DCO



100G QSFP28



QSFP+ QSFP+



40G 40G

OTU2

10G SFP+

8G/16G/32G FC



GbE

STM-4

SDI

GbE

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



Education



Hospital



Government



Data Centers



Defense



Finance



Broadcast

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



Certificate #3529



Selected Case Studies



Case Study: Alternative Service Provider

Challenges

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

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

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



Case Study: Country-wide Utility

Challenges

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

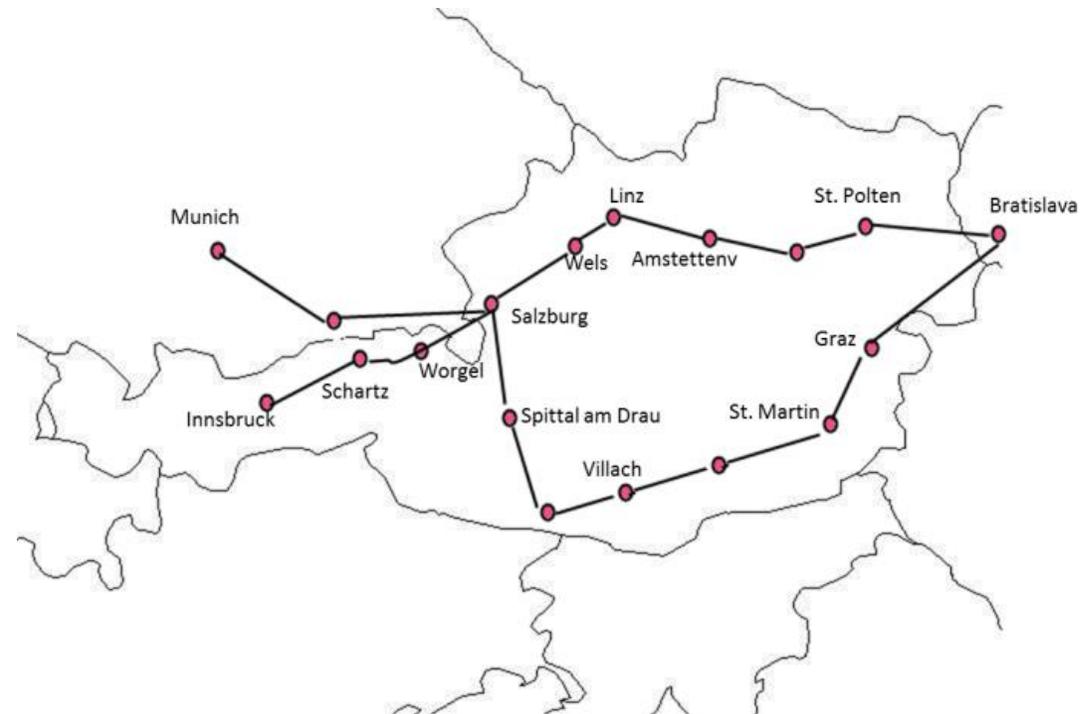
Solution

- 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

Where: Russia

What: RETN & Avelacom - international backbone ISP

Link Type: Long-haul PtP

Distance: 4,000 km, 18 nodes

 RETN.NET

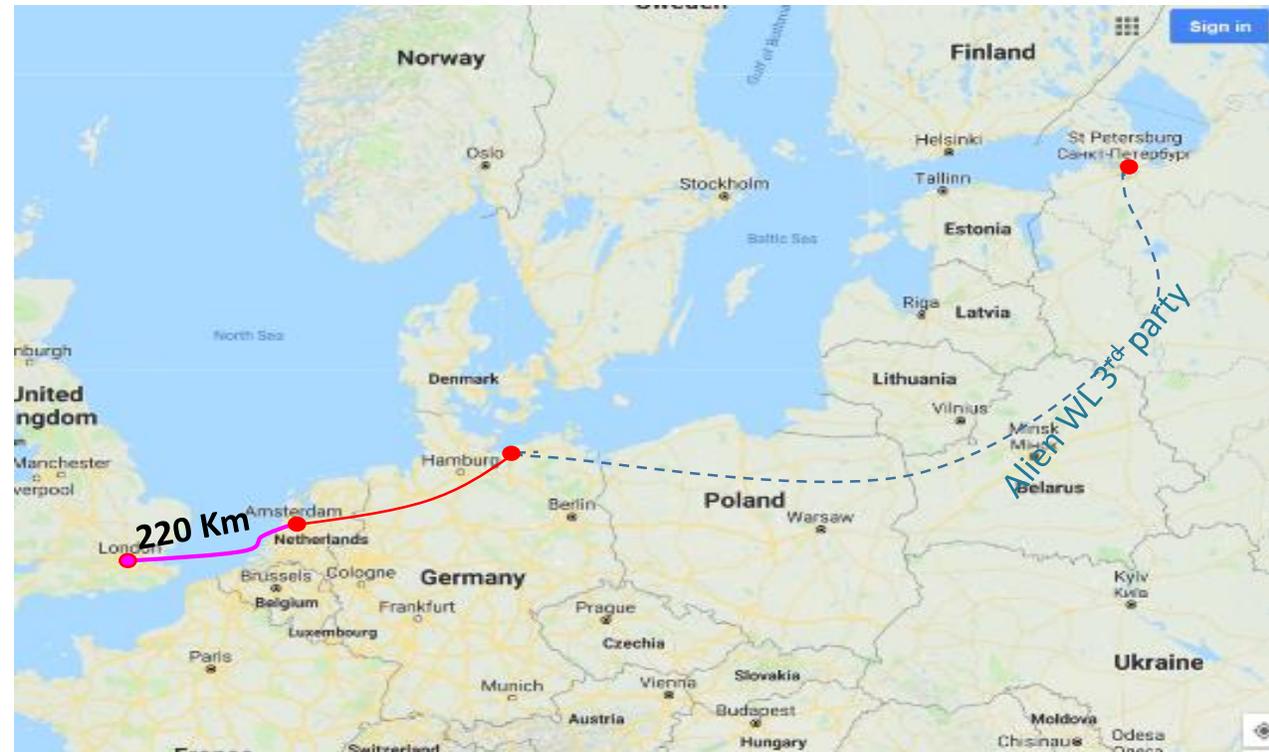
 AVELACOM

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



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!

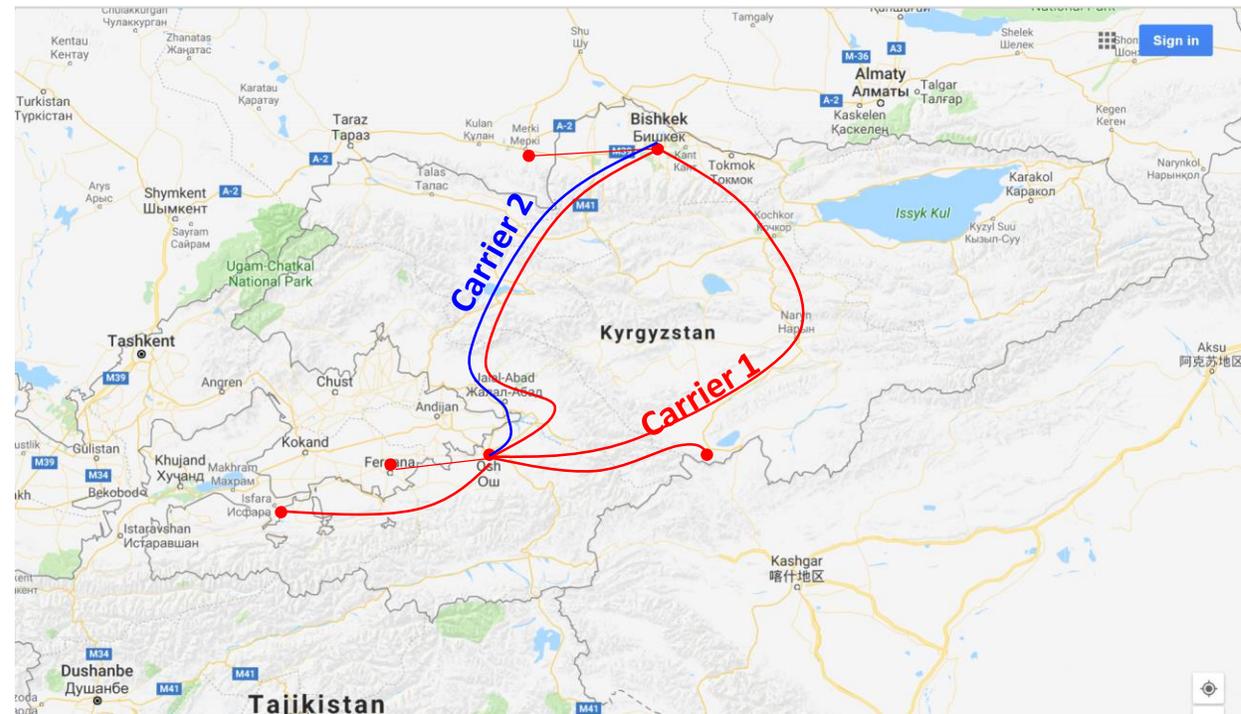
- Easy and quick deployment
- Low OPEX
- Scalable per customer needs (upgradeable to 100G network)
- Simple maintenance and support

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 100GbE
- 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!

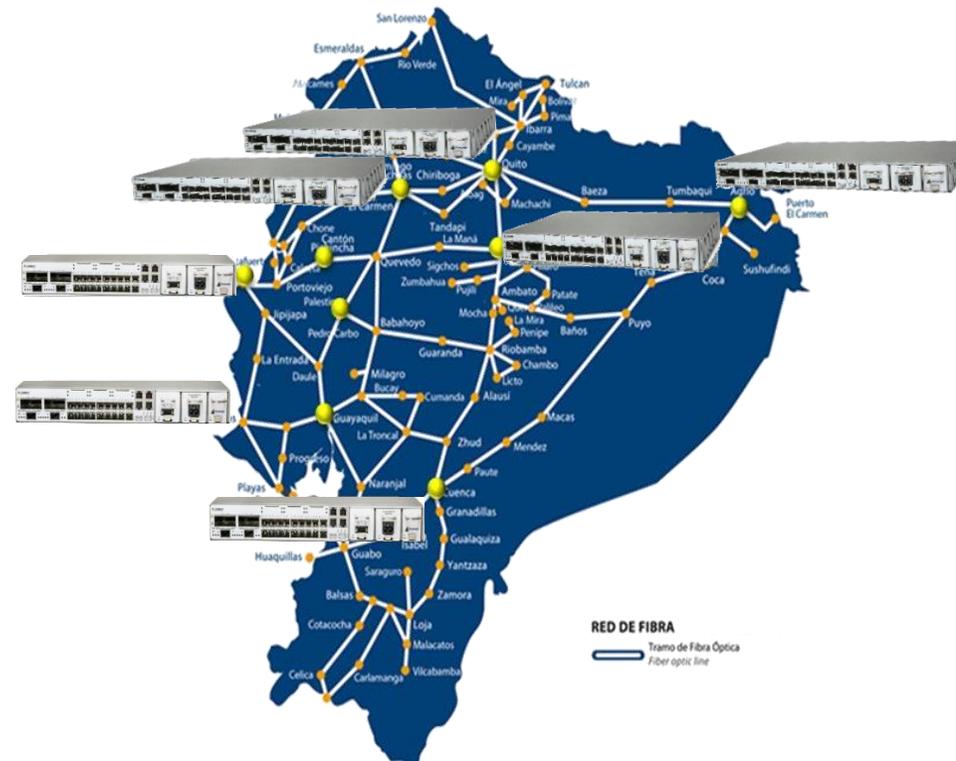
- Easy to install and maintain
- Low initial CAPEX
- Low CAPEX
- Scalable
- Simple maintenance and support

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

The screenshot displays the PacketLight PL-2000M web interface. At the top left is the PacketLight logo and the device name 'PL-2000M'. At the top right, the system name and IP address are shown: 'System Name: IP: 10.0.1.155'. Below this is a navigation bar with 'System' and 'ALL' tabs, and a row of status indicators for various ports and modules. The main content area is divided into tabs: 'Uplink', 'CFP2', 'ALS', and 'OTN'. The 'Uplink' tab is active, showing configuration details for an OTUC2 Uplink Port. The configuration includes: Port Type: OTUC2 Uplink Port; Port Rate: 264.536 Gbps; Maximal Distance: 100 km; Admin Status: Up; Operational Status: Down. To the right, there are dropdown menus for 'Service Type' (set to OTUC2) and 'Transponder Direction' (set to Tx+Rx), and a text input for 'Port Alias'. An 'Apply' button is located below these fields. At the bottom left, there are two status indicators: 'Admin Up' (green) and 'Admin Down' (red). A left sidebar contains navigation buttons for Fault, Configuration, Performance, Security, Topology, and Maintenance.

System Name: IP: 10.0.1.155

Uplink Configuration:

Port Type:	OTUC2 Uplink Port
Port Rate:	264.536 Gbps
Maximal Distance:	100 km
Admin Status:	Up
Operational Status:	Down

Service Type: OTUC2

Transponder Direction: Tx+Rx

Port Alias: []

Apply

Admin Up Admin Down

PL-2000M Uplink CFP2 Configuration

The screenshot displays the PacketLight PL-2000M configuration interface. At the top, the system name is 'PL-2000M' and the IP address is '10.0.1.155'. The interface includes a navigation menu on the left with options: Fault, Configuration, Performance, Security, Topology, and Maintenance. The main content area is divided into tabs: Uplink, CFP2, ALS, and OTN. The CFP2 tab is active, showing the following configuration details:

Vendor Name:	PLN
WDM Class:	DWDM
Lanes Num:	1
Lanes Spacing:	50 GHz
TX Nominal WL:	1549.32 nm
RX Nominal WL:	1554.94 nm
Max Bit Rate:	256 Gbps
Part Number:	CFP2-ACO-D-1101
Serial Number:	T29W4741
Connector Type:	LC

Performance metrics are shown in a separate box:

Tx Pwr:	-5.0 dBm
Rx Pwr:	NA
Current CD:	0 ps/nm
SNR:	NA
Pre-FEC BER:	2E-4
Temperature:	48 °C

Advanced settings for the CFP2 are also visible:

High Receive Power Threshold:	3.0 dBm
Low Receive Power Threshold:	-18.0 dBm
TX WL 1 Channel:	35
RX WL 1 Channel:	28
Spacing:	50GHz
Tx Output Power:	-5 dBm
Nyquist Filtering:	Disabled

An 'Apply' button is located at the bottom of the advanced settings section.

PL-2000M Port Configuration

The screenshot shows the PacketLight PL-2000M web interface. At the top, the system name is 'PL-2000M' and the IP is '10.0.1.155'. A navigation bar includes 'System' and 'ALL' tabs, and a status bar with various indicators like 'PWR', 'Uplink', and 'Port 1' through 'Port 16'. A left sidebar contains menu items: Fault, Configuration, Performance, Security, Topology, and Maintenance. The main content area is titled 'Port 1' and has tabs for 'SFP+', 'ALS', 'APS', and 'Provisioning'. The 'Provisioning' tab is active, showing a configuration form with the following fields:

Port Type:	Service Port
Port Rate:	10.3125 Gbps
Admin Status:	Down
Operational Status:	Down

Below the form are two status indicators: 'Admin Up' (green circle) and 'Admin Down' (red circle). To the right, a 'Service Type' dropdown menu is open, displaying a list of options:

- 10GbE-LAN
- 10GbE-LAN NO PM
- 16G FC
- 16G FC NO PM
- 8G FC
- OC-192
- STM-64
- OTU2
- OTU2e
- Encrypted 10GbE-LAN
- Encrypted 10GbE-LAN NO PM
- Encrypted 16G FC
- Encrypted 16G FC NO PM
- Encrypted 8G FC
- Encrypted OC-192
- Encrypted STM-64
- Encrypted OTU2
- Encrypted OTU2e

PL-2000M Uplink Performance Monitoring



PacketLight™ NETWORKS PL-2000M System Name: IP: 10.0.1.155

System ALL

Uplink Port 1 Port 3 Port 5 Port 7 Port 9 Port 11 Port 13 Port 15 MNG 1 ETH 1 COM COM 1 COM 2 Critical Minor Major Ext Alarm P 1 P 2 FAN

Port 21 Port 25 Port 2 Port 4 Port 6 Port 8 Port 10 Port 12 Port 14 Port 16 MNG 2 ETH 2 MUX EDFA 1 EDFA 2

Fault Configuration Performance Security Topology Maintenance

Uplink Port Performance Monitoring

PM Period: 15 Minutes Type: Optical Level Get PM

Interval	Rx Level dBm	Tx Level dBm	SNR dB	Chromatic Dispersion	Pre-FEC BER
Current 10/06/19;11:00:00	NA	-5.0 dBm	NA	NA	NA
1 10/06/19;10:45:00	NA	-5.0 dBm	NA	NA	NA
2 10/06/19;10:30:00	NA	-5.0 dBm	NA	NA	NA
3 10/06/19;10:15:00	NA	-5.0 dBm	NA	NA	NA
4 10/06/19;10:00:00	NA	-5.0 dBm	NA	NA	NA
5 10/06/19;09:45:00	NA	-5.0 dBm	NA	NA	NA
6 10/06/19;09:30:00	NA	-5.0 dBm	NA	NA	NA
7 10/06/19;09:15:00	NA	-5.0 dBm	NA	NA	NA
8 10/06/19;09:00:00	NA	-5.0 dBm	NA	NA	NA
9 10/06/19;08:45:00	NA	-5.0 dBm	NA	NA	NA

Export to File

Refresh every: seconds Start Refresh Stop Refresh

PL-2000M Events and Alarms

PL-2000M
System Name:
IP: 10.0.1.157

System

ALL

Uplink
Port 1
Port 3
Port 5
Port 7
Port 9
Port 11
Port 13
Port 15

MNG 1
ETH 1
COM
COM 1
COM 2

Critical
Minor
Major
Ext Alarm
P 1
P 2
FAN

PWR
Port 21
Port 25
Port 2
Port 4
Port 6
Port 8
Port 10
Port 12
Port 14
Port 16

MNG 2
ETH 2
MUX
EDFA 1
EDFA 2

Fault

Configuration

Performance

Security

Topology

Maintenance

Alarms

Events

Configuration Changes

Date & Time	Source	Severity	Message	Note
11/17/2020 11:50:44 AM	System	Event	10.0.6.199	
11/17/2020 4:14:03 PM	System	Event	System Event :Remote Unit Power Failure 10.0.6.126	
11/17/2020 4:17:55 PM	System	Minor	Equipment APS Mate Connection Lost	
11/17/2020 4:18:04 PM	System	Cleared	Equipment APS Mate Connection Lost	
11/17/2020 4:18:55 PM	System	Minor	Equipment APS Mate Connection Lost	
11/17/2020 4:19:04 PM	System	Cleared	Equipment APS Mate Connection Lost	
11/17/2020 4:19:30 PM	System	Minor	Equipment APS Mate Connection Lost	
11/17/2020 4:19:39 PM	System	Cleared	Equipment APS Mate Connection Lost	

Critical: 0

Major: 0

Minor: 13

Cleared: 13

Export to File

Refresh every: seconds

Start Refresh Stop Refresh

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

Ease of Use

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





20 Years of Technology Excellence

